

PROCEEDING



The 3rd Animal Production International Seminar
The 3rd ASEAN Regional Conference on Animal Production
3rd APIS & 3rd ARCAP – 2016

Enhancing Synergistic Roles of Stakeholders
for Development of Sustainable Livestock Production



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Proceeding 3rd Animal Production International Seminar (3rd APIS) & 3rd ASEAN Regional Conference on Animal Production (3rd ARCAP)

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tanpa seizin tertulis dari penerbit*

RECTOR SPEECH

Assalamualaikum warohmatullahi wabarakatuh
Distinguished Guests and Delegates, Ladies and Gentlemen,

It gives me great privilege and pleasure to extend to you all a very warm welcome on behalf of Brawijaya University and to say how grateful we are to the organizing committee of The Third Animal Production International Seminar (3rd APIS) and The Third ASEAN Regional Conference on Animal Production (3rd ARCAP) who made this important event happening from today onward. Your attendance in this conference will not be enough before exploring the serendipity of Batu city which has attracted so many visitors in the recent years. It offers you many attractive places to visit varying from leisure facilities to smallholder dairy farms that relevant to the topic of this conference.

The issues of livestock production and food security have been a hot topic of debates all over the world to challenge our capability to feed human population living on earth that is believed will reach 25 billion people by the middle of this millennium. The global call on quality human resources especially in developing countries may not be achieved without adequate supply of animal protein. This has urged animal scientists to make significant effort to increase animal production by inventing new technologies and approaches but have no negative impact on our natural resources because the majority of smallholder farmers face with scarcity of cultivable land to produce adequate quantity and quality fodder for their animals. The practice of uncontrolled fodder scavenging from forest and open land may provoke a serious natural disaster such as landslide, flood and loss of water resources for human beings. Through this stage I would like to extend my concern to all distinguished guests and delegates to pay more attention on sustainable development of animal production that assures our young generation lives on earth safely and happily.

As the rector of Brawijaya University, I am also delighted to welcome you in our green campus sometime in the middle of the conference to hasten mutual collaboration between Brawijaya University and either national or international partners. We are fully aware that in a modern life higher education quality should be built on the basis of collaboration for many reasons. Brawijaya University has 14 faculties that can be grouped into four science trees, that is engineering, humanity, economics, and life sciences. They have been growing significantly not only in the number of student enrollements but many prestigious achievement on research findings, student competitions and administrative transparency are our flagships in the last ten years. Nevertheless, we also realize that first and foremost constraint for any institution is the limit of resources and thereby underpinning the importance of establishing mutual collaboration. It is our opportunities to meet delegates from varying places of origin that open initial discussion for further networking on relevant topics of interests concordance to the main topic of this conference and beyond.

To conclude my address, once again I would like to express my sincere gratitude to all delegates, partners and conference committee who have made this important international conference occurs. I do hope that your stay and participation in these seminar and conference will be fruitful and unforgettable.

By the name of Almighty Allah Swt. I declare that The Third Animal Production International Seminar (3rd APIS) and The Third ASEAN Regional Conference on Animal Production (3rd ARCAP) are officially open.

Thank you very much
Wassalamualaikum warohmatullahi wabarokatuh.

Batu, 19 October 2016
Brawijaya University
Rector

Prof.Dr.Ir. Mohammad Bisri, MS.

Assalaamu'alaikum wr. wb.

Praise be to Allah, that the International Seminar 3rd-APIS could be held this year. This seminar is a routine agenda of the Faculty of Animal Husbandry UB held every three years, and this time held on October 19 to 21, 2016.

For participants come from outside the city of Malang, I proudly would like to say Welcome to the city of Malang and also on the beautiful campus of the University of Brawijaya, especially in the Faculty of Animal Husbandry. I'm sure the cool atmosphere of Malang and Batu, the participants will be able to feel a distinct impression and more enthusiastic in participating in the seminar

When we viewed from a trip APIS, we note that there is significant progress in every APIS's event. It can be noted by increasing the number of participants who submit their abstract / full paper and spread of country or university / institution they came from. This shows that the APIS is increasingly recognized by the researchers or academics community, and but on the other hand might be the number of researchers who want to publish scientific work is also increased.

Now, APIS not only belong to the Faculty of Animal Husbandry University of Brawijaya, but also belong to the universities and researchers in the world who require publish their qualified scientific paper immediately.

APIS is a very effective medium to introduce each other between researchers, as well as a very efficient medium for the information and experiences exchange among the participants. Through the APIS we can know the topics of research being conducted by other researchers in different regions or countries, so that we can develop our future research directions and topic. We can also use APIS meeting as a medium for constructing the research collaboration and networking with researchers from other institutions for strengthening our research foundation. By APIS meeting, some information about new and important problems in the livestock farming and their solutions in the field can be summarized, so it is be expected to be able to overcome some of the problems of animal farming. I am sure, that the scientific information presented in APIS are very important way out of various scientific problems and in practical condition. So that by referring to the new findings of the researchers stated in their scientific works will be able to immediately increase the efficiency of farm businesses and increase in profits for farmers.

Finally, we congratulate to have nice conference and wish all participants having good days for a better future.

Thank you,
Malang, October 13, 2016

Dean of the Faculty of Animal Husbandry
University of Brawijaya

Prof. Dr.sc.agr. Ir. Suyadi, MS.

WELCOME MESSAGE

Following the success of the First and Second Animal Production International Seminar (1st and 2nd APIS) held in 2010 and 2013, respectively, and based on the proposition during the International Representatives Steering Committee Meeting, The ASEAN Regional Conference on Animal Production (ARCAP) Committee, and Malaysian Society of Animal Production (MSAP), hence, it will be held Collaborative Seminar of The Third Animal Production International Seminar (3rd APIS) and The Third ASEAN Regional Conference on Animal Production (3rd ARCAP) at Shining Batu city, East Java Province, Indonesia from 19 to 21 October 2016 with the theme of Improving the Synergistic Roles of Stakeholders for Development of Sustainable Livestock Production.

Sustainable development has become globally interesting issue in the last decades, since the environmentally failure of green revolution in agriculture and in some other aspects of development. The developments have been blamed to result in environmental degradation and global climate change (global warming) that dangers for the sustainability of life. Hence, the concept of sustainable developments that are environmentally, economically, socially and finally lively friendly must be practiced in all aspects of development, and as a never ending process to result in the most promising outputs for either the present or the future sustainable lifes.

Livestock production is very well known to have very important and strategic roles for human life as well as the environment. Livestock production is as important source of high quality foods for human, where its requirement must continuously increase and cannot be stopped due to the continuous increase of the human population. Livestock production provides income for most of small farmers in the villages and industries. Livestock also functions as traction, fertilizer, investment or saving, social prides, wool, and fur. However, livestock production has recently been blamed for its contributions to the land degradation and the global climate changes. Livestock production has been blamed to degrade 70% of rain forest area in Amazon, contributes 18% of green house gas, and competing in the use of potential materials either for human food or renewable fuel.

Thus, to improve the important and strategic functions and contributions of livestock production, it is our great honors and pleasures to invite stakeholders in livestock production including scientists, practitioners, decision makers as well as farmers and industries to attend This 3rd Animal Production International Seminar (3rd APIS) and The Third ASEAN Regional Conference on Animal Production (3rd ARCAP) held in the most interesting agriculture complex and exotic tourism city of Shining Batu, East Java Province, Indonesia from 19 to 21 October 2016. The Shining Batu city that is located in the valley of nonactive volcanoes complex, is also known as the oldest dairy cattle production center in Indonesia and also as livestock production center where small, medium, and large scale of livestock production and industries present including dairy cattle, beef cattle, goat, sheep, poultry, pigs, and rabbits.

The seminar is supposed to be a chance for the participants to discuss and exchange the newest information on animal science and technology for improving the prospects and coping the challenges in animal production for its sustainable development. In addition, the seminar will be as a site in establishing and refreshing contacts among animal scientists as well as practitioners for the development of sustainable livestock production.

We strongly expect your active support and participation for the success of the seminar. Finally, we are looking forward to seeing you all in the most interesting city of Shining Batu and enjoying our wonderful traditions, cultures, cuisines, and scenery.

Bismillahirrohmaanirrohiim

Assalamualaikum wa rohmatullahi wa barokaatuh

Our sincerely Rector of Brawijaya University, Dean of Faculty of Animal Husbandry Brawijaya University, very important invited person, keynote speakers, and all of the participants,

In this opportunity, on behalf of the Organizing Committee, I would like to express my deeply thanks and welcoming all of you to attend this Third Animal Production International Seminar and The Third ASEAN Regional Conference on Animal Production (APIS & ARCAP-2016).

The theme of this seminar is **Improving the Synergistic Roles of Stakeholders for Development of Sustainable Livestock Production**. As all of us are aware that sustainable development in all of aspects of our live are very-very important to create a better live not only for ourselves generation but also more importantly for our next-next-next generations. Especially for the development of livestock production, it is not only targeted for the production of sufficient quantity of good quality foods including meat, milk, and egg but also to minimize its contribution to the degradation of environment. As it is very well known that livestock production is not only produce many fruitful functions our live but also has been blamed to cause land degradation, water and air pollution, and to contribute to the global climate change.

For those from this seminar we would like to expect that we can give and share our knowledge, technology, and experiences to give our contribution for the development of sustainable livestock production.

As I got the data from our secretary that this seminar is attended by not less than 300 participants from many different countries including Sudan, Iran, Sri Lanka, India, Thailand, Taiwan, Malaysia, Australia, and of course from all over Indonesia from North Sumatera to West Papua; from different discipline of livestock production including livestock production systems, feeds and nutrition, genetic, breeding, and conservation reproduction, environment and waste management, products processing and food safety, socio-economic and agribusiness of livestock, and veterinary and health care; and from different types of stakeholder including scientists, practitioners, decision makers as well as farmers and industries. For those, I would like again to express my deeply thanks to all of the participants. Please, enjoy our seminar and our most interesting city of Shining Batu and enjoying our wonderful traditions, cultures, cuisines, and scenery.

And finally, last but not least, I wish to thank to all sponsors who have contributed for financial support, to our partner institutions and especially to the organizing committee member who have been working very hard to prepare and ensure the success of this international seminar.

Good Luck and Wassalamualaikum wa rohmatullahi wa barokaatuh.

Chairman

Dr.Ir. Marjuki, M.Sc.

WELCOME SPEECH FROM MSAP PRESIDENT

Welcome Speech From MSAP President

It is indeed my pleasure to welcome you to the 3rd ARCAP (Asean Regional Conference on Animal Production) to be held in the Shining City of Batu, Malang from 19th – 22th October 2016. Malaysian Society of Animal Production is proud to be a co-organizer of this conference. ARCAP was mooted by the then president of MSAP Dr Abu Hassan Muhammad Ali, in 2013 and the first ARCAP conference was held in Kuching, Sarawak in June 2014. Representatives from Malaysia, Indonesia, Thailand, The Phillipines, Vietnam, Singapore, Laos and Myanmar were among the invited speakers. Brunei and Cambodia has yet to name their representatives. ARCAP was originally planned to be held every two years in different Asean countries but initially this system was not practical as some member countries were not represented during earlier meetings. The formation of ARCAP was to develop a network within the Asean region, providing a platform where scientists and livestock stakeholders can discuss, collaborate and exchange ideas and information on animal production specific to this region. At present ARCAP is somewhat a loose organization of societies of animal production in the Asean region and therefore look forward to receiving voluntary members to be actively involved. MSAP organized the first and second ARCAP conferences, and fortunately the Faculty of Animal Husbandry, Universitas Brawijaya, has volunteered to organize the 3rd ARCAP conference in Batu, Indonesia in conjunction with their 3rd APIS. It is hoped that future ARCAP conferences will be will be hosted by other member countries.

Before I end, I would like to thank the organizing committee, and all those involved, for their hard work to make this joint conference a success. Thanks are due to Faculty of Animal Husbandry, Universitas Brawijaya, for providing all the necessary facilities and support for the success of this conference.

Last but not least, I would like to thank all participants of this conference for your support and enthusiasm and hope that you have a fruitful and enjoyable conference.

Prof Dr Abd Wahid Haron

President MSAP 2016/2017

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	Ms. Dita Anggraini

OUTLINE OF THE CONGRESS

Congress Name:

3rd Animal Production International Seminar (3rd APIS) & 3rd ASEAN Regional Conference on Animal Production (3rd ARCAP)

Themes:

Enhancing Synergistic Roles Of Stakeholders for development Of Sustainable Livestock Production

Chairman:

Dr.Ir. Marjuki, M.Sc (Brawijaya University, Indonesia)

Date:

19-21 October 2016

Venue:

Royal Orchid Garden Hotel and Condominiums The Shining City of Batu

Official Website:

<http://apis.ub.ac.id>

Secretariat for APIS 2016:

Faculty of Animal Husbandry Brawijaya University, Malang Indonesia

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ACKNOWLEDGMENTS

BRAWIJAYA UNIVERSITY



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UNIVERSITI PUTRA MALAYSIA



MALAYSIAN SOCIETY OF ANIMAL PRODUCTION



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GENERAL INFORMATION OF BATU

Batu (Indonesian: Kota Batu, stone city) or officially Kota Batu is a city located in East Java Province of Indonesia. It is situated about 20 km to the northwest of Malang. Formerly, it was a part of Malang Regency; but in 2001, Batu became an independent city legalized by Act No. 11 of 2001, when it became an independent municipal city with its own mayor and council. A population of 190,000 people, it lies on the southern slopes of Gunung Welirang. Its population largely consists of Javanese. The town used to be a recreation place for the Dutch colonial officers in the Dutch colonial area (before 1945). Batu means rock in Indonesian.

1) Food

Many different foods are available in Malang including traditional, Chinese, Arabian and European foods.

2) Currency and Banking

Indonesian Rupiahs (IDR) are accepted at regular stores and restaurants. Most currencies and traveler's checks can be exchanged at international airport, large branches of major banks and hotels. Banks are open from Monday to Friday, 08.00 – 15.00. We will accept only IDR at the registration desks.

3) Time

Malang is in the same time zone with Indonesia Western Standard Time (IWST), +07:00 hour ahead of G.M.T. No daylight saving time is practiced in Malang.

4) Electricity

Indonesia use European style two-pin round plugs (c-type). Voltage is at 220 volt 50 Hz.

5) Emergency Number

Police in Batu City	: dial +62 341-599045 or 524111
Fire Fighter	: dial +62 341 512111
Ambulance	: dial 119

6) Transportation

- To Malang

There are several options to get in Malang. International flights to Jakarta or Denpasar (Bali) International Airport and then domestic flights to Surabaya International Airport or Malang Domestic Airport (many flights a day, approximately 1,5 hours). From Surabaya International Airport by taxi or chartered car to Malang (2-3 hours) passing through Lapindo Mud.

- In Malang

1. The participants can take public transports called as “angkot or mikrolet”, that is a blue van and can pick it up at any places. It will take you to many places around the city. It charges you a fixed cost of Rp 3.500,00 per trip (0.25 USD).

2. Or the participants can take a private taxi equipped with a charge counter that is a sedan car that the participants can also pick it up at any places or order by phone. It will take you to many places around the city. The charge is Rp. 3.500,00 per km (0.25 USD).
3. From Malang to Batu City
There are several options to go to Malang from Batu City by taxi or chartered car (1 hours) passing through Sengkaling Street.

7) Sight Seeing in Malang and Batu City

- Tugu Monument
- Merdeka Square (down town)
- Ijen Boulevard (with palm tree and Dutch houses design)
- Ceramic Industry in Dinoyo area.
- Agrotourism (tea, orange, apple, strawberry, vegetables in Lawang and Batu highlands).
- Singosari & Jajaghu Temples (ancient and attractive).
- Balekambang Beach (similar to Tanah Lot in Bali)
- Water fall Coban Rondo
- Selecta Garden and swimming pool
- Hot water spring Songgoriti
- Selorejo Lake
- Karangates Dam
- Sengkaling Fun Park
- Jatim Park and Museum
- Night Lives and Cafes
- Bromo, Tengger, and Semeru Volcanos (2-3 hours from Malang)
- Toko Oen (The oldest Dutch Restaurant)
- Malls and super markets

8) Culture and arts:

- Traditional dance
- Handicrafts and souvenirs (traditional mask, ceramics)

GENERAL INFORMATION OF THE CONGRESS

1) Language

- All presentation, discussion and questions must be in English
- Simulation translation is not provided

2) Registration

- The registration desks are located at second floor of Royal Orchid Garden Hotel
- Advanced registrants may pick up their Name Badge at the Desk.
- Registration desk will also be set up at Hotel Royal Orchid Garden during the following times on 19th October.
- Registration Fees

Category	Before September 25 th , 2016		After September 25 th , 2016	
	Indonesian	Overseas	Indonesia	Overseas
Participant	1.000.000 IDR	200 USD	1.250.000 IDR	225 USD
Student	750.000 IDR	150 USD	1.000.000 IDR	175 USD
Accompanying Person	750.000 IDR	150 USD	1.000.000 IDR	175 USD

The payment does not include accommodation (hotel) during the seminar

**Payment should be made available through bank transfer to:
Bank Central Asia (BCA) Malang, cq. Asri Nurul Huda, Account Number 315 091 2279
Swift Code: CENAIJJA**

3) Certificate

- Attendance certificates are printed on the same face of Name Badge.
- Certificates will not be issued for accompanying persons.

4) Proceedings

Proceedings are provided in USB Flash Memory Stick in your congress bag.

5) Congress Bag

Please register your name for a congress bag. One bag per person.

6) Lunch

- Lunches will be buffet style on 19 and 21 October.
- The venue for all lunches is “SINGHASARI RESTAURANT” of the Royal Orchid Garden Hotel

- Please note that an accompanying person's name badge will not allow entry into the lunch venue

7) Coffee Break

- The venues for coffee breaks are "Panderman Lobby/Hall" of the Royal Orchid Garden Hotel
- Please note that an accompanying person's name badge will not allow entry into the lunch venue

8) Internet

- A WI-FI service is available in some areas. However, strongly recommended to use personal connection internet.
- There is no business support center.

9) Non-Smoking policy

Smoking is strictly forbidden in the meeting area. Thank you for your cooperation.

10) Oral and Poster Presentation Place

- Oral Presentation will be held at Pandeman 1 & 2 room, Semeru room, Anjosmoro Room and Welirang Room of Royal Orchid Garden Hotel.
- Poster presentation will be held at Pandermal Hall of Royal Orchid Garden Hotel

11) Program For Accompanying Persons

- Accompanying persons can participate in the following 2 programs
- Please apply at the "Information" desk at the congress registration desks.
- Applications will be accepted on a first-come-first-served basis.
- Please make sure wear accompanying person's name badge.

12) Others

- Please wear your Name Badge during the congress. Please note that Name Badges will not be reissued if lost or forgotten at your hotel.
- There is no travel support desk.
- Unauthorized recording of sound and/ or video of any sessions is prohibited.
- Participants are kindly requested to keep their mobile phones switched off while in the session rooms.
- It is rainy season in Malang and Batu City. You may bring umbrella handy.

Opening ceremony/ Keynote Lecturer

- To be held at the time, date and venue shown below:
08.30 – 09.30, Wednesday, 19th October
Panderman room, Royal Orchid Garden Hotel
- Please complete registration, and attach your Name Badge before entering the venue.

Welcome Party

To be held at the time, date and venue shown below:
15:00-22:00, Wednesday, 19th October
Faculty of Animal Husbandry, Brawijaya University

Closing ceremony/ Farewell party and Dinner

To be held at the time, date and venue shown below:
18.00 – 21.00, Thursday, 20th October
Singhasari restaurant, Royal Orchid Garden Hotel

PRORGAM DETAIL

**The 3rd Animal Production International Seminar &
The 3rd ASEAN Regional Conference on Animal Production
(3rd APIS - 3rd ARCAP 2016)
Batu, 19-21 October 2016**

Wednesday, 19 October 2016			
Time	Program	Person In Charge	Venue
07.00-08.30	Registration	OC	Panderman Room
08.30-09.30	Opening Ceremony <ul style="list-style-type: none"> • Welcome Traditional Dance • Report by Chairman of Organizing Committee • Opening Remarks by Dean Fac. Anim. Husbandry . Brawijaya University • Opening Remarks by Rector, Brawijaya University • Dance Performance • Pray for the success of the seminar 	MC OC Dr.Marjuki Prof.Dr.Sc.Agr. Suyadi Prof.Dr. Mochammad Bisri OC OC	Panderman Room
09.30-10.00	Coffee Break	OC	Panderman Lobby
10.00-10.40	Keynote Speakers Presentation 1 <ol style="list-style-type: none"> 1. Review of Researches for Development of Sustainable Livestock Production <i>(Prof. (Emeritus) Liang Chou Hsia, Ph.D.)</i> 2. Breeding Program of Local and Imported Beef/Dairy Cattle Breed for Development of Sustainable Livestock Production <i>(Prof.Dr. A.K.Thiruvenkadan, Ph.D.)</i> 	Moderator Dr.Bambang Ali N.	Panderman Room
10.40-11.20	Keynote Speakers Presentation 2 <ol style="list-style-type: none"> 1. Current Analysis on Beef Self Sufficiency Program in Indonesia <i>(Prof.Dr.Ir. Hendrawan Soetanto)</i> 2. Current Development Trends in Global Broiler Production <i>(Prof. Dr. Yusuf L. Henuk)</i> 	Moderator Prof.Dr. A.K.Thiruvenkadan ,Ph.D.	Panderman Room
11.20-12.00	Keynote Speakers Presentation 3 <ol style="list-style-type: none"> 1. Feeding Management of Ruminant Animals to Reduce Their Contribution for Gas Emission <i>(Assoc.Prof. Anjas Asmara Samsudin, DVM,Ph.D.)</i> 2. Manipulation of Ruminant Fermentation and Methane Mitigation by Feeding Management: Strategic Success Keys for Smallholder Dairy Farm with Environmentally Friendly <i>(Assoc. Prof. Suntorn Wittayakun, Ph.D.)</i> 	Moderator Prof.Dr. Hendrawan Soetanto	Panderman Room
12.00-13.00	Lunch Break	OC	Orchid Hotel Restaurant

13.00-14.00	Parallel Oral Presentation Session 1 Feeds and nutrition Feeds and nutrition Genetic, breeding, and conservation Livestock production systems Socio-economic and agribusiness	Scientific Committee	Orchid Hotel Panderman Room 1 Panderman Room 2 Semeru Room Anjasmoro Room Welirang Room
14.00-15.00	Parallel Oral Presentation Session 2 Feeds and nutrition Feeds and nutrition Socio-economic and agribusiness Reproduction Products processing and food safety	Scientific Committee	Orchid Hotel Panderman Room 1 Panderman Room 2 Semeru Room Anjasmoro Room Welirang Room
15.00-22.00	Welcome Party and Dinner Trip to Venue (Brawijaya University Campus) Reog performance Welcome speech Welcome dance Welcome party and Dinner Return to Hotel	OC	Faculty of Animal Husbandry, Brawijaya Univ. Campus

Thursday, 20 October 2016			
Time	Program	Person In Charge	Venue
08.00-16.00	Field Trip: Group 1. Livestock Training Center-Songgoriti, Pujon Dairy Cooperatives- milk collecting/processing plant and farms, Lunch, Eco Green park. Group 2. Pujon dairy cooperatives- milk collecting/processing plant and farms, Livestock Training Center-Songgoriti,Lunch, Eco Green Park.	OC	Orchid Hotel
18.00-21.00	Farewell Party and Dinner	OC	Orchid Hotel Restaurant

Friday, 21 October 2016			
Time	Program	Person In Charge	Venue
08.00-09.30	Oral Parallel Presentation Session 3 Feed and Nutrition Feed and Nutrition genetic, breeding, and conservation	Scientific Committee	Orchid Hotel Panderman Room 1 Panderman Room 2 Semeru Room

	Livestock production systems Veterinary and health care		Anjasmoro Room Welirang Room
09.30-10.00	Coffee Break and Poster Presentation		Panderman Hall
10.00-11.00	Oral Parallel Presentation Session 4 Feed and Nutrition Feed and Nutrition Reproduction Livestock production systems Socio-economic and agribusiness	Scientific Committee	Orchid Hotel Panderman Room 1 Panderman Room 2 Semeru Room Anjasmoro Room Welirang Room
11.00-12.30	Lunch Break	OC	Orchid Hotel Restaurant
12.30-14.00	Oral Parallel Presentation Session 5 Feed and Nutrition Feed and Nutrition Feed and Nutrition Livestock production systems Socio Economics and Others	Scientific Committee	Orchid Hotel Panderman Room 1 Panderman Room 2 Semeru Room Anjasmoro Room Welirang Room
15.30-15.45	Coffee Break		Panderman Hall
15.45-16.30	Young Scientist Awards and Closing Session	Scientific Committee	Orchid Hotel

Badges

Wear your meeting badge. It is required for admission to breaks and meals.

Photo Policy

Capturing Power Point images during oral presentations or image of poster presentations via photography with camera or cell phones is strictly prohibited.

Chairs

- Please be seated of your session room at least 10 minutes prior to the start of your session
- Their is a time keeper to indicate each speaker's allotted time.
- Please manage the seassion time not to delay the schedule.

Oral Presenters

Keynote and Oral Sessions :

1. Presentation time for:
 - 1.1 **Keynote** speaker is 15 minutes followed by 5 minutes discussion.
 - 1.2 Allocated time for each **Oral Speaker** is 8 minutes, discussion and questions are 2 minutes and all must be in English
2. Volunteer worker in the presentation hall is given a time and bell to ensure the session progressing on time.

Oral Presentation Session:

1. Presentation time for each speaker is 8 minutes followed by 2 minutes discussion.
2. Volunteer worker in the presentation hall is given a timer and bell to ensure the session progressing on time.
3. If the presenter is absent, please keep his or her presentation session empty. We do not change the program and bring other presentations forward. This is to ensure those participants from other sessions will be able to join the session on time.

Presentation guideline:

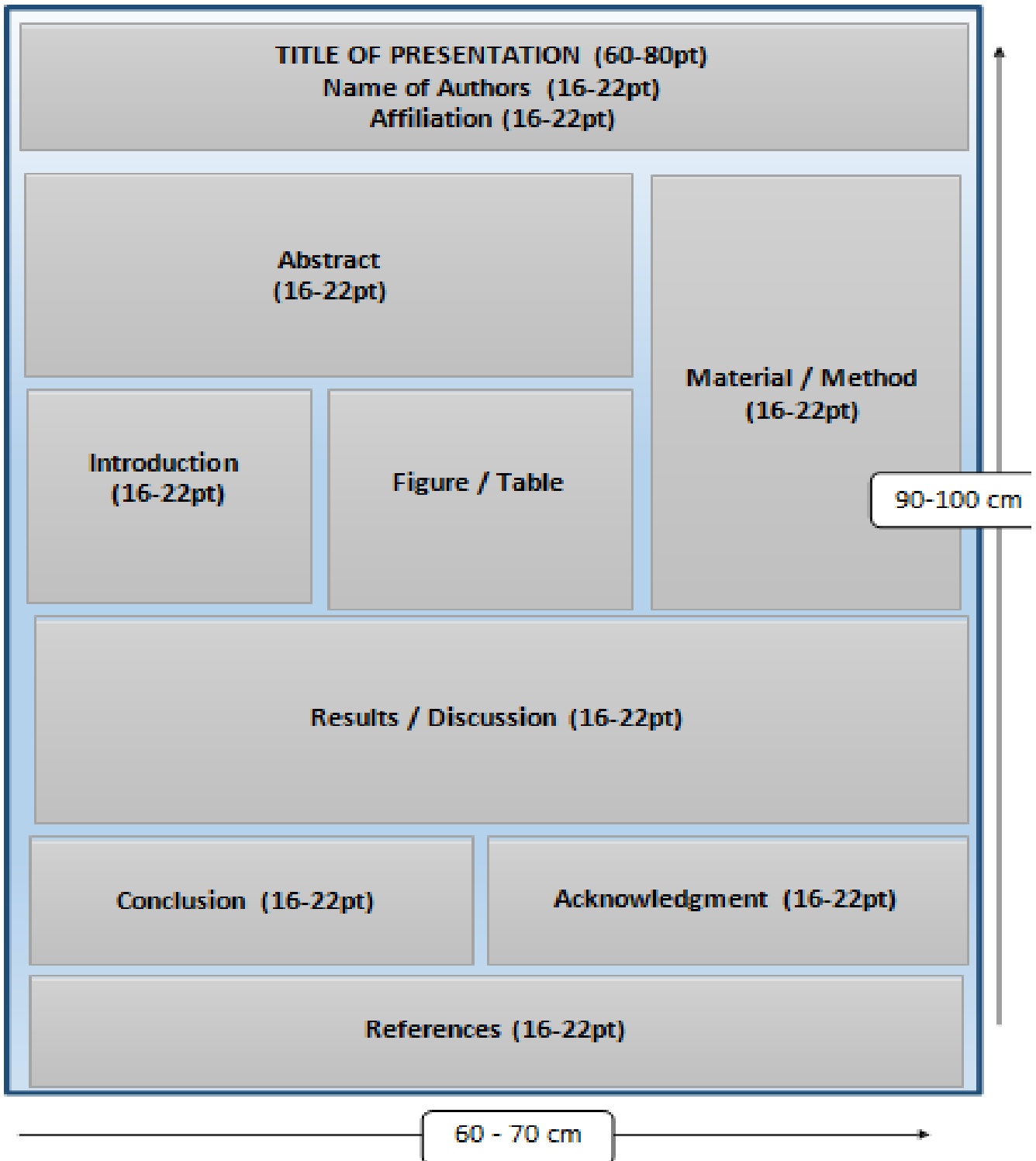
1. All Power Point presentations will be loaded in advance at least **45 minutes** before the start of each session by APIS & ARCAP Secretariat team.
2. If combining video films with Power Point, please make sure to check it in the session hall where your lecture is taking place during a coffee or lunch break prior to your session, at least **45 minutes** before the start of the session. However, no audio file to be operated.
3. No presentation will be accepted in the session room or loaded while the session is in progress or between presentations. The use of personal computers for presentations in the session rooms will not be permitted. If you cannot follow these guidelines you should plan to present without visual tools.
4. We will accept computer-based PowerPoint presentations. Slide/ Overhead projectors will NOT be available

5. Please bring your presentations on a USB Flash Memory Stick. Please do not bring your own computer.
6. Presentation must be made in PowerPoint readable in Windows.
7. The computers provided for sessions will be running by Windows 7 or 8 operation system with the following application software installed. Power Point 2003, 2007, 2010 and 2013.
8. Use the above operating systems English fonts only.
9. If your presentation data is linked to other file (i.e still or moving images, graphs, etc), those linked files should also be saved in the same folder, and the links to be checked beforehand.
10. The resolution of the LCD projector for presentation is XGA (1024 x 768)
11. Please note that MOs, floppy disks, and CD RWs cannot be accepted
12. Please drop off your data at the PC of secretariat team by the appointed time.
13. All presenters are responsibility for checking virus at the PC of secretariat team.
14. The secretariat team is responsible for discarding all copies of any data after the session.

Poster Presenters

1. Please find your poster board number at the list of poster presentation in the program book, and check the times for mounting, viewing, and removal of your poster.
2. Poster presentation should be mounted during 09:30-10:00 a.m. on October 21th, and removed after 17:00 p.m. on October 21.
3. The participants are **REQUIRED** to be presented by their poster during the sessions.
4. Failure to display an accepted poster during the poster time at the meeting may result in the rejection and removal of abstract and pull paper from the electronic version of the conference proceedings.
5. The dimensions of the poster board are: **60-70 cm WIDE x 90-100 cm HEIGHT (see below image)**
6. Allocate the top of the poster for the title and authors as stated on the submitted abstract.

GUIDELINE FOR POSTER PRESENTATION CONFERENCE
(PORTRAIT ORIENTATION) A1 PAPER



Oral Presentation Program

Day1: Wednesday, 19 October [Orchid Hotels]

Oral Presentation 1 Focus Session: Feed and Nutrition(1)

Wednesday, 19 October 13:00-14:00 Room: Panderman 1

Time	Title	Presenter	Code
13.00-13.10	Smallholder dairy cattle farmer capacity in providing feeds and nutrient in several population densities of villages of Sleman Regency, DIY Province – Indonesia Permana I. G., Zahera R., Toharmat T. and Despal	Permana I. G (Moderator 2)	FN – 392
13.10-13.20	Nutritional properties of several seaweeds species for dairy cattle Despal, Hasri N. and Permana I. G.	Despal	FN – 393
13.20-13.30	Inclusion of various levels of peanut hay (rendeng) in the rabbit diet Tuti Haryati, Bram Brahmantiyo, Bayu Dewantoro P. Soewandi, and Yono C. Raharjo	Tuti Haryati	FN – 327
13.30-13.40	The use of corn fodder for rabbit production Yono C. Raharjo, S. Rahayu, Bayu Dewantoro P. Soewandi, and Tuti Haryati	Yono C. Raharjo(Moderator 1)	FN – 328
13.40-13.50	Effect of mixture of manure and jackfruit peel fermented by <i>Aspergillus oryzae</i> on in vitro gas production parameters ¹ Mashudi, Siti Chuzaemi and Eka Yunianti	Mashudi	FN – 399
13.50-14.00	Changes in nutrition and fibre silage water hyacinth (<i>Eichornia crassipes</i>) as ruminant feed fermented with several fermentative materials ¹ ¹ Muhammad Mukhtar	Muhammad Mukhtar	FN – 361

Oral Presentation 1 Focus Session :Feed and Nutrition (2)

Wednesday, 19 October 13:00-14:00 Room: Panderman 2

Time	Title	Presenter	Code
13.00-13.10	Performance of broiler chickens fed diets supplemented with several palm polysaccharides ¹ ¹ B. Sundu, S. Bahry, and H. B. R. Dien	B. Sundu (Moderator 2)	FN – 374
13.10-13.20	Supplementation of the diets with rich – selenium feedstuffs on the performance of 4 weeks old broiler chickens ¹ ¹ B. Sundu. A. Adjis and R. Dien	B. Sundu	FN – 369
13.20-13.30	Effects of different combination of water hyacinth (Eichornia crassipes mart) leaves and sapu sapu fish (Hypostomus plecostomus) on growth performances of local ducks in Lombok ¹ ¹ B. Q. Erni Nurhidayati, Asnawi and Wiryawan, K. G.	B. Q. Erni Nurhidayati	FN – 316
13.30-13.40	Evaluation on the biological effectivity of BS4 enzymes in laying hens diet at commercial farms level ¹ ¹ Arnold P. Sinurat, Broto Wibowo, Tresnawati Purwadaria, and Tuti Haryati	Arnold P. Sinurat (Moderator 1)	FN – 317
13.40-13.50	The effect of Type of Microbes and Humic Acid Does to Improve The Quality and Nutriet Contents of Palm Oil Sludge ¹ ¹ Mirnawati, Ade Djulardi and Gita Ciptaan	Mirnawati	FN – 324
13.50-14.00	Effect of probiotic supplementation in feed on meat cholesterol content and intestinal microflora of broiler ¹ ¹ Ilham Ardiansah, Syaiful Haq Baderuddin, Kholifatus Sholiha, Andini Nur Izza, Ratna Mustika Pratiwi, Zeta Rivlinia Sari and Osfar Sjojfan	Ilham Ardiansah	FN – 396

Oral Presentation 1 Focus Session :Genetic Breeding and Conservation

Wednesday, 19 October 13:00-14:00 Room: Semeru

Time	Title	Presenter	Code
13.00-13.10	The qualitative and quantitative characteristics identification of bali cows having different coat color in Kupang, East Nusa Tenggara, Indonesia ¹ ¹ Arnold. Christian Tabun, Ferdinan Suharjon Suek, Bernadus Ndoen, Thomas Lapenangga, Cardial Leo Penu, and Johanis Jermias	Arnold. Christian Tabun	GB – 106
13.10-13.20	Mitochondrial d-loop nucleotide sequence of indonesian gayo buffalo: variation and phylogeny studies 1 1 Eka Meutia Sari, Mohd. Agus Nashri Abdullah, M. Yunus, Nuzul Asmlia, and Eryk Andreas	Eka Meutia Sari	GB -107
13.20-13.30	Morphology of Indonesian native ducks 1 1 Daniel D. I. Putra, Dyah Maharani, Dwi N. H. Hariyono, Jafendi H. P. Sidadolog, and Jun Heon Lee	Daniel (Moderator 1)	GB -109
13.30-13.40	Variation of Quantitative Traits of Kamang Duck as Local Genetic Resources in Kamang Regency West Sumatera ¹ ¹ Firda Arlina, Sabrina, Husmaini, and Franky	Firda Arlina(Moderator2)	GB -111
13.40-13.50	Flock Composition, Effective Population Size, Actual Population Size And Rate of Inbreeding of Kamang Duck in Kamang Magek Regency Agam District ¹ ¹ Sabrina, Firda Arlina, Husmaini, and Guntur Eka Putra	Sabrina Amini	GB -112
13.50-14.00	Polimorphism of Silkworms Bombyx mori of two Breeding Centers (Soppeng and Temanggung) in Indonesia ¹ ¹ Nur Cholis	Nur Cholis	GB – 110

Oral Presentation 1 Focus Session : Livestock Production Systems

Wednesday, 19 October 13:00-14:00 Room: Anjasmoro

Time	Title	Presenter	Code
13.00-13.10	Chickens Population and Production and Their Contribution to Human Population in Indonesia ¹ ¹ Yusuf L. Henuk, D. Bakti, Rosmayati, G. A. M. K. Dewi, S. Y. F. G. Dillak	Arnold. Christian Tabun	LP - 232
13.10-13.20	Prospects of broiler Industry in Indonesia ¹ ¹ V. J. Ballo, M. Sinlae, J. F. Theedens, S. T. Temu, and Y. L. Henuk	V. J. Ballo	LP - 233
13.20-13.30	Structural adaptation and concentrating capacity of ruminant kidney: buffalo, cattle and goat ¹ ¹ Djoni Prawira Rahardja, Tri Widyo Utomo and H. Sonjaya	Djoni Prawira Rahardja	LP – 208
13.30-13.40	Doe productivity of etawah grade does based on hair color differences ¹ ¹ I Gede Suparta Budisatria, Panjono, and Dyah maharani	I Gede Suparta Budisatria	LP – 207
13.40-13.50	The effect of duration of photoperiod and light intensity toward first age of laying, feed consumption, daily egg production, and feed conversion ¹ ¹ Prayogi H. S., Sudjarwo E., and Putra A. P. P.	Heni Setyo Paryogi (Moderator 1)	LP – 229
13.50-14.00	Integrated rice-duck farming system in asia ¹ ¹ Y. L. Henuk, S. P. Ginting, A. R. Hasyim, Muslim, T. J. Adawiyah, M. Firdaus, and Arwinsyah	Y. L. Henuk	LP – 212

Oral Presentation 1 Focus Session : Socio-economics and agribusiness

Wednesday, 19 October 13:00-14:00 Room: Welirang

Time	Title	Presenter	Code
13.00-13.10	An assessment of Indonesia's beef supply chain ¹ ¹ Bambang Ali Nugroho	Bambang Ali Nugroho(MODERATOR 2)	SE – 718
13.10-13.20	Feasibility of sugarcane - cattle integration model in supporting farmers self sufficiency and prosperity in Kerinci Regency, Province of Jambi, Sumatera ¹ ¹ Firmansyah, Afriani H. and Rahmi Dianita	Rahmi Dianita	SE – 701
13.20-13.30	Profile analysis and application of technology in the farmer's group of ettawa crossbred goat in Yogyakarta Indonesia ¹ ¹ Tri Anggraeni Kusumastuti and Sigit Bintara	Tri Anggraeni Kusumastuti	SE – 702
13.30-13.40	Profile of farmers' groups and its affectivity in supporting agribusiness on the smallholder beef cattle in Yogyakarta Province, Indonesia ¹ ¹ Rini widiaty, Trisakti Haryadi, and Tri Anggraeni Kusumastuti	Rini widiaty	SE – 703
13.40-13.50	Socioeconomic and productive performance of smallholder dairy farm in Lampung Province, Northern Thailand ¹ ¹ Suntorn Wittayakun	Assoc.Prof.Dr. Suntorn Wittayakun(MODERATOR 1)	SE – 704
13.50-14.00	Analysis of maize feed industry : a supply chain perspective ¹ ¹ James Hellyward, Jafrinur, Nurhayati, Fitriani, and Elfi Rahmi	James Hellyward	SE – 729

Oral Presentation 2 Focus Session :Feed and Nutrition (1)

Wednesday, 19 October 14:00-15:00 Room: Panderman 1

Time	Title	Presenter	Code
14.00-14.10	Production and milk composition of crossbred etawah goats fed on basal diet containing different levels of sesbania (<i>Sesbania grandiflora</i>) leaves ¹ ¹ A R. S. Asih, K G. Wiryawan, I. N. Sadia, and Kertanegara	A. R. S. Asih (MODERATOR 2)	FN – 367
14.10-14.20	The fermentation of bagase with fungi <i>Ganoderma lucidum</i> and its ligninolytic enzyme activity ¹ ¹ Fauzia Agustin and Elihasridas	Fauzia Agustin	FN – 370
14.20-14.30	Encapsulated biomineral supplementation in dairy cattle ration on in vitro fermentability and digestibility ¹ ¹ Anita S. Tjakradidjaja, Ajeng Puspandari, Suryahadi, B. Bakrie and Dewi A. Astuti	Anita S. Tjakradijaja	FN – 371
14.30-14.40	Effect of packaging medium on survival of napier grass stem cutting ¹ ¹ J. Shokri, H. Yaakub, and N. H. Hussein	J. Shokri	FN – 372
14.40-14.50	<i>Manihot utilisima</i> leaves supplement in cow dietary of rice straw ammoniation basis and synchronize in releasing N-protein and energy in the rumen ¹ ¹ Hermon and Jaswandi	Hermon	FN – 383
14.50-15.00	Effects of Rumen Mechanical Stimulating Brush Administration on eating behavior, dry matter intake and dry matter digestibility of Brahman Cross Steers Fed with Low Forage Diet ¹ ¹ Sari Nurmeiliasari, Rudy Priyanto, and Dewi Apri Astuti	sari nurmeiliasari (MODERATOR1)	LP – 215

Oral Presentation2 Focus Session :Feed and Nutrition (2)**Wednesday, 19 October 14:00-15:00 Room: Panderman 2**

Time	Title	Presenter	Code
14.00-14.10	Effect of Piper retrofractum as a phytogetic feed additive for broiler performance ¹ ¹ Ninasari R. A., Mutia R., and Sukria H. A.	Rahayu Ambarwati Ninasari (MODERATOR2)	FN – 373
14.10-14.20	Production performance and egg quality of laying hens on silage juice addition ¹ ¹ R.A.Rosa, M. Ridla, A. Setiyono, N. Fauziah, W. Hermana and Nahrowi	Rahayu Asmadini Rosa	FN – 375
14.20-14.30	Digestibility evaluation of microparticle protein derived from fish meal and soybean meal in broiler chicken ¹ ¹ Nyoman Suthama and Pratama Jujur Wibawa	Nyoman Suthama	FN – 376
14.30-14.40	Piper betle Leaf Infuse Supplementation as Herbal Antibiotic to Reduce Salmonella sp. in Small Intestine of Quail (<i>Cortunix cortunix japonica</i>) ¹ ¹ Widjaya F.E., Y. Retnani, and W. Hermana	Fensa Eka Widjaya	FN – 377
14.40-14.50	The effect of addition mannase enzyme in diet on broiler production performances ¹ ¹ Eko Widodo, Osfar Sjojfan, and Hesdyana Novita	Eko Widodo (MODERATOR1)	FN – 381
14.50-15.00	Broiler chickens performance as affected by animal fat and plant oil under hot arid conditions of Sudan ¹ ¹ Asma H. M. Hamed , N. A. Musharaf and Amani A. B. Osman	Asma Himmmed Mohammed	FN – 344

Oral Presentation2 Focus Session : Socio-economics and agribusiness

Wednesday, 19 October 14:00-15:00 Room: Semeru

Time	Title	Presenter	Code
14.00-14.10	Development of livestock agroindustry: increasing revenue economic and employment opportunities to local society ¹ ¹ Sitti Zubaidah	Sitti Zubaidah (Moderator 2)	SE – 707
14.10-14.20	Urban community program of rabbit raising based on eco-friendly ¹ ¹ Mudawamah	Mudawamah	SE – 714
14.20-14.30	Farmers' adoption to pig intensive keeping system in Taebenu Sub District, West Timor, Indonesia ¹ ¹ Johanis A. Jermias, Cardial Leo Penu , Defrys R. Tulle, I Gusti Ngurah Jelantik, Devi A. J. Ndolu, Sondang P. P. Leoanak	Johanis A. Jermias	SE – 709
14.30-14.40	The empowerment of Rabbit Breeders in Lang-lang Village, Singosari Districts, Malang City, East Java Province, Indonesia ¹ ¹ Kusumastuti A. E., Azizah S., and Nugroho E.	Anie Eka Kusumastuti (Moderator 1)	SE – 720
14.40-14.50	Evaluation of productivity indicators to propose broiler performance index for assessment of broiler operations ¹ ¹ Jayaweera B. P. A.	Jayaweera B.P.A	SE – 713
14.50-15.00	Fresh Milk Quality and Information Availability on Local Stage in Malang Area East Java, Indonesia ¹ ¹ Firmansyah Tri Saputra	Firmansyah Tri Saputra	SE – 727

Oral Presentation2 Focus Session :Reproduction

Wednesday, 19 October 14:00-15:00 Room: Anjasmoro

Time	Title	Presenter	Code
14.00-14.10	Sperm quality of ongole crossbred cattle on egg yolk cauda epididymal extender during cooling process in straw ¹ ¹ Aulia Puspita Anugra Yekti, Enike Dwi Kusumawati, Nislaus Sholikah, Muchamad Luthfi, Lukman Affandhy, Dicky Pamungkas, Kuswati, Aswah Ridhowi, Nurul Isnaini, and Trinil Susilawati	Aulia Puspita Anugra Yekti	RP – 401
14.10-14.20	Semen characteristics and sperm recovery rate of Aceh bull frozen semen ¹ ¹ Wilmietje Marlene Nalley, Hensieriana L.L Belli, Thomas Mata Hine, Iis Arifiantini, and Eros Sukmawati	Wielmientje Marlene Nalley	RP – 405
14.20-14.30	Post-thawed semen quality of West Java local ram at different level of gliserol ¹ ¹ Nurcholidah Solihati, Siti Darodjah Rasad, Rangga Setiawan, and Santi Nurjanah	Nurcholidah Solihati	RP – 414
14.30-14.40	Effect equilibration time in the process of freezing the quality of semen Wagyu bull using diluent (R) Andromed ¹ ¹ Trinil Susilawati, Hirzi Hanifi, and Moh. Nur Ihsan	Trinil Susilawati (moderator1)	RP – 417
14.40-14.50	The Effect of Mangosteen (Garcinia mangostana) Peel Filtrate Supplementation in Skim Milk based Diluent on Limousin Culled Semen Quality during Cooling Process ¹ ¹ Nurul Isnaini and Aulia Puspita Anugra Yekti	Nurul Isnaini (Moderator 2)	RP – 423
14.50-15.00	The acceptability of limousine bull raw semen for frozen semen production ¹ ¹ Iis Arifiantini, Meta Yuniar, Wilmintje Marlene Nalley, and Eros Sukmawati	Iis Arifiantini	RP – 406

Oral Presentation2 Focus Session :Product Processing and Food Safety

Wednesday, 19 October 14:00-15:10 Room: Welirang

Time	Title	Presenter	Code
14.00-14.10	Meta-analysis of nutritional quality comparison between organic and conventional dairy products ¹ ¹ Eny Palupi , Angelika Ploeger , Johannes Kahl , and Anuraga Jayanegara	Anuraga Jayanegara (Moderator 2)	PP – 601
14.10-14.20	Physical characteristics and mineral composition of bone meals produced from different body parts of cattle bones by open-air burning and limed-water cooking and limed-water cooking ¹ ¹ Khalil, Reswati, Ferawati, Y. F. Kurnia, and F. Agustin	Khalil	PP – 603
14.20-14.30	Effect of storage time and citric acid addition on functional properties of arabian chicken egg white ¹ ¹ Imam Thohari, Muji Lestari, and Firman Jaya	Imam Thohari	PP – 604
14.30-14.40	The Physical quality and organoleptic properties of beef meatballs in Malang, East Java, Indonesia ¹ ¹ Rosyidi D., A. S. Widiati, E. S. Widyastuty, and Agustina D. P.	Djalal Rosyidi (Moderator 1)	PP – 607
14.40-14.50	Application of porang flour for fat replacer in reduced fat mayonnaise ¹ ¹ Herly Evanuarini, Nurliyani, Indratiningsih	Herly Evanuarini	PP – 608
14.50-15.00	Effect of canna starch (<i>Canna edulis</i> Ker) during refrigerator storage on syneresis, viscosity, and total plate count of yoghurt drink ¹ ¹ Lilik Eka Radiati, Imam Thohari and Ahmad Khoirul Umam	Lilik Eka Radiati	PP – 609

Oral Presentation Program

Day 3: Friday, 21 October [Orchid Hotels]

Oral Presentation 03: Focus Session :Feed and Nutrition(1)

Friday, 21 October 08:00-09:20 Room: Panderman 1

Time	Title	Presenter	Code
08.00-08.10	Biological status and conservation of anoa (<i>Bubalus depressicornis</i>) in tropical forest of North Sulawesi ¹ ¹ Bernat Tulung, J. F. Umboh, K. Maaruf, A. F. Pendong, and Y. L. R. Tulung	Johnny F. Umboh (MODERATOR 2)	FN – 302
08.10-08.20	The nutritional value evaluation of ammoniated rice straw and fermented sago dregs in complete feed on performances of ongole cross breed cattle. ¹ ¹ R. A. V. Tuturoong, Y. L. R. Tulung dan A. F. Pendong	Ronny A. V. Tuturoong	FN – 349
08.20-08.30	Potential Source of Feedstuffs From Oil Palm Plantation Areas For Development of Cattle Production in Indonesia ¹ ¹ D. Bakti, Y. L. Henuk, Rosmayati, E. Purba, D. Siahhan	D. Bakti	FN – 389
08.30-08.40	Methane reduction strategy with fat supplementation for development of sustainable ruminant livestock production ¹ ¹ Nur Hidayah	Nur Hidayah	FN – 395
08.40-08.50	Study of the effect of fortification of herbals to multinutrient feed block on rumen fermentation and total gas production in vitro ¹ ¹ Rusmana Wijaya Setia Ningrat, Montersqrit, and Erpomen	Rusmana Wijaya Setia Ningrat	FN – 397
08.50-09.00	Evaluation of Edamame Husk Silage Using In Vitro Gas Production Method ¹ ¹ Siti Chuzaemi, Mashudi, Hendrawan Soetanto, Asri Nurul Huda	Siti Chuzaemi (MODERATOR 1)	FN – 398
09.00-09.10	Development of beef cattle using agricultural by-product in West Java ¹ ¹ Erika Budiarti Laconi and Sri Mulatsih	Erika Budiarti Laconi	FN – 359
09.10-09.20	Nutritional responses on the hypothalamic-pituitary-ovarian axis on female goats ¹ ¹ Mashitah Shikh Maidin	Mashitah Shikh Maidin	RP – 407

Oral Presentation 3 Focus Session :Feed and Nutrition(2)

Friday, 21 October 08:00-09:20 Room: Panderman 2

Time	Title	Presenter	Code
08.00-08.10	Performance and egg quality of quail fed marigold flower extract ¹ ¹ Nuraini, Mirzah and Ade Djulardi	Nuraini	FN – 301
08.10-08.20	Performance of broiler fed diets containing lipid from mealworm (<i>Tenebrio molitor</i> L.) ¹ ¹ Intan Permata Sari, Sumiati, and Nahrowi	Intan Permata Sari	FN – 353
08.20-08.30	Propionic acid and enzymes for rabbit feed ¹ ¹ Susana I. W. Rakhmani	Susana I. W. Rakhmani	FN – 378
08.30-08.40	Enzyme activities and retention of Ca and P of the small intestinal digesta of broilers fed Papua Foxtail Millet containing feed ¹ ¹ Sisca Tirajoh, Osfar Sjojfan, and Eko Widodo	Eko Widodo (MODERATOR 1)	FN – 379
08.40-08.50	Evaluation of Alabio duck diet (<i>Anas platyrhynchos</i> borneo) on the chemical composition of egg yolk at farms in District Alabio South Kalimantan ¹ ¹ Dwi Margi Suci, S. T. Purnamasari, and Widya Hermana	Dwi Margi Suci	FN – 384
08.50-09.00	Enrichment of Feedstuff With Fermented Soybean Peel to Increase Rabbit Body Weight ¹ ¹ Sri Minarti, Endang Setyowati, Tatik Wardiyati and Sri Kumalaningsih	Sri Minarti	FN – 385
09.00-09.10	Correlation of NDF (Neutral Detergent Fiber) With In Vitro Gas Production on various legumes ¹ ¹ Sudarwati,H., I. Subagiyo, A. Irsyammawati, and R. D. Wahyuni	Herni Sudarwati	FN – 386
09.10-09.20	Effectiveness of Feeding Fermented Noni Leaf Meal on Body Resistance, Protein Utilization Efficiency and Performance of Crossbred Kampong Chickens ¹ ¹ Mahfudz L. D. and N. Suthama	Mahfudz L. D. (Moderator 2)	FN – 387

Oral Presentation 3: Focus Session: Genetic Breeding and Conservation

Friday, 21 October 08:00-09:40 Room: Semeru

Time	Title	Presenter	Code
08.00-08.10	Measurement of reactive oxygen species (ROS) in high and low residual feed intake cattle ¹ ¹ Nadiatur Akmar Zulkifli, Pitchford, W. S., and Bottema, C. D. K.	Zulkifli N A	GB – 117
08.10-08.20	Prediction of meat quality in bali cattle using ultrasound imaging ¹ ¹ Jakaria, H. Khasanah, R. Priyanto, M. Baihaqi, M. F. Ulum	Jakaria (Moderator 2)	GB – 102
08.20-08.30	Diversity Of Insulin Growth Factor-1 (Igf-1) Gene Of Kacang Goat In Kota Gorontalo And Regency Of Bone Bolango Provinceof Gorontalo ¹ ¹ Fahrul Ilham, Safriyanto Dako, Agus Bahar Rachman, Muhammad Ihsan Andi Dagong, and Lellah Rahim	Fahrul Ilham	GB – 113
08.30-08.40	Identification of single nucleotide polimorphism of melanocortin 4 receptor gene in bligon goat ¹ ¹ Latifah, Tety Hartatik*, Kustantinah, Dyah Maharani, and Dwi Ahmad Priyadi	Latifah	GB – 105
08.40-08.50	Assosiation of leptin genes polymorphism with average daily gain of local cattle at ciamis west java ¹ ¹ N. Hilmia, R. R. Noor, C. Sumantri, R. Priyanto, and Gurnadi E.	Nena Hilmia	GB – 108
08.50-09.00	Single nucleotide polymorphism (SNP) using growth hormone (GH) gene of results reciprocal crosses tegal with magelang duck ¹ ¹ Dattadewi Purwantini, Ismoyowati, Setya Agus Santosa	Dattadewi Purwantini	GB – 103
09.00-09.10	Color variation of Indonesian native ducks ¹ ¹ Daniel D.I. Putra, Dyah Maharani, Dwi N.H. Hariyono, and Jafendi H.P. Sidadolog	Daniel D Putra	GB – 116
09.10-09.20	Polymorphism of Growth Hormone Gene in Selecting Etawah Crossbred (PE) Goats ¹ ¹ Tri Eko Susilorini, Kuswati, and S. Maylinda	Tri Eko Susilorini (Moderator 1)	GB – 114
09.20-09.30	Estimation of Heritability and Breeding Value for Birth Weight in Bali Cattle ¹ ¹ Nurgiartiningsih, V. M. A., Hakim, L., and Budiarto, A.	Nurgiartiningsih, V. M. A.	GB – 115
09.30-09.40	Quality of semen and production frozen semen of different breed and individual beef cattle ¹ ¹ Trinil Susilawati, Herni Sudarwati, Muhammad Dedi, Mita Ayu Rahmawati, and Aulia Puspita Anugrayekti	Trinil Susilawati	RP – 416

Oral Presentation 3 Focus Session: Livestock Production

Friday, 21 October 08:00-09:20 Room: Anjasmoro

Time	Title	Presenter	Code
08.00-08.10	Physical Carcass Characteristics From Body Composition of Timor Pigs Boar Kept Extensively in the Province of East Nusa Tenggara – Indonesia R. Wea, Y.L. Henuk, T. Barus, S. Sembiring, U.Ginting-Moenthe	R. Wea	LP – 234
08.10-08.20	Effect equilibration time in the process of freezing the quality of semen Wagyu bull using diluent (R) Andromed Trinil Susilawati, Hirzi Hanifi, and Moh. Nur Ihsan	Trinil Susilawati	RP – 417
08.20-08.30	The effect of cherry leaf (<i>Muntingia calabura</i>) extract on hatchability and embryo mortality hybrid duck egg Muhammad Ngalaul Huda, Fatikhatul Huda Alkhakim, Galuh Dianita Fitri, Dewi Ambarwati and Heli Tistiana	Muhammad Ngalaul Huda (Moderator 2)	LP – 235
08.30-08.40	Preliminary study on estimation of energy requirement for eating through urinary creatinine in local male sheep ¹ ¹ Kuntara Fauzan Setyawan, and Agung Purnomoadi	Kuntara Fauzan Setyawan	LP – 236
08.40-08.50	Correlation between crude protein levels in the diets and carcass weight and carcass percentage in thin tailed lambs ¹ ¹ Rizky Choirunnisa, Ari Prima, Nadhlirotul Lutfi, Mukh Arifin M., Sutaryo, Agung Purnomoadi	Rizky Choirunnisa	LP – 201
08.50-09.00	Correlation between yield grade and rib eye muscle area with different feed level protein of male thin-tailed weaning lamb ¹ ¹ Agung Purnomoadi and Febrian Rhamadya Dwi Prakoso	Febrian Rhamadya Dwi Prakoso	LP – 202
09.00-09.10	Correlation between fecal rough particle and feed digestibility on thin tail lambs ¹ ¹ Agung Purnomoadi and Talitha Flora Zahari	Talitha Flora Zahari	LP – 203
09.10-09.20	Phenotypic characteristics of aceh cattle on different sex and age in smallholder farmers ¹ ¹ Tri Satya Mastuti Widi, Endang Baliarti, Alek Ibrahim, Hendra Koesmara, and I Gede Suparta Budisatria	Tri Satya Mastuti Widi (Moderator 1)	LP – 206

Oral Presentation 3 Focus Session: Veterinary and Health Care

Friday, 21 October 08:00-09:30 Room: Welirang

Time	Title	Presenter	Code
08.00-08.10	Jeringau (Acorus Calamus L) As antibiotic substitute on salmonella typhimurium infected broiler performances ¹ ¹ Yuli Arif Tribudi, Retno Budi Lestari, Ahmad Thohardi and Yeti Rohayeti	Yuli Arif Tri Budi	VT – 801
08.10-08.20	Prevalence of trematodes infection in sacrificial cattle in some mosques manokwari regency west Papua province Indonesia ¹ ¹ Purwaningsih , Priyo Sambodo , Noviyanti , Alnita Baaka	Purwaningsih	VT – 803
08.20-08.30	Identification of swine disease, prevention and treatment (a case study in Pinasungkulan village Bitung city) ¹ ¹ Sri Adiani, Nansi Margret Santa	Sri Adiani	VT – 806
08.30-08.40	Residues of aflatoxins in liver, meat, and egg of alabio duck collected from South kalimantan, Indonesia ¹ ¹ Ika Sumantri	Ika Sumantri	VT – 807
08.40-08.50	Extraction of bioactive components of cocoa leaves by product and their activation as antioxidants and antimicrobials ¹ ¹ Chairil Anwar, Asriani Hasanuddin, Marhawati M, Hafsa	Asriani Hasanuddin	VT – 809
08.50-09.00	In vitro antibacterial activity of Black soldier fly (Hermetia illucens) larvae extracts against gram-negative bacteria ¹ ¹ Harlystiarini, Mutia, R., and Astuti, D. A.	Harlystiarini(MODERATOR 1)	VT – 810
09.00-09.10	Isolation and Characterization of Oviduct Specific Glycoprotein At Goats Oviductal fluid As Candidate Isolate Supplementation of Goats Frozen Semen ¹ ¹ Herawati, Aulia Firmawati, Herlina Pratiwi, and Nurul Isnaini	Herlina Pratiwi	VT – 811
09.10-09.20	Antibacterial activity of Muntingia Calabura Lam. against some selected bacteria causes mastitis ¹ ¹ Puguh Surjowardojo, Imam Thohari, Firmansyah, Aswah Ridhowi	Puguh Surjowardojo	VT – 812
09.20-09.30	GST fusion assisted overexpression and purification of recombinant parasite lactate dehydrogenase enzyme in Escherichia coli ¹ ¹ Ramadhani Haryati, Sulaiman N. depemada dan Muhammad Ali	Ramadhani Haryati	VT – 805

Oral Presentation 4 Focus Session :Feed and Nutrition(1)

Friday, 21 October 09:45-11:05 Room: Panderman 1

Time	Title	Presenter	Code
09.45-09.55	Profile of corn silage juice in different ages and its shelf life ¹ ¹ Nahrowi Ramli, Muhammad Ridla, Anuraga Jayanegara, Erika Budiarti Laconi, Rahayu Asmadini Rosa, and Ai Karwati	Nahrowi Ramli (MODERATOR 2)	FN – 303
09.55-10.05	Effect of formic acid on intestinal truly absorbed protein of alfalfa silage ¹ ¹ Parisa Kheyrandish, M. Danesh Mesgaran and A. Vakili	Parisa Kheyrandish	FN – 307
10.05-10.15	In vitro dry matter degradation kinetics of ruminant feed ¹ ¹ Rudi, Suryahadi, and Anuraga Jayanegara	Rudi	FN – 309
10.15-10.25	The effects of phenolic compounds in brown propolis extracts on rumen methane production (in vitro) ¹ ¹ Sh. Ehtesham, A. R. Vakili, and M. Danesh Mesgaran	A. R. Vakili	FN – 310
10.25-10.35	Effect of corn grain physical procesing on in vitro rumen microbial protein production and gas production parameters ¹ ¹ Behnaz Eyni, Mohsen Danesh Mesgaran, and Alireza Vakili	Behnaz Eyni	FN – 311
10.35-10.45	Effect of peppermint essential oil versus a mixture of formic and propionic acids on corn silage VFA score ¹ ¹ Mosen Danesh Mesgaran, A. Hodjatpanah-Montazeri, A. Vakili, and M. Tahmasbei	Mosen Danesh Mesgaran	FN – 312
10.45-10.55	Forage production and nutritive value of Clitoria ternatea grown under different maize plant density ¹ ¹ Jelantik I. G. N, Nikolaus T. T. and Leo Penu C.	I Gusti N. Jelantik	FN – 313
10.55-11.05	Prediction of feed metabolizable energy and metabolizable protein contents from their chemical 1 Constituents ¹ ¹ Anuraga Jayanegara, Sari P. Dewi, Muhammad Ridla, Erika B. Laconi, and Nahrowi	Anuraga Jayanegara	FN – 314

Oral Presentation 4 Focus Session: Feed and Nutrition (2)

Friday, 21 October 09:45-11:35 Room: Panderman 2

Time	Title	Presenter	Code
09.45-09.55	Nutritional responses on the hypothalamic-pituitary-ovarian axis on female goats ¹ ¹ Mashitah Shikh Maidin	Mashitah Shikh Maidin (moderator 2)	FN – 320
09.55-10.05	Effects of long transportation preceded by short periods of deprivation on the intake and nutrient digestibility of Bos sondaicus bulls ¹ ¹ C. L. O. Leo-Penu, D. R. Tulle, J. A. Jermias, U. R. Raya, I. G. N. Jelantik, G. Maranatha, Y. Manggol T. Lapenangga, A. Ch. Tabun, V. Lenda, J. Oematan, and A. J. Parker	C. L. O. Leo-Penu	FN – 321
10.05-10.15	Addition of different species of forages legumes on physical, chemical characteristics and in vitro digestibility of dairy cattle feed pellet ¹ ¹ Iin Susilawati and Lizah Khairani	Iin Sulistiawati	FN – 365
10.15-10.25	Supplementing Saccharomyces cerevisiae into low quality local-based feeds improves performance and nutrient digestibility of starter local pigs ¹ ¹ Johanis Ly	Johanis Ly	FN – 322
10.25-10.35	Effects of poultry by product meal based diet on performances of weaning and growing pigs ¹ ¹ Vidyarathna M. G. S. M. and Jayaweera B. P. A.	Jayaweera B. P. A.	FN – 323
10.35-10.45	Growth performance and carcass composition of lambs consumed complete feed with increasing poly unsaturated fatty acids of sunflower oil ¹ ¹ Lilis Khotijah, Sailandi R., Ramadani M. F., and Suryati T.	Lilis Khotijah (Moderator1)	FN – 343
10.45-10.55	Blood properties of broiler feed ration containing different Level of pearl grass (Hedyotis corymbosa (L) Lamk) ¹ ¹ Nurhayati, Madyawati Latief, and Anie Insulistyowati	Nurhayati	FN – 345
10.55-11.05	Effect supplementation of multi-nutrient feed supplement or urea multi-nutrient molasses block in diet of dairy cattle ¹ ¹ Suharyono, Yeni Widiawati, and A. Kurniawati	Suharyono	FN – 351

Oral Presentation 4 Focus Session: Reproduction

Friday, 21 October 09:45-11:15 Room: Semeru

Time	Title	Presenter	Code
09.45-09.55	Cleavage rate of sheep oocytes in vitro fertilized by post-thawed epididymal spermatozoa after storage of epididymis at 4° c ¹ ¹ Ni Wayan Kurniani Karja, Nur'aisyah Amrah Safitri, Anita Hafid, Mokhamad Fahrudin, and Mohamad Agus Setiadi	Ni Wayan Kurniani Karja	RP – 404
09.55-10.05	Effect of Carnitine on Quality of Post Thawed Goat Sperm ¹ ¹ Sri Wahjuningsih and Muhammad Nur Ihsan	Sri Wahjuningsih	RP – 420
10.05-10.15	Hormone progesteron concentration at the time of Artificial Insemination (AI) on conception rate of beef cows in rural farm in West Sumatera ¹ ¹ Zaituni Udin, Ferdinal Rahim Hendri, and Yula Yellita	Zaituni Udin	RP – 408
10.15-10.25	Different ratio of omega-3 and omega-6 in total mix ration on blood metabolites, characteristic of estrous and pregnancy rate of ewes ¹ ¹ Yusti Pujiawati, Asep Sudarman, and Lilis Khotijah	Yusti Pujiawati	RP – 411
10.25-10.35	The comparison of estrus between natural and synchronized PGF2α based on clinical sign and vaginal cytology in Ettawa grade ¹ ¹ Tuty Laswardi Yusuf and Azmi Firman Binangkit	Tuti Laswardi Yusuf (Moderator 2)	RP – 412
10.35-10.45	The oocyte and sperms cryopreservation of local sheep and goat for gene bank in native Indonesian animal ¹ G. Ciptadi, S. Rahayu, Fatchiyah, Maidaswar, Sarastina, Nurhayati, S. Wahjuningsih, E. Herwiyanti, Mudawamah and M. N. Ihsan	G. Ciptadi (Moderator1)	RP – 413
10.45-10.55	Motility spermatozoa of bali cattle after given crude tanin supplement ¹ ¹ Abyadul Fitriyah, Supriyono, Dian Octaviana Said, and Hery Harianto	Abyadul Fitriyah	RP – 418
10.55-11.05	Reproductive performance of female PO and PO x Limousin crossbred cattle in Kepanjen District of Malang Regency ¹ ¹ Suyadi and N. Nugoho	Suyadi	RP – 421
11.05-11.15	Estrus emerging following laser puncture induction in goats ¹ ¹ Suyadi and T. E. Susilorini	Suyadi	RP – 422

Oral Presentation 4 Focus Session: Livestock Production System

Friday, 21 October 09:45-11:05 Room: Anjasmoro

Time	Title	Presenter	Code
09.45-09.55	Correlations between crude protein / total digestible nutrients ratio with commercial cuts weight and percentage of thin tailed lambs ¹ ¹ F. Nabila, A. Prima, N. Luthfi, E. Purbowati, Sutaryo, and A. Purnomoadi	Farah Nabila (MODERATOR 2)	LP – 204
09.55-10.05	Eating time and ruminating in lambs fed at different total digestible nutrients content of feed ¹ ¹ F. D. Nugroho, A. Prima, N. Luthfi, S. Dartosukarno, and A Purnomoadi	Febrianto Dwi Nugroho	LP – 205
10.05-10.15			
10.15-10.25			
10.25-10.35	Growth performance of pelung sentul kampung meat type chicken crossing on age 0-10 weeks ¹ ¹ Darwati S., Hasyim A. R., Rukmiasih, and Prabowo, S.	Darwati	LP – 223
10.35-10.45	Physiological Responses and Milk Qualities of Holstein Friesian During Dry Season at High Altitude ¹ ¹ E. Mariana, C. Sumantri, D. A. A. Astuti, A. Anggraeni, A. Gunawan, and N. Q. Agustin	Elmy Mariana (MODERATOR 1)	LP – 230
10.45-10.55	Effects of rumen mechanical stimulating brush administration on eating behavior and dry matter digestibility of brahman cross steers fed with low forage diet ¹ ¹ Sari Nurmeiliasari, Rudy Priyanto, and Dewi Apri Astuti	Sari Nurmeiliasari	LP – 215
10.55-11.05	The study on the use of rough fecal particle proportion to estimate feed digestibility on post-weaned lambs ¹ T. F. Zahari, A. Prima, N. Luthfi, S. Dartosukarno, and A. Purnomoadi	Talitha Flora Zahari	LP – 217

Oral Presentation 4 Focus Season : Socio-Economic and Agribusiness

Friday, 21 October 09:45-11:35 Room: Welirang

Time	Title	Presenter	Code
09.45-09.55	Business characteristic of salted egg in the agro industrial center, Brebes, Central Java ¹ ¹ W. Sumekar, A. N. Al-Baari and E. Kurnianto	Dr. Ir. Wulan Sumekar, MS (MODERATOR 2)	SE – 717
09.55-10.05	Application of science and technology through making compost fertilizer for group members of pig farming ¹ ¹ A.H.S Salendu, F.H. Elly, F.S.G. Oley, and R.E.M.F. Osak	Artise H. S. Salendu	SE – 726
10.05-10.15	Impact on capital assistance group revenues pig farm "Maesaan" Pinasungkulan Bitung City ¹ ¹ Lidya Siulce Kalangi and Stanly O. B. Lombogia	Lidya Siulce	SE – 716
10.15-10.25	Empowerment for farmers group of cattle farming in the Tonsewer Village ¹ ¹ Anneke. K. Rintjap, Fietje S. Oley, J.K.J. Kalangi	Fietje Sophie Greta Oley	SE – 719
10.25-10.35	Productivity of pigs and contribution of pig farming on household income in Pinasungkulan Village Bitung City ¹ ¹ Nansi Margret Santa and Ingriet D. R. Lumenta	Nansi Margret Santa	SE – 712
10.35-10.45	Introduction of feed technology for development of cattle in North Bolaang Mongondow ¹ ¹ M. L. Rundengan, S.P. Pangemanan, J.O. Rawis and F.H. Elly	M L. Rundengan	SE – 721
10.45-10.55	Fresh beef demand elasticity among households in Malang city ¹ ¹ Hari Dwi Utami, Febri Velindria Susanti, and Ainun Pizar Seruni	Hari Dwi Utami	SE – 722
10.55-11.05	Analysis of the self ability level of farmers on the integration system of cattle and oil palm plantations in Jambi Province ¹ ¹ Nahri Idris, Afriani H., and Fatati	Nahri Idris	SE – 708

Oral Presentation 5 Focus Session: Feed and Nutrition (1)

Friday, 21 October 12:30-14:40 Room: Panderman 1

Time	Title	Presenter	Code
12.30-12.40	Feed consumption and dry matter digestibility of feed containing different protein levels in thin tailed lambs fattened after weaning ¹ ¹ Ari Prima, Edy Rianto, and Agung Purnomoadi	Ari Prima	FN – 305
12.40-12.50	Effect of storage time and physical form of diet with formulated from local feed based on nutrient composition of the diets ¹ ¹ Hafsah, Fatmawati, Sri Sarjuni, and Anantesya Hera Dini	Hafsah (MODERATOR 1)	FN – 390
12.50-13.00	A pathway to sustainable agriculture through protection and propagation of indigenous livestock breeds of pakistan-cholistani cattle as a case study through protection and propagation of indigenous livestock breeds of pakistan-cholistani cattle as a case study ¹ ¹ Umer Farooq	Umer Farooq	GB – 101
13.00-13.10	Effect of encapsulant materials in encapsulation process of leaf green grass jelly extract (<i>Cyclea barbata</i> L. Miers) on product microcapsule quality ¹ ¹ Natsir M. H, R. Rusdianawati, O. Sjojfan and Muharlieni	Muhammad Halim Natsir (MODERATOR2)	FN – 388
13.10-13.20	Nutritive value of various legume tree as protein sources in animal nutrition ¹ ¹ A. Irsyammawati, I. Subagiyo, H. Sudarwati, and R.D. Wahyuni	Artharini Irsyammawati	FN – 394
13.20-13.30	Enrichment of Feedstuff With Fermented Soybean Peel to Increase Rabbit Body Weight ¹ ¹ Sri Minarti, Endang Setyowati, Tatik Wardiyati and Sri Kumalaningsih	Sri Minarti	FN – 385
13.30-13.40	Broiler chickens performance as affected by animal fat and plant oil under hot arid conditions of Sudan ¹ ¹ Asma H. M. Hamed , N. A. Musharaf and Amani A. B. Osman	Asma Himmed Mohammed	FN – 344
13.40-13.50	Calcium and phosphorous absorption of field grass during the dry season at medium altitude in Garut ¹ ¹ Ana Rochana, Iin Susilawati, Herryawan Kemal Mustafa, Nyimas Popi Indriani, and Budi Ayuningsih	Ana Rochana (MODERATOR 2)	FN – 391
13.50-14.00	Isolation and screening of lactic acid bacteria from dadih for glutamic acid production as precursor of γ -Amino Butyric Acid (GABA) induced heat stress in broiler ¹ ¹ Yetti Marlida, Harnentis, and Nurmiati	Yetti Marlida	FN – 347

14.00- 14.10	The effect of fertilizers on soil characteristics of sand-mining land and nutrients content of sorghum patir 3.7 (<i>Sorghum bicolor</i> (L) Moench) ¹ ¹ Apdila Safitri, Dewi Apri Astuti, Panca Dewi M. H. Karti	Apdila Safitri	FN – 357
14.10- 14.20	Arbuscular mycorrhizal fungi and rock phosphate role on plant growth of sorghum (<i>Sorghum bicolor</i> L.) as a forage ¹ ¹ Nyimas Popi Indriani, Lizah Khairani, Budi Ayuningsih	Nyimas Popi Indriani	FN – 365
14.20- 14.30	The Potential of Local Feed Sources for Silage Production in Supporting The Cattle Raising Business in East Ranotongkor Village ¹ ¹ Sintya J.K. Umboh, Helena Dasilva, Hendrik O. Gijoh, and Tilly F.D. Lumy	Sintya J.K. Umboh	FN – 364

Oral Presentation 5 Focus Session: Feed and Nutrition (2)

Friday, 21 October 12:30-14:40 Room: Panderman 2

Time	Title	Presenter	Code
12.30-12.40	Legumes wafer for improvement the post-weaning etawah crossbreed goats performance ¹ ¹ Brilian Desca Dianingtyas, Yuli Retnani, and Dwierra Evvyernie	Brilian Desca Dianingtyas	FN – 352
12.40-12.50	Utilization of cricket meal in creep feed diet of growing etawah cross breed goats ¹ ¹ Dewi Apri Astuti, Widya, L. Khotidjah, A. Angraeny, K. Komalasari, and Dewi Apri Astuti	Dewi Apri Astuti	FN – 332
12.50-13.0	Performance of first cutting of Pennisetum purpureun cv. Mott under different level of light and nitrogen fertilizer ¹ ¹ David A. Kaligis, Selvie D. Anis, Johanis R. Tulung, and Sahrudin Dalie	David A. Kaligis	FN – 360
13.00-13.10	Amino acid characterization of tofu waste fermentation using effective microorganism-4 and Lactobacillus plantarum culture ¹ ¹ Eka Fitasari and Budi Santosa	Eka Fitasari (MODERATOR 2)	FN – 325
13.10-13.20	In vitro digestibility profiles of cricket meal as protein source in the ration ¹ ¹ Dewi Apri Astuti, M. Miftakhul Solikhin, and Yuni Cahya Endrawati	Dewi Apri Astuti	FN – 331
13.20-13.30	Production of roughage feed under different drying methods and evaluation of the feeding value ¹ ¹ Jayaweera B. P. A.	Jayaweera B. P. A.	FN – 333
13.30-13.40	In vitro nutrient digestibility of Chromolaena odorata-based silage treated with Corypha gebanga meal and rumen content ¹ ¹ Yelly M. Mulik, Muhammad Ridla, Iwan Prihantoro, and Marthen L. Mullik	Yelly M. Mulik	FN – 335
13.40-13.50	Production, characterization and purification of xylanase from Staphylococcus aureus MBXi-K4 ¹ ¹ Indah Wijayanti, Maggy T Suhartono, Khaswar Syamsu, and Yulin Lestari	Indah Wijayanti (MODERATOR 1)	FN – 336
13.50-14.00	To estimate intestinal truly absorbed protein of alfalfa hay and alfalfa silage using new dutch system (DVE/OEB) ¹ ¹ P. Kheyrandish, M. Danesh Mesgaran and A. Vakili	Parisa Kheyrandish	FN – 340
14.00-14.10	Chitosan protection to saga leaves extract (Abrus precatorius Linn) and Lingzhi mushroom (Ganoderma lucidum) from rumen microbial degradation ¹ ¹ Evvyernie D., Sukria H. A., Harlina E., Suningsih N., and Zetira H.	Dwierra Evvyernie	FN – 342
14.10-	Effects of different types of cakes in rations on the	Amani Osman	FN – 348

14.20	performance of culled Cyprus shami does in Half Elgededa, Kassala State, Sudan ¹ ¹ Amani A.B. Osman and Mohmmmed E. Elimam		
14.20-14.30	Changes in nutrition and fibre silage water hyacinth (<i>Eichornia crassipes</i>) as ruminant feed fermented with several fermentative materials ¹ Muhammad Mukhtar	Muhammad Mukhtar	FN – 361
14.30-14.40	Effect of <i>Phanerochaete chrysosporium</i> to enzymatic activity and lignin on fermentation process of cocoa pod (<i>Theobroma cacao</i>) ¹ ¹ Engkus Ainul Yakin and Ali Mursyid Wahyu Mulyono	Engkus Ainul Yakin	FN – 400

Oral Presentation 5 Focus Session :Feed and Nutrition (3)

Friday, 21 October 12:30-13:50 Room: Semeru

Time	Title	Presenter	Code
12.30-12.40	Effect of fish oil and its combination with tomato powder supplementation on laying performance of native chicken ¹ ¹ Faizal Andri, Aji Sukoco, Taufich Hilman, and Eko Widodo	Faizal Andri	FN – 329
12.40-12.50	Effect of substitution of meat bone meal with protein concentrate of mealworm (<i>Tenebrio molitor</i> L) on performance of broilers ¹ ¹ Yuli Purnamawati, Sumiati, and Nahrowi	Yuli Purnamawati	FN – 354
12.50-13.00	Supplementation of Zn and vitamin E on the immune responses and performance of broilers in a tropical environment ¹ ¹ Febrinita Ulfah, Rita Mutia, Asep Gunawan, and Niken Ulupi	Febrinita Ulfah	FN – 356
13.00-13.10	Supplementation of zinc and vitamin E in the diet on performance and expression of HSP70 gene of broiler in tropical environment ¹ ¹ Rita Mutia, Sumiati, and Tera Fit Rayani	Rita Mutia	FN – 358
13.10-13.20	Supplementation of phitase and mananase in diet which high fiber and phitat acid on quality of quail eggs <i>Coturnix – coturnik japonica</i> ¹ ¹ Ilfi Rahmi Putri Syanur, Rita Mutia, and M. Ridla	Ilfi Rahmi Putri Syanur	FN – 362
13.20-13.30	Production performances of broiler chicken fed on diets containing different levels of crab (<i>Portunuspelagicus</i>) by- product meal ¹ ¹ I Ketut Gede Wiryawan, Syamsuhaidi, Kasip, L. M. and Binetra, T. S.	I K. G. Wiryawan	FN – 366
13.30-13.40	Serum lipid profile and egg quality of layer fed boiled tomato waste ¹ ¹ Maria E. M., Dedek H., Gina A. N, Yose. R., and Ardi	Maria E. M.	FN – 368
13.40-13.50	Optimalisation usage of feed additives on low protein diet for broiler raised in the tropical region ¹ ¹ St. Y. F. G. Dillak and N. G. A. Mulyantini	N. G. A. Mulyantini	FN – 315

Oral Presentation 5 Focus Session: Livestock Production System

Friday, 21 October 12:30-15:00 Room: Anjasmoro

Time	Title	Presenter	Code
12.30-12.40	Estimating yield grade by using body measurements and body condition score in thin-tailed sheep ¹ ¹ Ulia Renfelia Baysi, Agung Purnomoadi and Endang Purbowati	Ulia Renfelia Baysi	LP – 218
12.40-12.50	Exploration of fecal physical test to estimate weaning age of kids ¹ ¹ L. P. Lestari, R. N. Andrian, S. Dartosukarno, A. Purnomoadi	Lujeng Puspita Lestari	LP – 219
12.50-13.00	Lactation Curve Pattern and Milk Production Performance of Crossbred Friesian Holstein in Pasuruan Regency, Indonesia ¹ ¹ Aswah Ridhowi, Trianti Djoharjoni, Herni Sudarwati, Sucik Maylinda	Aswah Ridhowi	LP – 237
13.00-13.10	Correlation of Protein Level in the Diets on Yield Grade and Rib Eye Muscle Area of Post-Weaning Lamb ¹ ¹ F. R. D. Prakoso, A. Prima, N. Luthfi, E. Purbowati, S. Dartosukarno, and A. Purnomoadi	Febrian Rhamadya Dwi Prakoso (MODERATOR 2)	LP – 226
13.10-13.20	Effects of different combination of water hyacinth leaves and sapu sapu fish on growth performances of local ducks in lombok ¹ ¹ BQ Erni Nurhidayati, Asnawi and Wiryawan, K.G.	Baiq Erni	LP – 227
13.20-13.30	Identification of Sonok cattle characteristics as local genetic resources in Madura island ¹ ¹ Busono W., S. Maylinda, and H. Nugroho	Woro Busono	LP – 228
13.30-13.40	Physiological Responses and Milk Qualities of Holstein Friesian During Dry Season at High Altitude ¹ E. Mariana, C. Sumantri, D. A. A. Astuti, A. Anggraeni, A. Gunawan, and N. Q. Agustin	Elmy Mariana	LP – 230
13.50-14.00	Correlation between body weight, body condition score and vital statistics of madura cattle in pamekasan, madura ¹ ¹ Maylinda S, M. Nasich and Pertiwi	Maylinda S (MODERATOR1)	LP – 224
14.00-14.10	Growth and development of senduro goat in senduro lumajang district ¹ ¹ Nasich, M., G. Ciptadi and A. Budiarto	Nasich, M	LP – 214
14.10-14.20	Senduro goats doe productivity index in senduro subdistrict lumajang regency ¹ ¹ Agus Budiarto, M. Nur Ihsan and A. Naufal	Agus Budiarto	LP – 210
14.20-14.30	Effects of probiotics supplementation on milk quality of etawa crossbred dairy goat fed by product of palm oil industry ¹ ¹ Arief, N. Jamarun and B Satria	Arief	LP – 209

14.30- 14.40	Milk production of holstein friesian cows related to heat stress in responding to climate change ¹ ¹ Anneke Anggraeni and Fachry Hadiyawan	Anneke Anggraeni	LP – 213
14.40- 15.00	The Effect of Water Clover Leaf Juice (<i>Marsilea crenata</i>) Against Blood Calcium Levels And Histology Os humerus On Rat (<i>Rattus novergicus</i>) ¹ ¹ Pratiwi Trisunuwati, Anom, and Fauzi	Pratiwi Trisunuwati	LP – 241

Oral Presentation 05 Focus season : Socio-Economics & Others

Friday, 21 October 12:30-14:10 Room: Welirang

Time	Title	Presenter	Code
12.30-12.40	Financial analysis of the pig farming that utilizing waste disposal system as environmentally friendly farming practices (A case on a pig breeding farm in Tomohon, North Sulawesi) ¹ ¹ Richard E.M.F. Osak, Meiske L. Rundengan and Tilly F.D. Lumy	Richard E. M. F. Osak	SE – 724
12.40-12.50	Farmers group's role in farming management and rabbit farmers' communication in Lang – Lang Village, Singosari District, Malang Regency, Indonesia ¹ ¹ S. Azizah, B. Hartono, E. Nugroho and A. E. Kusumastuti	Siti Azizah (MODERATOR 1)	SE – 723
12.50-13.00	The Development Program “Village Poultry Farming” to local hens Farmers of Tenga Village ¹ ¹ Jein Rinny Leke, F. Ratulangi, D.Rembet, and J.Mandey	Jein Rinny Leke	SE – 728
13.00-13.10	Utilization of pig waste to biogas in Kotamobagu City ¹ ¹ T. F. D. Lumy, P. O. V. Waleleng, F. N. S. Oroh, N. M. Santa and F. S. Oley	T. F. D. Lumy (MODERATOR 2)	EV – 504
13.10-13.20	Spatial distribution model of dairy cattle productivity in West Java ¹ ¹ Ahmad Yani, Afton Atabany, Windi Al Zahra, and Hilda Susanty	Hilda Susanty (MODERATOR 1)	EV – 501
13.20-13.30	Methane emission from beef cattle production at low- and high-altitude of East Nusa Tenggara, Indonesia ¹ ¹ Gustaf Oematan, Yelly M. Mulik, and Mathen L. Mullik	Marthen L. Mullik	EV – 502
13.30-13.40	The effect of parity, month of lactation and incidence of subclinical mastitis on milk yield ¹ ¹ H. Susanty, B.P. Purwanto, M. Sudarwanto, and A. Atabany	Hilda Susanty	LP – 216
13.40-13.50	Production and Carcass Performance of Male Local Mojokari Ducks Given the Traditional Medicine Herbs on Drinking Water ¹ ¹ Ita Wahyu Nursita and Nur Cholis	Ita Wahyu Nursita	LP – 238
13.50-14.00	Effect of Closed House Temperature on feed intake, weight gain and Triiodothyronine (T3) and Thyroxine	Pratiwi Trisunuwati	LP – 242

	Hormone (T4) levels of Broiler Chickens ¹ ¹ Pratiwi Trisunuwati		
14.00– 14.10	Production and nutrition composition of pollen from foraging honey bees (<i>Apis mellifera</i> L.) in the red caliandra (<i>Calliandra calothyrsus</i>) plantation area ¹ ¹ Sri Minarti, Yugi Mustofa, Firman Jaya	Sri Minarti	LP – 240

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Keynote Speakers Presentation
Wednesday, October 19th 10.00-12.00
Room: Panderman

Development of Sustainable Livestock Production- A Review

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Introduction

A sustainable livestock production can be described as: (1) from research to extension and farmers without waste is a high level of sustainable livestock development, (2) a cycle production system, (3) production without contamination of earth, (4) if production efficiency can be improved even better, (5) production system can reduce greenhouse gases production.

1. Research transfer to extension then to farmers without waste resources

Any sustainable livestock production has to go through research-extension and farmers cycle (Figure 1). Any big mistake will cause big waste to whole production. A sustainable livestock production system needs research people to read more, to have practical experience and to get useful feedback from extensionists and farmers; the same for extensionists and farmers. Today this linkage is quite loose. It seems that people who were elderly, had higher income or work harder had higher motivation in learning (Lee, 2012). If this is true, then whole industry may lose a lot of money and time on build up sustainable livestock industry. We must remember a lifelong learning is so important.

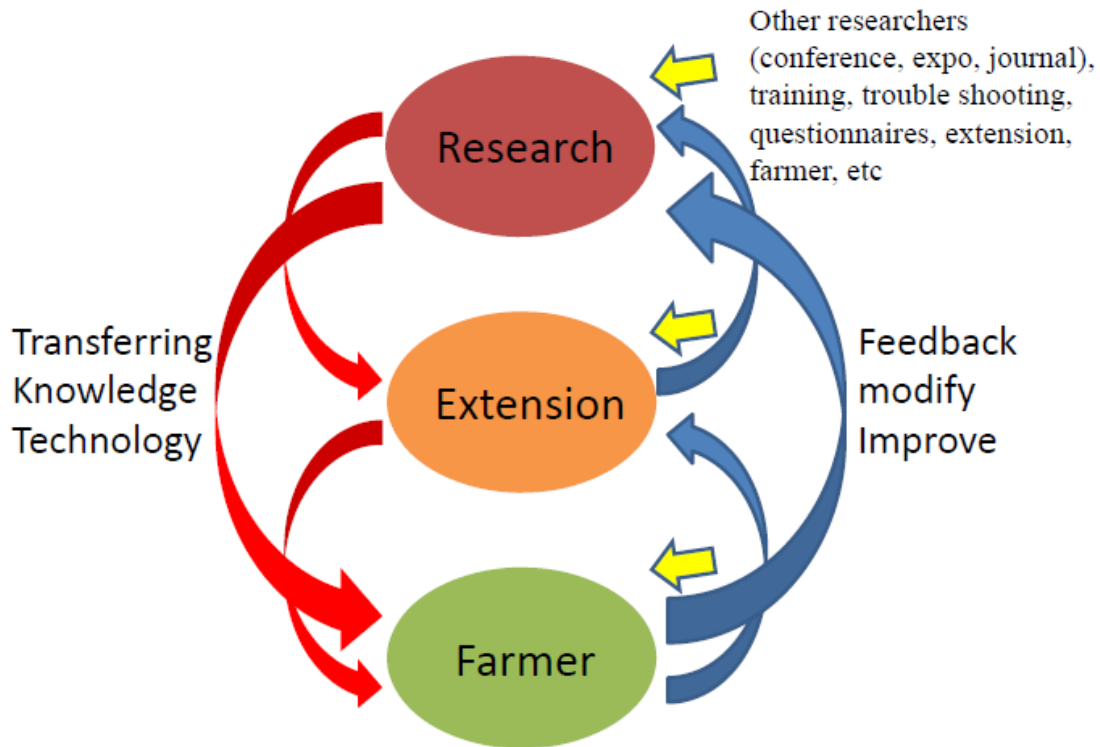


Figure 1.Flow chart of integrated research, extension, and farmer

Figure 1. Flow chart of integrated research, extension, and farmer

2. A cycle production system

Traditional animal production is very important key point in cycle production (Figure 2). Farmers use faeces and urine to make compost as a fertilizer to plants, then use plants for human food or animal feeds. This cycle production system is not only a sustainable livestock production, but also very good for soil quality. Recent years farmers have to maintain their living or to earn more money, then they start raising more animals in one area. This phenomena causes too much faeces and urine produced in a specific time. This over production of faeces and urine cause big waste management problem. This intensive animal production causes three problems: (1) waste management, (2) odor problem and, (3) greenhouse gases problem. Today all three problems can be solved by some new technology.

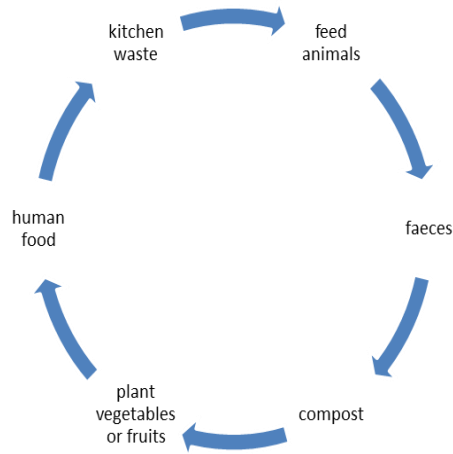


Figure 2. Flow chart of traditional animal production

(1) Waste management

There are two major ways to treat animal waste.

- a. Three phases waste treatment system accompanied with good breeding, nutrition, house, diseases control methods, etc. The main product is methane gas. The by-products are solid waste and sludge. The flow chart is shown on Figure 3.
- b. Scraper system, also accompanied with good breeding, nutrition, house, diseases control methods, etc. The main product is compost (Figure 4).

The above two methods not only try to solve waste problems, but also produce useful products for utilization. This is basic requirement of sustainable production system.



Figure 4. Scraper system in wet pad and forced-ventilation dairy house

Production without contamination of earth

Farmers get rid of waste but still have odor problem which need to remove it. This method was developed many years ago in Taiwan (Figure 5). The basic principle is if we can remove dust then the high percentage odor can be removed.



Figure 5. A simple net and wind break filtered the dust and odor

3. Production efficiency can be improved

Any method can improve animal performance then can improve the situation of animal waste and other contamination.

(1) Animal breeding

a. Any important on animal breeding can reduce waste production. e.g. feed efficiency improvement from 3.3 to 3.0 then total feed intake reduce $0.3 \times 100 \text{ kg} = 30 \text{ kg}$.

b. Total is reduce $30 \text{ kg} \times (1 - (70/100)) = 9$
that is reduced 9 kg waste

(2) Animal nutrition

a. The same as animal breeding

b. Ideal protein can reduce N excretion and reduce odor (NH_3)

c. Phytase can reduce P excretion

d. Balance mineral supplement can reduce mineral excretion

e. Reduce salt content can improve the soil quality when compost spray on the ground

f. Mineral should supply for animal with lowest heavy metal Hg, Pb, Cr, Zn, Cu, etc.

(3) Animal house

Temperature stress is one of very important factors to cause lower performance of animals. The improvement of insulation, ventilation, etc. can reduce heat and cold stress condition of animals, consequence can reduce waste quantity, manure and improve the environment quality, NH_3 and H_2S , etc.

4. Reduce greenhouse gas (GHG)

There are several ways to reduce GHG. The most important method is to provide animals with balance feeds, which can produce less CO_2 , CH_4 and N_2O (Hsia, unpublished data). As for the dairy cattle, we have many methods to reduce the greenhouse gases (Moncada Laínez and Hsia, 2015).

Conclusion

A sustainable livestock production can be achieved by new technology. The important point is we need to use all the knowledge.

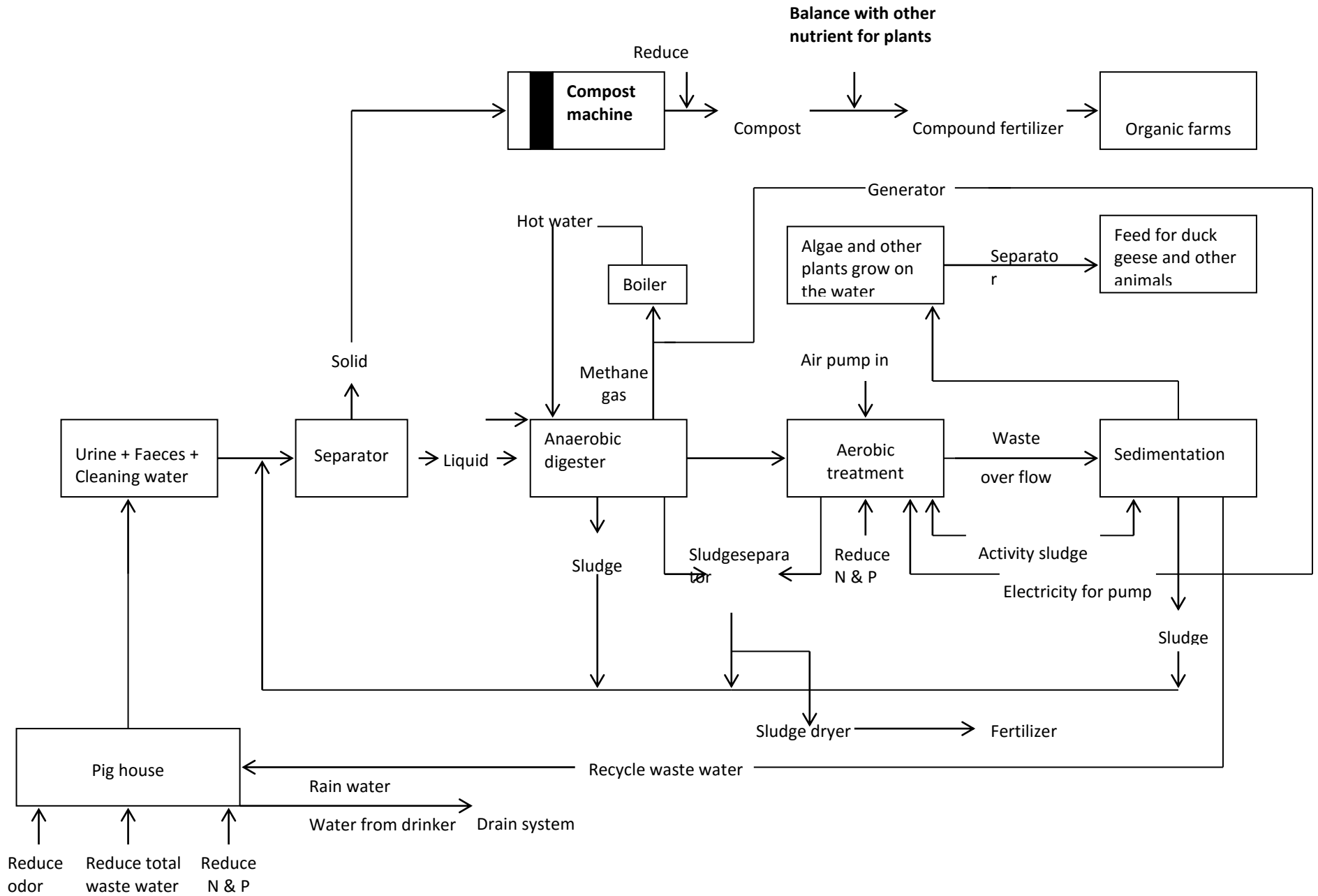


Figure 3. Waste Management Flow Chart (Hsia, 1997)

Breeding Program of Local and Imported Beef/Dairy Cattle Breed for Development of Sustainable Livestock Production in Tropics

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Abstract

The challenge to increase food production in tropical countries lies in efficient exploitation of genetic diversity among and within breeds of cattle. Theoretical and practical ways to improve meat and milk production in the tropics is by selection within local *Bos indicus* breeds, within *Bos taurus* x *Bos indicus* composite populations, upgrading of *Bos indicus* with *Bos taurus* breeds. Many breeding programmes for different species in temperate climates have shown the opportunities to increase the output per animal. But the breeding strategies applied in temperate countries cannot be transferred to tropical conditions without modifications. The animal production in the tropics is generally not just a business, but rather part of a socio-economical and ecological complex. Several crossbreeding programmes have been made in tropical countries with temperate breeds and the crossbreeding programmes indicated a considerable improvement of meat and/or milk production. Based on practical experience of the different breeding programmes, the *Bos taurus* inheritance should not exceed 50 per cent for exploitation of better production potential under the tropical climatic conditions. As a result of widespread crossbreeding programme, there is a drastic reduction in native cattle population in almost all the tropical countries. In order to protect the valuable genetic resources, conservation programmes have to be initiated to preserve them for socio-cultural benefits and to utilize the special characteristics of each breeds for our future genetic improvement programmes. Hence, a balance has to be made during selection programme for improvement of the production potential as well as to preserve the valuable genetic resources. The application of new techniques like artificial insemination, embryo transfer and eventually transgenic animals open new ways to improve milk and meat production in the tropics.

Keyword: *Beef, Dairy, Cattle, Improvement, Tropics,*

Introduction

Livestock production plays an important role in agro-based economies in both developed and developing countries. The demand for livestock products is growing faster than that for other agricultural products, and human nutritional demand indicators identify a movement towards a 'livestock revolution' in developing countries. In general, animal breeding is a vital component of livestock production that requires long-term planning to prepare the livestock industry for the potential benefits of genetic improvement. There is a need to improve current practices in tropical countries including Asia with regard to selection of cattle for breeding purposes, for both dairy and beef production. For many years, most of the countries in the region have been importing cows, bulls and semen largely from the temperate regions of the world to upgrade indigenous genetic resources. Based on current

evaluation of production levels and the productivity of cattle and buffalo, some doubts exist regarding the need and wisdom to continue this practice. The primary current need is to properly manage the genetic resources within each country, by developing selection programmes to improve the productivity of the existing stock while maintaining the unique and beneficial genetic characteristics of the indigenous breeds (Delgado, 2003; Tambi and Maina, 2003; Hammond, 2006; Rewe *et al.*, 2009; Peacock *et al.*, 2011; Philipsson *et al.*, 2011; Rege *et al.*, 2011). The main purpose of this paper is to discuss some problems related to breeding programs for meat and/or milk production in the tropics and strategies to be followed for further progress.

Challenges of the genetic improvement programmes in the tropics

Many attempts to improve livestock in the tropics have been made and improved livestock have been successfully produced or introduced in favourable areas of the tropics. However, in relatively intense peri-urban production systems, many attempts have failed due to introduction of breeds not adapted to tropical conditions, or due to lack of long-term strategies for the breeding programme to be sustainable. The major problems encountered/reported (Payne and Hodges, 1997; Kosgey *et al.*, 2006; Mueller, 2006; Kosgey and Okeyo, 2007; Peacock *et al.*, 2011; Philipsson *et al.*, 2011; Rege *et al.*, 2011) are as follows:

- Indiscriminate crossbreeding of indigenous breeds with exotic breeds without enough consideration of environmental conditions for production.
- High levels of upgrading have generally led to animals with lower resistance to diseases and impaired ability to withstand environmental stress.
- Breeding programmes have been too complex in terms of logistics, technology and other resources without considering the infrastructure required.
- Lack of analysis of the different socio-economic and cultural roles that livestock play in each situation, usually leading to wrong breeding objectives and neglect of the potentials of various indigenous breeds of livestock.
- Lack of comprehensive approaches to design simple, yet effective breeding strategies in low-input environments.
- Lack of maintenance and promotion of breed standards (uniformity, colour and body conformation), and small population sizes limiting the selection, multiplication and stabilization of crossbreds to form synthetic breeds.

Genetic improvement programmes for dairy and beef cattle

The challenge to increase food production in developing countries lies in efficient exploitation of genetic diversity among and within breeds of different species. Hence, the most productive and adapted animals for each environment must be identified for breeding purposes. Only then will it be viable to increase the food production without further increasing the number of animals with the subsequent effects of land degradation. A production system must therefore consider all aspects of the resources needed along with the outputs, both positive and negative. Realistic ways of improving these breeds must be chosen and applied in the context of environmental constraints and socio-economic demands and within the resources available. A basic principle to follow should be based on the assumption that there is no better way to conserve a breed for future generations than to consistently keep the breed or population viable by using an efficient, demand-driven long-term breeding programme suitable to commercial or cultural needs of livestock owners. An important

feature of a genetic improvement programme, contrasting to an external input effect is that the effects of selection accumulate over time and the economic benefits of selection also accumulate. Breeding programmes should, therefore, be seen as an investment for sustainable improvements of the animal stock and the potential to produce food or other goods.

Any breeding programme is totally dependent on environmental conditions, the production system, the culture of the people for whom the animals are bred, and the market to which the animals and animal products are sold. Village breeding programmes for smallholder farmers will be different from those of large-scale farming systems (Jain and Muladno, 2009; Phillipson *et al.*, 2011). One of the first steps in developing breeding programme is to consider which phenotypic traits are of importance. Some of the important traits that need to be included for both dairy and beef cattle are as follows:

Table 1. Important economic traits of dairy and beef cattle

Important traits	Dairy cattle	Beef cattle
Production	Milk Yield, Fat percentage and Solid-not-Fat percentage	Body size/weight, Growth rate, Carcass quality, Age at weight at slaughter, Leanness and Carcass percentage
Reproduction	Age at first calving and Calving interval	Age at first calving and Calving interval
Health	Disease resistance	Disease resistance
Management	Longevity and Milk let-down	Calving ease and Temperament
Physical appearance	Body colour, Shape and Udder characteristics	Body colour, Shape, Dimensions and Body condition
Jain and Muladno (2009)		

In general, the breeding and improvement of farm animal genetic resources for different traits has to be made based on the following principles:

- Breeding will be based on a sound scientific basis for the genetic improvement of livestock breeds, for superior productivity, optimal resource utilization and environmental sustainability.
- Farm animal genetic resources are biological capital which can continue to be utilized for wealth generation, improvement of the socio-economic status of citizens and economic growth of the nation.
- Indigenous farm animal genetic resources are recognized as a national heritage and they must be conserved and sustainably utilized for the present and future generations.
- Formulation and implementation of the policy framework for the breeding, improvement, conservation and sustainable utilization of livestock breeds should be in close cooperation with all stakeholders, including policymakers, scientists, farmers, entrepreneurs, consumers and the public.
- Farmers must be intrinsically involved in livestock breeding and improvement programs and the formation of breed societies should be encouraged.

- Usage of assisted reproductive technology such as artificial insemination, embryo transfer and other relevant cost-effective technologies should wherever possible be utilized for the genetic improvement of breeding stock.
- Legal framework has to be strengthened to empower the competent livestock authority, regulate livestock breeding and to protect the rights of animal breeders (Breeders' rights).
- Networking and collaboration with established international partners should be pursued for mutual benefit. The government shall provide long-term support and incentives for breeding programs and establishment of well documented breeding data which has to be easily assessable and user friendly.
- Government and private sector shall create and encourage a smart partnership to ensure the continuous improvement of breeding programs to achieve the desired outcome (Anon, 2013).

Breeding programme for indigenous and non-descript cattle

With the introduction of crossbreeding programme on large scale in different tropical countries, the population of the recognised zebu breeds has decreased alarmingly. Thus an urgent need exists to conserve the unique adaptable, heat tolerant, disease resistant, draught compatible animals of local breeds of zebu cattle. As there are large numbers of zebu breeds, the choice for conservation of some of the breeds will depend upon various factors such as their capacity for economic sustainability and true desire of the people to conserve the breed for social and religious purposes. The selection within local cattle is the only way to conserve them. This is only possible, if the herd size is large and if the infrastructure and will of the cattle holders to collaborate in a breeding programme is available (Philipsson *et al.*, 2011; Rege *et al.*, 2011).

There are about 50 per cent of the cattle in the tropical regions are unimproved and non-descript. Upgrading the production potential of the large proportion of these lowly productive non-descript cattle is seemingly necessary to improve the overall cattle productivity in the region and incomes of farmers. Controlled crossbreeding to produce 50 per cent *Bos taurus* or 100 per cent *Bos indicus* can be implemented based on the availability of nutritional resources in the area. Only the non-descript local animals and very low productive animals of recognized breeds should be used for crossbreeding. The destruction of valuable indigenous breeds with unique adaptability characters for those particular agro-climatic conditions should be avoided. A well-planned crossbreeding programme can be a valuable tool in helping to obtain genetic improvement as long as the compatibility of the genotypes of the incoming breed with local farming objectives and the production system are considered (Jain and Muladno, 2009; Philipsson *et al.*, 2011; Rege *et al.*, 2011; Anon, 2013;).

Selection within crossbred populations

Due to a large number of crossbreeding programmes an important percentage of the tropical cattle populations are crossbred animals. Main reasons for the realized improvement in crossbreeding programs is due to combination of adaptability of *Bos indicus* breeds with the production potential of the *Bos taurus* breeds. However, the population structure of the crossbred population is complicated, mainly because of genes from temperate breeds introduced in a stepwise manner in to the indigenous populations and in most of the crossbreeding programmes implemented in tropics, selection programmes were made without

reliable prediction of expected response (Kunzi and Kropf, 1986; Phillipson *et al.*, 2011). In general, high percentage of cattle population in the tropics for meat/milk production are crossbred animals, selection programme have to be operated within the composite breeds in a planned manner with the proper data recording and animal evaluation programmes for further genetic improvement in adaptability and production potentiality.

The general strategic approach needed for beef and dairy cattle breeding of indigenous and crossbred cattle are as follows:

- Dairy breeding is for the primary goal of producing quality milk economically and for the secondary goal of producing beef. Selective breeding of the recognised breeds and upgrading of non-descript dairy animals using temperate dairy breeds (eg. Jersey and Holstein-Friesian) and limiting the exotic inheritance to 50 per cent as an option for high input farms.
- Pureline breeding of cattle for beef production has to be continued with selected farmers who are involved in the multiplier programme and crossbreeding with *Bos taurus* or *Bos indicus* breeds for production of terminal crosses at the commercial level. Enhancing local beef cattle breeding so as to decrease dependence on imports of beef and live cattle for slaughter by providing special incentive.
- Establishment of beef and dairy cattle breeders associations for implementing genetic improvement programmes with farmers and entrepreneurs cooperation.
- Establishment of computerized data recording system and data management for efficient genetic selection in lean growth rate, feed efficiency, fertility and tropical adaptability traits for beef cattle. For milk production, genetic selection in milk yield, milk protein, milk fat, lean growth rate, feed efficiency, fertility and tropical adaptability traits is needed.
- Aggressive bio-prospecting with proper pre- and post- evaluation to determine suitability of imported breeds which are adaptable to and highly productive under tropical climatic conditions.
- Establishing dairy colonies or clusters and production areas to enhance the development of dairy industry for better management and marketing (Anon, 2013).

Conclusion

In conclusion, improving the productivity of cattle will require multifaceted set of intervention that will involve not only proper management of local animal genetic resources, but also strengthening of local institutions for support of farming activities, including not only breeding-related services, but also services related to nutrition, health care, milk marketing and social services. These services are to be provided by a combination of government, non-governmental and private institutions. A contribution by the government for policy setting and support in management of local resources is necessary to ensure sustainability and fair exchange of germplasm between countries. Livestock development is essential to fulfill the increasing demand for livestock products in the region. Strategies that incorporate the genetic resources existing locally and active farmer participation are essential to achieve sustainable livestock development and genetic improvement in the region. The role of animal breeding in the development of the livestock industry is highly recognized by the government and the farming community. Unlike other investments, gains made in breeding, though minute, are cumulative and for perpetuity. The diversity of livestock genetic resources is very wide, both in variety and variability in terms of species, breeds, populations and unique genotypes. The presence of a variety of production systems for milk and beef

cattle in this region requires system specific solutions if the benefit from available animal breeding technologies is to be maximized. In order to improve the milk and meat production in the tropics, efforts have to be made to develop breeding strategies adapted to the circumstances and in agreement with the principles of genetic improvement programmes.

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Current Analysis on Beef Self Sufficiency Program in Indonesia

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Abstract

It has been a trending topic of discussion across the country since the government of Indonesia launched a program called “beef self-sufficiency” in 1997 and later it was expanded to include buffalo meat to the program with the ambitious target should have been achieved by 2005. In fact, up till now such a program moves divergently due to diverse vested interests among shareholders or institutions involved in the supply chain pipeline of beef market. Increased human population and hence demand for beef meat has been one of determining factor for current domestic high price of cut beef meat that seems lasting timelessly. It thus is not surprising if the import door either for live beef cattle or meat from overseas has been opened by the Indonesian government to stabilize the meat price. Nevertheless, the price remains high and provokes the government to blame some private cattle business had acted as a cartel.. This condition attracts academic scholars as well as economic players to analysis the ultimate journey of the program amidst the Indonesian government remains optimistic to achieve self sufficiency of beef by 10 years from now. These two divergent views are discussed in this paper to highlight the underlying reasons of each party in favor of whether such the program realistic to be continued or should be modified.

Keywords: *beef, self sufficiency, Indonesia*

Current Development Trends in Global Broiler Production

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Abstract

Poultry is one of the fastest growing agricultural sub-sector. Demand for animal source food is increasing because of population growth, rising income, and poultry meat has shown the fastest trend in the last decades. Poultry meat and eggs are among the most common animal source of food consumed at global level, through a wide diversity of cultures, traditions and religions, making them key to food security and nutrition. On the world stage chicken meat production represent about 87% compared with 6% for turkey meat, 4% for duck meat and less than 3% for the combined category of geese with guinea fowl. Broilers used in intensive systems are of strains that have been bred to be very fast growing in order to gain weight quickly with typical gains of over 50 g per day. Unlike laying hens (kept for egg production) which live for about a year, broilers only live for several weeks before they are slaughtered. In the US, the average slaughter age is 47 days at a weight of 2.60kg. While, the average slaughter age in the EU is 42 days at a weight of 2.50kg. In Indonesia, for example, broilers are grown to 1.0 – 2.0kg (average of around 1.40kg at 30 days of age). Mortality on broiler farms is 6 – 7%. Over the last 80 years or so from 1925 to 2016, the slaughter age of a standard fast growing broiler has been decreasing from 112 days to 48 days, and market weight of broiler has increased from 1.25kg to 3.11kg, **feed to meat gain has decreased from 2.35kg to 0.94kg**, and mortality has decreased from 18% to 4.8%, respectively. In comparison, traditional meat chickens take around 12 weeks reach slaughter weight. In conclusion, most of the world's chicken meat production is merely based on intensive farming of the most popular fast-growing hybrids (i.e. Ross, Cobb and Hubbard) reaching the slaughter weight in a very short time and having high meat yields.

Keywords: *world poultry meat production, global chicken meat production*

Introduction

Poultry is one of the fastest growing agricultural sub-sector. Demand for animal source food is increasing because of population growth, rising income, and poultry meat has shown the fastest trend in the last decades. Poultry meat and eggs are among the most common animal source of food consumed at global level, through a wide diversity of cultures, traditions and religions, making them key to food security and nutrition. Within the livestock sector, poultry emerges the most efficient sub-sector in its use of natural resources and in providing protein to supply a global growing demand (Mottet and Tempio, 2016).

Broilers used in intensive systems are of strains that have been bred to be very fast growing in order to gain weight quickly with typical gains of over 50 g per day. Unlike laying hens (kept for egg production) which live for about a year, broilers only live for several

weeks before they are slaughtered. In the US, the average slaughter age is 47 days at a weight of 2.6kg. While, the average slaughter age in the EU is 42 days at a weight of 2.5kg (FAWC, 2013). On the world stage, chicken meat production represent about 87% compared with turkey meat (6%), duct meat (4%) and the combined category of geese with guinea gowl (< 3% - Figure 1; Valavan, 2016). Worldwide, this poultry sector consists of chickens (90.55%), ducks (5.53%), geese and guinea fowl (1.67%), turkeys (2.09%), and other poultry (0.15%; FAO, 2014 – Table 1). In general, there are three main types of poultry production systems can be considered: broilers, layers and backyard (Table 2). This paper reviews literature which identifies current development trends in global broiler production.

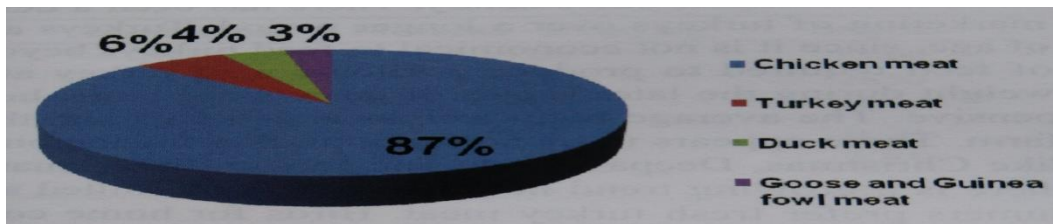


Figure 1. World poultry meat production by species (Valavan, 2016: 308).

Table 1. Distribution of poultry species by region (%; FAO, 2014: 3).

Region	Chickens	Ducts	Geese and guinea fowl	Turkeys	Other poultry
Africa	96.03	1.10	0.85	1.21	0.81
Americas	93.95	0.45	0.01	5.58	0.00
Asia	88.07	8.99	2.70	0.10	0.14
Europe	91.30	2.65	0.89	5.03	0.13
Oceania	96.45	1.60	0.07	1.88	0.00
World	90.55	5.53	1.67	2.09	0.15

Table 2. Poultry production systems (Gerber *et al.*, 2015).

System	Housing	Characteristics
Broilers	Broilers assumed to be primarily loosely housed on litter, with automatic feed and water provision.	Fully marked oriented; high capital input requirements (including infrasturcture, buldings, equipment); high level of overall flock productivity; purchased non-local feed or on farm intensively produced feed.
Layers	Layers housed in a variety of cage, barn and free range systems, with automatic feed and water provision.	
Back-yard	Simple housing using local wood, bamboo, clay, leaf material and handmade construction resources for supports (columns, rafters, roof frame) plus scrap wire netting walls and scrap iron for roof. When cages are used, these are made of local material or scrap wire.	Animals producing meat and eggs for the owner and local market, living freely. Diet consists of swill and scavenging (20 to 40%) and locally-produced feeds (60 to 80%).

Current Development Trends in Global Broiler Production

Nowadays most of the world's chicken meat production is merely based on intensive farming of the most popular fast-growing hybrids (i.e. Ross, Cobb and Hubbard) reaching the slaughter weight in a very short time and having high meat yields. Because of the consumer's preference for breat meat and as a consequence of the developing market of cut-up and

processed products, broiler are slaughter at increased weights (Petracci *et al.*, 2016). There are top 10 broiler exporter countries in the world in 2016 (Figure 2). Over the last 80 years or so from 1925 to 2016, the slaughter age of a standard fast growing broiler has been decreasing, and market weight of broiler has increased. In comparison, traditional meat chickens take around 12 weeks reach slaughter weight (Table 3 & Figure 3).



Rank	Country	Exports (1000 MT)
1	<u>Brazil</u>	4,090.00 
2	<u>United States</u>	3,057.00 
3	<u>EU-27</u>	1,180.00 
4	<u>Thailand</u>	630.00 
5	<u>China</u>	375.00 
6	<u>Turkey</u>	340.00 
7	<u>Argentina</u>	225.00 
8	<u>Ukraine</u>	165.00 
9	<u>Canada</u>	150.00 
10	<u>Chile</u>	105.00 

Figure 2. Top 10 broiler exporter countries in the world in 2016 (USDA, 2016).

In Indonesia, for example, broilers are grown to 1.0 – 2.0kg (average of around 1.40kg at 30 days of age). Mortality on broiler farms is 6 – 7%. Average feed conversion ratio (FCR) is about 1.6 – 1.7: 1, with significant variation throughout the country due to widely differing housing, animal health, and management practice (USAID, 2013). Broiler chicken is one kind of birds that many farmed and supplier majority (55%) of meat production in Indonesia with a population of over 255.08 million people in 2016, followed by cattle (19%), native chicken (10%), pigs (8%), goats (7%) and other livestock (1%). Total consumption of chicken meat in Indonesia is above 5.0kg/ capita/year and is still very low when compared to many ASEAN countries as well as developed countries, but only above the India (Figure 4). Average per capita consumption of chicken meat people of Indonesia in 2011 - 2015 amounted to 4,28kg/capita/year, derived from chicken meat consumption of 3.75kg/capita/year and native chicken meat consumption of 0.53kg/capita/year (Muliandy, 2015). Actually broiler industry still has large growth potential and good prospects in Indonesia. Some other contributing factors that increase the demand of broiler meat products is mainly because of most the majority Muslim population of Indonesia, the relatively lower prices of broiler meat than beef and the belief that white meat is healthier than red meat (Fitriani *et al.*, 2014). In the recent years, the lifestyle changes have dramatically modified the way in which the poultry meat is marketed and consumed and therefore food technologies have become part of the poultry industry, and today much of the broiler production is marketed in the form of cut-up and processed products (Petracci *et al.*, 2016 – Table 4).

Table 3. Market age, weight changes, feed to meat gain and mortality rate of broiler since 1925 to 2016 (after NCC, 2015).

No	Year	Market Age	Market Weight		Feed to Meat Gain		Mortality (%)
			Pound	Kg	Pound	Kg	
1	1925	112	2.5	1.25	4.7	2.35	18
2	1935	98	2.86	1.43	4.4	2.2	14
3	1940	85	2.89	1.45	4.0	2.0	12
4	1945	84	3.03	1.52	4.0	2.0	10
5	1950	70	3.08	1.54	3.0	1.5	8.0
6	1955	70	3.07	1.54	3.0	1.5	7.0
7	1960	63	3.35	1.68	2.50	1.25	6.0
8	1965	63	3.48	1.74	2.40	1.2	6.0
9	1970	56	3.62	1.81	2.25	1.13	5.0
10	1975	56	3.76	1.88	2.10	1.05	5.0
11	1980	53	3.93	1.97	2.05	1.03	5.0
12	1985	49	4.19	2.1	2.0	1.0	5.0
13	1990	48	4.37	2.19	2.0	1.0	5.0
14	1995	47	4.67	2.34	1.95	0.98	5.0
15	2000	47	5.03	2.52	1.95	0.98	5.0
16	2005	48	5.37	2.69	1.95	0.98	4.0
17	2006	48	5.47	2.74	1.96	0.98	5.0
18	2007	48	5.51	2.76	1.95	0.98	4.5
19	2008	48	5.58	2.79	1.93	0.97	4.3
20	2009	47	5.59	2.8	1.92	0.96	4.1
21	2010	47	5.7	2.85	1.92	0.96	4.0
22	2011	47	5.82	2.91	1.92	0.96	3.9
23	2012	47	5.95	2.98	1.90	0.95	3.7
24	2013	47	6.01	3.01	1.88	0.94	3.7
25	2014	47	6.12	3.06	1.89	0.95	4.3
26	2015	48	6.24	3.12	1.89	0.95	4.8
27	2016	47	6.22	3.11	1.87	0.94	4.8

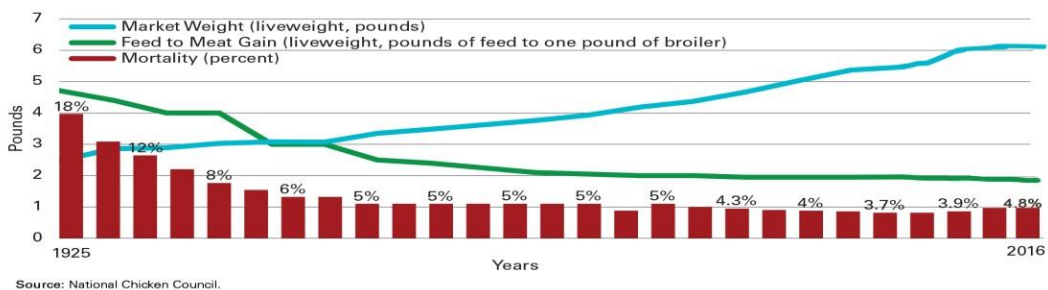


Figure 3. Market age, weight changes, feed to meat gain and mortality rate of broiler since 1925 to 2016 (after NCC, 2015).

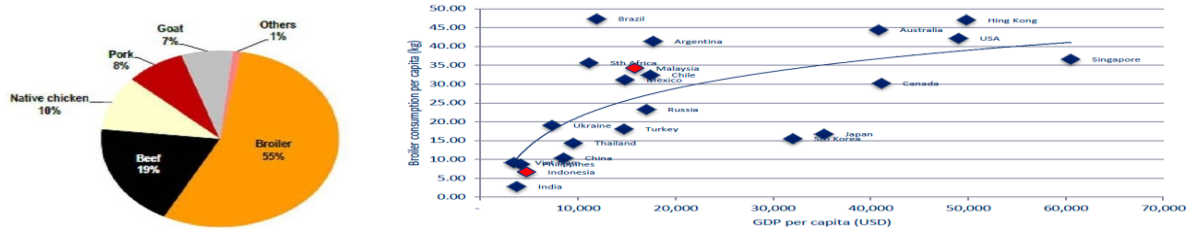


Figure 4. Broiler meat consumption in Indonesia compared with other countries

(USAID, 2013: 43).

Table 4. Evolution of market segments and forms of chicken meat.

Year	Market segments (%)		Market forms (%)		
	Retail grocery	Food service	Whole	Cut-up parts	Further processed
1975	75	25	61	32	7
1985	71	29	29	53	18
1995	58	42	10	53	36
2005	55	45	11	43	46
2015	55	45	11	40	49

Conclusion

Most of the world's chicken meat production is merely based on intensive farming of the most popular fast-growing hybrids (i.e. Ross, Cobb and Hubbard) reaching the slaughter weight in a very short time and having high meat yields.

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Feeding Management of Ruminant Animals to Reduce their Contribution for Gas Emission

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Abstract

It is estimated that the global human population is going to expand from 7.4 – 9.2 billion by the year 2050. This situation is definitely going to increase the demand for animal food products worldwide which will directly have an undesirable impact on the environment. Enteric methane from rumen methanogens and nitrous oxide from agricultural activities is estimated to be around 10-12% of the world's total anthropogenic greenhouse gas (GHG) emission. It is also estimated to increase by 30% above current levels by the year 2050. Reducing GHG emissions from ruminant livestock is a technically challenging even if the livestock production is constant. For methane mitigation strategies to be successful, it is important to establish which factors influence the rumen methanogen community and rumen volatile fatty acids (VFA) since this could reduce animal feed efficiency if it is not properly manage.

Keywords: feeding, ruminants, methane, gas emission

Introduction

Livestock is one of the rapidly growing agricultural sectors in developing countries. It is driven by rapidly increasing demand for livestock products to support population growth, urbanization and increasing incomes in developing countries (Delgado, 2005). According to FAO, the world livestock population in 2011 comprised 1,400 million cattle, 195 million buffaloes, 1,044 million sheep and 876 million goats. The growing demand for livestock products especially in ruminant sector is likely to have an undesirable impact on the environment. Apart of poor water pollution handling and also a public health risks due to location of the farm often located close to urban centers, the anthropogenic GHG emissions was also a threat to the environment. It is estimated that the GHG emitted from the livestock to be around 18% (FAO, 2006). The main sources and type of GHG from livestock systems are methane production from ruminants (25%), carbon dioxide from land use and its change (32%), and nitrous oxide from manure and slurry management (31%). In ruminant animal, taking cattle as an example, it can produce approximately 250 – 500 liter of CH₄/day/animal (Johnson and Johnson, 1995) and generally lose 2–15% of their ingested energy as eructated CH₄ (Giger-Reverdin and Sauvant, 2000). Nonetheless, controlling CH₄ losses from ruminants has environmental as well as economical benefits. Less CH₄ means a lower concentration of GHG been emitted in the atmosphere and also increased efficiency of livestock production. A greater amount of CH₄ production can be controlled by manipulating the composition of the animal feed. Varying the feed composition to reduce the percentage

which is converted into CH₄ has been considered as the most efficient CH₄ reduction strategy.

Mitigation strategies of GHG from animals through feed management

The rumen microbes convert ingested organic matter into energy for microbial growth, and into fermentation end-products, including VFA, alcohols, CO₂ and H₂. Acetate, butyrate, and propionate are the main VFA produce in the rumen, which generally account for more than 95% of the total VFA production that supply the main energy sources for the host animal. The methanogenic archaea have the ability to take some of fermentation end products and reduce them with H₂ to produce CH₄ and H₂O. The majority of the methane is eructated and exhaled out by the ruminant into the environment. For methane mitigation strategies to be successful, it is important to identify factors that may influence the rumen environment and thus, affect the rumen methanogen population.

Manipulation of dietary regime for an example increasing the level of concentrate in the diet has demonstrated a reduction in methane emissions as a proportion of energy intake (Martin et al., 2010). Feeding high concentrate-based diet increases the feed intake by the animal, increase the rates of ruminal fermentation and speed up the feed turnover resulted to large modifications of rumen physic-chemical conditions and microbial populations. This will shift the composition of partial short chain fatty acids (SCFA) from higher to lower acetate production and more propionate with the help of starch-fermenting microbes, and this will reduce CH₄ production because the relative proportion of ruminal hydrogen sources declines whereas that of hydrogen sinks increases.

The use of plant secondary compounds such as condensed tannins and saponins as a feed additives is one of the feeding strategies to reduce enteric methane emission by the ruminant (Wanapat et al., 2013). These two compounds have a direct impact on reducing the rumen methanogens population and also reducing the hydrogen production due to lower feed degradation. Apart from the plant secondary compounds, the use of feed additives such as organic acids (e.g. malate, fumarate and acrylate) and ionophores (e.g. monensin). Ionophores act by shifting Gram-positive bacteria population to Gram-negative bacteria that associated with change in the fermentation from acetate to propionate (Hook et al., 2011). The used of dietary fats seems a promising nutritional alternative to depress ruminal methanogenesis without affecting other rumen functions. Supplementing the dietary fats in the diet will reduced fibre digestion, lowering dry matter intake (if >7% was included in the feed); reduction of methanogens (mainly in medium chain fatty acids); reduction of rumen protozoa and to a limited extent through biohydrogenation process (Wanapat et al., 2013). In summary it is important to establish which factors would influence the rumen methanogen population most and perhaps, combination of several feeding strategies mentioned beforehand may resulted in lowering the enteric methane emission efficiently without compromising the production of the animals.

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Manipulation of Ruminal Fermentation and Methane Mitigation by Feeding Management: Strategic Success Keys for Small Holder Dairy Farm with Environmentally Friendly

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Abstract

The fermentation by rumen microbes has been recognized as the substantial process for the ruminant animals to allow the use of high fibrous feed. However, rumen fermentation also causes adverse effect to environment due to methane emission by methane-producing bacteria. The objective of this paper is to emphasize on crucial tips of feeding management as strategic keys for smallholder dairy farms to manipulate rumen fermentation to improve both dairy production aspect and mitigation of methane emission including manipulation type and amount of carbohydrate in diets, manipulation fiber-rich roughage with starch-rich roughage, manipulation concentrate supplement, manipulation forage to concentrate ratio and proper supplement with condensed tannin-containing forages. In addition, current useful research outcomes associated with these techniques have been reviewed and included to be achievable in productivity, sustainability and environmentally friendly.

Keywords: *feeding, dairy, ruminal fermentation, methane*

Introduction

The pregastric fermentation by rumen microbes has been recognized as the substantial process for the ruminant animals. This allows the use of high fibrous feed, itself the most abundant carbohydrate form present in the plant, to become end-products particularly volatile fatty acids (VFAs) as well as allows the synthesis of high biological value microbial protein from low quality plant protein, dietary nonprotein nitrogen and recycled nitrogenous metabolic compound as major energy and protein sources for the ruminant host (Owens and Goetsch, 1993). In addition, it provides all components of water soluble vitamins that are essential for biochemical pathways in ruminant animals (Huber, 1993). However, rumen fermentation also causes adverse effect to environment due to methane emission by methane-producing bacteria. Reduction of CO₂ with H₂ gas is a primary pathway that methane is produced in the rumen by several methanogenic bacteria such as *Methanobrevibacter ruminantium*, *Methanobacterium formicicum* and *Methanomicrobium mobile* (Yokoyama and Johnson, 1993). Livestock farming could produce approximately 39% of the total global anthropogenic greenhouse gas emissions annually. About 65 percent of the livestock sector emissions are from cattle and the main emitted gas is methane (CH₄) which accounts for 44% of livestock emission sector (Gerber et al., 2013). Methane emissions account for an approximate loss of 5 to 7% of dietary gross energy (Hristov et al., 2013) or approximately 0.89 to 7.21 Mcal losses from Holstein cows daily (Wilkerson et al., 1995). Manipulation of

ruminal fermentation by feeding management to reduce the amount of methane emission from dairy cows would be an optional process which offers economic benefits to dairy producers due to minimized energy loss from the production system in addition to the environmental benefits.

Manipulation type and amount of carbohydrate in diets

Carbohydrates are an important component of all forages and roughages as a major source of energy for the ruminant animal which is normally classified as structural and nonstructural carbohydrates. Structural carbohydrates or plant cell walls compose of a glucose polymer which consists mainly of long, unbranched chain β -D-glucose units connected by β 1, 4 glycosidic linkages and other monosaccharides such as glucose, xylose, arabinose, mannose, galactose; and sugar acids such as galacturonic and glucuronic acids (Lehninger et al., 1993). Structural carbohydrates include cellulose and hemicellulose that are partly digestible by rumen microbes to produce volatile free fatty acids (VFAs) e.g. acetate, propionate and butyrate which are mainly used as energy source for ruminant animals (Van Soest, 1994). Nonstructural carbohydrates mostly compose of a glucose polymer with unbranched chain α -D-glucose units connected by α 1, 4 glycosidic linkages which are easily digested by both ruminants and monogastric animals. These are simple sugars, starch and fructan (Lehninger et al., 1993). Feeding dairy cattle with high structural carbohydrate-rich diets (grass or hay) or nonstructural carbohydrate-rich diets (starch) are resulting in different of VFAs and methane produced. Hatewet et al. (2015) demonstrated the effects of starch varying in rate of fermentation and level of inclusion in the diet (low vs. high; 270 vs. 530 g/kg of concentrate dry matter using native corn grain as starch source) in exchange for fiber on methane production of dairy cows. The result indicated that an increased rate of starch fermentation and increased level of starch in the diet of dairy cattle had no effect on VFAs production but reduced CH_4 produced per unit of rumen-fermentable organic matter. Pirondini et al. (2015) also observed a trend for lower CH_4 emission (g/d) and intensity (g/kg of milk) with the high-starch diets (27.7% of dietary starch on a dry matter (DM) basis) compared with the low-starch diets (23.7% of dietary starch on a dry matter (DM) basis) by using corn meal as the starch source. Cows fed with the high-starch diets had shown no effect on VFAs production except reduction in CH_4 production. Normally, starch fermentation favors production of propionic acid in rumen (Owens and Goetsch, 1993), which may cause an alternative hydrogen decline to methanogenesis by methanogenic bacteria (Dijkstra et al., 2011). In addition, some potentially fermentable starch may escape from rumen to be digested enzymatically in the small intestine duodenum, adding extra blood glucose without associated losses of energy with CH_4 production (Dijkstra et al., 2011).

Manipulation fiber-rich roughage with starch-rich roughage

Even though roughage is prime nutritionally and economically important for dairy cows, replacing fiber-rich roughage with starch-rich roughage is necessary and may be an alternative potential feeding strategy to reduce CH_4 emissions. Van Gastelen et al. (2015) determined the effects of replacing grass silage (GS) with corn silage (CS) in dairy cow diets on milk yield, ruminal fermentation characteristics and enteric CH_4 production. The roughage consisted of either replacing fiber-rich roughage (grass silage) with starch-rich roughage (corn silage) at ratios 100:0, 67:33, 33:67, or 0:100% corn silage (all DM basis). All diets had a roughage-to-concentrate ratio of 80:20 (DM basis). They found that milk yield and ruminal fermentation characteristics were not affected by the replacement. However, methane production decreased quadratically with increasing corn silage inclusion, and decreased linearly when expressed as grams of CH_4 per kilogram of DM intake (Table 1). Ellis et al. (2012) evaluated the effects of feeding high-water soluble carbohydrate (WSC) grasses on

CH₄ emissions, using the high-WSC grass simulation scenarios. Nonetheless, an increasing in the WSC content of grass, simulated CH₄ emission tended to increase when CH₄ was expressed as mega joules per day or percentage of gross energy intake, but results were more variable when CH₄ was expressed as grams per kilogram of milk.

Table 1. Methane production in lactating dairy cows fed different proportions of grass silage in the diet (Van Gastelen et al., 2015)

Items	Treatment				SEM	P-value	
	GS100	GS67	GS33	GS0		Linear	Quadratic
Milk yield (kg/d)	22.6	23.2	24.2	23.6	1.19	0.457	0.185
Rumen pH	6.77	6.74	6.73	6.72	0.100	0.671	0.917
VFA (% of total VFA)							
Acetate	65.6	66.0	65.8	63.6	1.23	0.126	0.127
Propionate	18.9	17.8	17.7	17.1	1.10	0.141	0.590
Butyrate	11.7	12.5	13.0	15.2	0.41	0.006	0.577
Acetate: Propionate	3.55	3.83	3.97	3.78	0.318	0.426	0.241
CH ₄							
g/d	399	414	411	387	12.8	0.028	<0.001
g/kg of DMI	24.6	25.0	24.5	22.0	0.38	0.010	0.107
g/kg of FPCM ¹	16.6	17.0	16.2	15.3	0.50	<0.001	<0.001
% of GEI ²	6.96	7.17	7.11	6.45	0.107	<0.001	<0.001

¹Fat- and protein-corrected milk. ²Gross energy intake.

Manipulation concentrate supplement

Concentrate feed is characterized by high density of nutrients, high dry matter, less bulky, longer lifespan and usually low in crude fiber (less than 18% of dry matter). These nutrients include not only energy and protein but also important specific nutrients such as fatty acids, minerals, vitamins, and others (Jurgens, 1993). Concentrate supplement is also a potential method to improve productive performance and CH₄ mitigation. Lovett et al. (2005) evaluated the effect of adding concentrates, composed primarily (720 g/kg) of fibrous by-products, with barley and wheat constituting only 140 g/kg, at 0.87 vs. 5.24 kg on a dry matter basis with 210 g/kg crude protein on pasture in late-lactation dairy cows to determine productive performance and methane (CH₄) production in relation to milk yield. Increasing concentrate supplementation resulted in a significant increase in total dry matter intake, milk yield, fat-corrected milk (FCM) yield, but a declining trend in CH₄ production per kilogram of FCM and milk fat (Table 2).

Table 2. The effect of concentrate level on intake, milk and methane emission (Lovett et al., 2005)

Items	Low concentrate	High concentrate	SEM	Significance
Total DMI, kg	17.74	21.51	0.679	***
Milk yield, kg	17.55	22.72	1.357	**
Milk fat (g/kg)	42.1	42.9	2.34	NS
Milk protein (g/kg)	33.16	34.19	1.033	NS
CH ₄ (g/d)	346	399	25.3	*
CH ₄ (g/kg of DMI)	19.60	17.83	1.820	NS
CH ₄ (g kg of milk)	21.0	17.7	2.01	NS
CH ₄ (g/kg of FCM)	19.26	16.02	1.731	†
CH ₄ (g/kg of milk protein)	555	509	38.1	NS
CH ₄ (g/kg of milk fat)	525	428	50.7	†

† $P < 0.10$, * $P < 0.05$

Jiao et al. (2014) also reported the effects of concentrate feed level (2.0, 4.0, 6.0, and 8.0 kg/cow per day; fresh basis) on enteric CH₄ emissions from cows grazing perennial ryegrass. They found that concentrate supplementation improved milk yield and reduced CH₄ emissions per unit of milk produced (Table 3)

Table 3. The effect of concentrate level on intake, milk and methane emission (Jiao et al., 2014)

Item	Concentrate level (kg/d)				SEM	P-value
	2.0	4.0	6.0	8.0		
Total DMI (kg/d)	14.5 ^a	14.2 ^a	15.5 ^b	15.4 ^b	0.42	0.007
Milk yield (kg/d)	19.6 ^a	22.4 ^b	25.9 ^c	26.5 ^c	0.87	<0.001
Milk fat (g/kg)	45.5 ^c	41.5 ^b	36.8 ^a	36.5 ^a	1.42	<0.001
Milk protein (g/kg)	35.6 ^b	34.0 ^a	34.0 ^a	33.6 ^a	0.56	0.003
CH ₄ (g/d)	287	273	272	277	11.1	0.52
CH ₄ energy (MJ/d)	16.0	15.2	15.2	15.4	0.62	0.52
CH ₄ /DMI (g/kg)	20.0 ^c	19.3 ^{bc}	17.7 ^a	18.1 ^{ab}	0.72	0.005
CH ₄ /milk yield (g/kg)	15.4 ^c	12.9 ^b	11.2 ^a	10.8 ^a	0.66	<0.001
CH ₄ /ECM (g/kg)	14.1 ^c	12.5 ^b	11.4 ^{ab}	11.1 ^a	0.56	<0.001
CH ₄ -E/GE intake (MJ/MJ)	0.059 ^c	0.057 ^{bc}	0.053 ^a	0.054 ^{ab}	0.0021	0.015
CH ₄ -E/ME intake (MJ/MJ)	0.093 ^b	0.089 ^b	0.081 ^a	0.082 ^a	0.0031	<0.001

Means with different superscript within a row are different ($P < 0.05$).

CH₄-E = CH₄ energy; GE = gross energy.

Manipulation forage to concentrate ratio

Altering the forage to concentrate ratio in a dairy cow diet has been observed to be able to improve productive performance as well as CH₄ emission under field conditions. Aguerre et al. (2011) carried out a trial to evaluate the effect of forage-to-concentrate ratio (F:C) in dairy cow diets on lactation performance and emission of methane. They found that decreasing F:C ratio in the diet had little effect on animal performance. On the other hand, CH₄ emission was reduced linearly expressed as g/day, g/kg of DMI, g/kg of OM intake and g/kg of milk (Table 4).

Table 4. Effect of forage-to-concentrate ratio of the diet on cow performance and CH₄ emission (Aguerre et al., 2011)

Item	Forage-to-concentrate ratio (DM basis)				SEM	P-value	
	68:32	61:39	54:46	47:53		L	Q
DMI (kg/d)	20.2	20.2	21.0	20.7	0.67	0.46	0.82
OM intake (kg/d)	17.5	17.6	18.4	18.2	0.58	0.26	0.77
NDF intake (kg/d)	6.5 ^a	6.2 ^{ab}	5.9 ^{bc}	5.4 ^c	0.18	<0.01	0.77
Milk yield (kg/d)	36.4	36.8	37.9	38.3	1.45	0.13	0.98
Rumen pH	6.59 ^a	6.55 ^{ab}	6.45 ^{bc}	6.38 ^c	0.06	<0.01	0.59
VFA (mol/100 mol)							
Acetate	64.5	64.4	63.0	65.3	1.1	0.83	0.29
Propionate	20.9	20.7	21.5	20.5	1.0	0.95	0.66
Butyrate	10.8	11.0	11.1	10.3	0.3	0.28	0.05
Acetate: Propionate	3.17	3.15	3.03	3.31	0.2	0.72	0.40
CH ₄ (g/d)	648 ^a	586 ^{ab}	597 ^{ab}	538 ^b	29.4	0.01	0.94
CH ₄ (g/kg of DMI)	31.9 ^a	29.1 ^b	28.2 ^b	25.9 ^c	1.21	<0.01	0.68
CH ₄ (g/kg of OM intake)	37.1 ^a	33.5 ^b	32.4 ^b	29.5 ^c	1.37	<0.01	0.63
CH ₄ (g/kg of NDF intake)	99.4	95.6	101.0	99.2	3.83	0.52	0.56
CH ₄ (g/kg of milk)	17.8 ^a	16.1 ^b	15.9 ^b	14.0 ^c	0.64	0.01	0.85

Supplement with condensed tannin-containing forages

Condensed tannin or Proanthocyanidins found in several legumes and tropical plants worldwide such as *Cassia rotundifolia* (cassia), *Lablab purpureus* (lablab), *Macroptilium atropurpureum* (siratro), *Flemingia macrophylla* (apa apa, hahapaan, pok kepokan; Indonesia), *Arachis pintoii* (kacang pinto; Indonesia), *Leucaena leucocephala* (lamtoro; Indonesia), *Manihot esculenta* (cassava) (Mupangwa et al., 2000; Rojas et al., 2005). Anantasook et al. (2015) reported an increase of 10% in milk yield of dairy cows fed 88 g of condensed tannin per kg DM because condensed tannins have the ability to create complexes with the polysaccharides and proteins to increase the amount of low rumen

degradable protein which flows to the small intestine, favoring weight gain and milk production (Min et al., 2006; Anantasook et al., 2015). Optimal level of condensed tannins have the capacity not only to promote production, but also to reduce emissions of CH₄ in the rumen (Puchala et al., 2005; Jayanegara et al., 2012; Puchala et al., 2012; Anantasook et al., 2015). These potential available forages should be considered and exploited as supplements for dairy cows.

Conclusion

Feeding management to manipulate rumen fermentation in order to improve both dairy production and mitigation of methane emission will continue to be important in dairy production systems especially during the environmentally failure of green revolution in agriculture. Improvements of ruminal fermentation by feeding management such as manipulation type and amount of carbohydrate in diets, manipulation fiber-rich roughage with starch-rich roughage, manipulation concentrate supplement, manipulation forage to concentrate ratio and proper supplement with condensed tannin-containing forages should be considered and exploited by smallholder dairy farmers to increase their productivity as well as environmentally friendly. Even though, there are huge numbers of high feeding technology to cope with animal production itself and green revolution, these crucially basic feeding management should systematically be introduced to on-farm uses by smallholder dairy farmers for the sustainable dairy production and environmentally friendly.

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Oral Presentation 1 Focus Session:

Feed and Nutrition (1)

Wednesday, 19 October 13:00-14:00

Room: Panderman 1

Smallholder Dairy Cattle Farmer Capacity in Providing Feeds and Nutrient in Several Population Densities of Villages of Sleman Regency, DIY Province - Indonesia

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Abstract

A study to compare smallholder farmer capacity in providing feeds and nutrients for dairy cattle have been done in 5 different population density villages (Boyong, Tunggalarum, Cemoroarjo, Kemiri and Tambakrejo) of Sleman regency, DIY province. Forty cattle have been observed and 15 farmers have been interviewed. Feeds offered have been identified, weighted, sampled and analyzed for their proximate compositions and minerals. Nutrients requirement and balance of each cow has been calculated. The result showed that type and amount of feed offered related to the village typological area. Farmer in Tunggalarum provided sufficient nutrient and balanced ration with forage to concentrate ratio 55:45. The study concluded that the less population densities, the higher dairy farmer capacities in providing feeds and nutrients for their cattle.

Keywords: *Nutrient balance, dairy cattle, typological area, requirement, traditional*

Background

Smallholders which commonly undertake dairy farming in developing countries, often operated with quite rudimentary facilities (Andrews and Davison 2002). They diversified land as a characteristic of low-input farming systems (Andrieu et al. 2007) to grow grasses and food crops. The grasses and food crops residues were the major feed securities for their cattle. Despal et al (2014^a) reported about 50% of dairy cattle daily ration consisted of forage either cultivated (50 - 66%) or non-cultivated (34 – 50%) such as natural grasses or agricultural by-products (Despal et al. 2014^b). Increasing population pressure on agricultural land resulted high conversion rate of agricultural land into non-agricultural land and limited the farmer capacity to supply nutrients for their cows.

The ability of farmer in providing nutrient depend on land carrying capacity and landuse priority and negatively correlated with population density. Limited land and higher stocking rate reduced milk production if there were no supplement feed to overcome the deficient nutrients (Baudracco et al. 2011).

DIY Province is one of dairy producing area in Indonesia. The Province is under rapid development. Dairy farming in the area had advantage from direct milk marketing but disadvantage from limited land availability and human population pressure. This study was

aimed at comparing the capacity of traditional dairy farmer in providing nutrients for their cattle under different population densities.

Methodology

This study was conducted in 5 different population densities villages of Sleman Regency, DIY Province. Population densities per km² in each village were 525 (Boyong), 610 (Tunggalarum), 833 (Cemoroharjo), 1849 (Kemiri) and 2438 (Tambakrejo). Forty cattle have been observed and 15 farmers have been interviewed. Feeds offered have been weighted, 1 kg each forage type and 100 g each concentrate type have been sampled and analyzed for their proximate compositions and minerals. Proximate composition consisted of dry matter (DM), ash, crude protein (CP), fat, crude fibre (CF) have analyzed using AOAC (2003) procedures. Ca and P preparation samples used Reitz *et al.* (1987) method. Mineral P quantification has been analyzed using Taussky Shorr (1953) method, while Ca used AOAC (2003) procedure.

Dairy cattle nutrient requirements were interpolated from NRC (1989) nutrient requirement table based on individual cattle specifications. The amount of nutrients provided were calculated from the amount of feed offered and their nutrient contents. Nutrient sufficiencies were calculated by subtracted the amount of nutrient offered from nutrient required by each cattle. The experiment used block randomized design. The data were analyzed using ANOVA (Steel and Torrie) (1991) and continued by Duncan multiple rank test.

Results and Discussion

Feed used by the farmer have been grouped into forage and concentrate, Forage type used by the farmer included napier grass, natural grass, rice straw, albizia leaves and mixed legume. While concentrate type used consisted of different sources of mixed concentrate, tofu waste, pollard, wheat brand, rice polishing. The amount of nutrient provided, nutrient required and balanced are shown in Table 1.

Table 1. Feed and nutrient provided, required and balanced

Parameters	Boyong	Tunggalarum	Cemoroharjo	Kemiri	Tambakrejo
Feeds offered					
Forage (kg FS)	37.49±1.11a	34.17±5.52a	32.08±2.57a	40.00±0.00a	15.42±0.83b
Concentrate (kg FS)	10.88±5.66ab	5.75±2.63bc	8.75±1.54ab	6.80±1.09bc	11.88±1.25a
Forage (kg DM)	7.33±1.69ab	6.21±1.94bc	5.13±0.42c	8.21±0.00a	3.53±0.19d
Concentrate (kg DM)	7.83±2.64a	5.07±2.38b	7.84±1.49a	4.50±0.96b	6.53±1.07b
Total (kg DM)	15.01±2.93a	11.27±3.14bc	12.97±1.07ab	12.70±0.96b	10.06±0.88c
Forage:concentrate	48.8 : 52.2	55.1 : 44.9	39.6 : 60.4	64.6 : 35.4	35.1 : 64.9
Forage (%BW)	1.86±0.44ab	1.59±0.39bc	1.23±0.16cd	2.00±0.09a	0.98±0.05d
Concentrate (%BW)	1.95±0.54a	1.30±0.53bc	1.87±0.38a	1.10±0.26c	1.81±0.31ab
TDN (kg)	9.57±2.11a	6.61±1.99b	8.01±1.11ab	7.81±0.73ab	6.06±0.69b
PK (g)	1797.20±3.92a	1348.57±b3.11c	1545.31±1.76ab	1499.65±1.23ab	1148.10±1.66c
Ca (g)	46.15±1.16b	73.88±1.74a	35.17±2.59b	38.89±0.97b	39.27±1.77b
P (g)	30.28±5.36ab	39.76±7.33a	22.58±1.47b	24.44±1.24b	23.75±8.35b
Requirement					
DM (kg)	11.63±1.09	11.28±0.80	12.68±1.09	12.08±1.18	11.48±1.06
TDN (kg)	7.32±1.13	5.89±1.46	8.02±1.13	7.06±1.46	7.76±1.06
PK (g)	1435.23±3.15	1024.12±3.78	1567.37±3.15	1329.27±4.41	1624.98±2.94
Ca (g)	56.09±1.16	41.26±1.44	61.82±1.16	53.05±1.46	61.75±1.04
P (g)	36.52±7.18	27.39±8.99	40.28±7.18	34.74±8.96	39.76±6.42
Balance					

DM (kg)	3.39±2.67a	0.01±2.53b	0.28±1.48b	0.62±0.94b	-1.41±1.25b
TDN (kg)	2.24±1.98a	0.73±1.60ab	-0.01±0.94bc	0.75±1.44ab	-1.70±0.39c
PK (g)	361.97±4.23a	324.44±3.11a	-22.06±2.74a	170.38±4.24a	-476.89±1.47b
Ca (g)	-9.94±1.39b	32.62±1.24a	-26.65±3.91b	-14.16±1.50b	-22.48±8.21b
P (g)	-6.24±7.04b	12.37±6.33a	-17.70±2.31b	-10.31±8.68b	-16.01±2.61b

The table showed that the amount of feeds and nutrient provided varied between the villages observed. Tambakrejo village which has most dense population provided the least amount total feeds and proportion of forage to concentrate. Comparing the feed offered to cattle requirement, Tambakrejo village also provided feed less than the cattle need. All villages provided amount of DM above their cattle requirements, except tambakrejo village. Although farmer in Cemoroharjo provided sufficient DM to their cattle, but the TDN and protein offered were less which showed lower ration qualities used. All village provided less Ca and P minerals than their cattle needed except for Tunggalurum village.

Conclusion

Type and amount of feed offered related to the village typological area. Farmer in Tunggalurum provided balanced ration with forage to concentrate ratio 55 : 45 and satisfied cattle requirement. The less population densities, the higher dairy farmer capacities in providing feeds and nutrients for their cattle.

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Nutritional Properties of Several Seaweeds Species for Dairy Cattle

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Abstract

An effort to improve dairy cattle feed security by finding new feedstuffs have been done through a serial study. Five types of seaweeds (*Sargassum*, *Gracilaria*, *Gelidium*, *E. cottoni* and giant *E. cottoni*) have been evaluate for their nutritional properties as dairy cattle feedstuffs. The properties observed included proximate compositions (DM, Ash, CP, Lipid, CF and NFE), mineral (Ca and P) contents, fermentability (VFA and NH₃), gas production (GB) and digestibility (DMD and OMD). The results showed that all the seaweeds species observed contained high proportion of ash (21.9 – 54.4%), contained CP similar to Napier grass except for giant *E.cottoni* which was slightly lower than Napier grass. All species observed categorized as highly fermentable and digested feedstuffs. Based on their nutritional properties, it is concluded all seaweeds observed have potential as dairy cattle feedstuffs with their ash contents as limiting factor for their inclusion in dairy ration.

Keywords: *Nutritional properties, seaweeds, dairy cattle, feedstuff, limiting factor*

Background

To fulfill dairy cattle requirement on fibre, farmers offered 40 – 60% of forage in dairy cattle ration (Despal et al. 2014^a) which consisted of cultivated (50 - 66%) and non cultivated (34 – 50%). In average, farmer cultivated 0.44 ha land that can only fulfill 62.7% of forage required. The rest was fulfilled by using non cultivated forage such as agricultural by-product or natural grass (Despal et al. 2014^b). Due to high conversion rate of agricultural land into non-agricultural land in the last decade, land for forage cultivation became scarce. It is true for agricultural by-product availabilities too. There is a need to find alternative sources of land forage such as from seagrass.

Indonesia has 3.257.483 km² oceans with about 384.733 ha effective land for seagrass cultivation (Indonesian Ministry of Trade 2013) and produced about 3.082.112 ton seaweeds. From total of 8642 identified seagrass species, about 555 species were found in Indonesia (Suparmi and Sahri 2009), but only some of them which have economic value such as *E.cottoni* and *Gracilaria* (Indonesian Ministry of Trade 2013), *Sargassum* and *Gelidium* (Suparmi and Sahri 2009) that can be used for industry, food, textile, paper, paint, cosmetics and pharmacy.

Previous study reported that seaweed contained 1-5% fat, 6-20% crude protein (Wardani et al. 2004), 113,77 µmol amino acids, 4-7% Ca, 0,3-0,6% P (Dharmananda 2002), 50-300 mg/100g vitamin A, B, C (Wardani et al. 2004). Some of the species may be used as feedstuff for dairy, but their information have not been explored. This study evaluated nutritional properties of several seaweeds as dairy feedstuffs.

Methodology

Five species of seaweeds have been used in this experiment, namely brown algae (*Sargassum sp.*) green algae (*E. cottoni*, giant *E.cottoni* and *Gracilaria*), red algae (*Gelidium sp.*) from Lontar village, Pontang and Karangantu district, Serang-Banten, Indonesia have been collect for about 3 kg fresh substance of each species, sun-dried and ground to pass 0.5 mm screen. Proxymate analyses to measure dry matter (DM), ash, crude protein (CP), fat, crude fibre (CF) have been done using AOAC (2003) procedures. Ca and P samples were prepared using Reitz *et al.* (1987) method. Mineral P measurement has been conducted using Taussky Shorr (1953) method, while Ca have been quantified using AOAC (2003) procedure.

Feed fermentability (VFA and NH₃) and digestibility (DMD and OMD) have tested using in vitro methods according to one and two-stage methods from Tilley and Terry (1966). Concentration of VFA in the rumen fluid after 4 hours of incubation were measure using steam distillation method, while NH₃ were measured in Conway micro diffusion apparatus (General Laboratory Procedures 1966). Gas production (GP) produced after serials incubation were measured using Hohenheim gas test (Menke *et al.* 1979). Estimated metabolic energy (ME) was calculated using 24 hours GP information and CP content according to formula: ME (MJ/kg DM) = 2.20 + 0.136 GP + 0.057 CP + 0.0029 CP². The experiment used block randomized design to test in vitro fermentabilities, digestibilities and gas production with rumen fluid as blocks. The data were analyzed using ANOVA (Steel and Torrie) (1991) and continued by Duncan multiple rank test.

Results and Discussion

Nutritional properties of seaweeds species observed are presented in table 1.

Table 1. Nutritional properties of several seaweeds species

Parameters	<i>Sargassum</i>	<i>Gracilaria</i>	<i>Gelidium</i>	<i>E.cottoni</i>	Giant <i>E.cottoni</i>
Proxymate					
DM (%)	12.63	8.90	10.10	10.22	12.91
Ash (% DM)	54.54	36.00	21.93	31.90	44.57
CP (% DM)	10.59	10.79	12.11	10.46	5.44
Fat (% DM)	0.40	0.12	0.37	0.35	0.53
CF (% DM)	4.26	2.47	7.93	2.41	2.46
Minerals	30.21	50.62	57.65	31.44	46.99
Ca (% DM)	0.02	0.05	0.03	0.04	0.02
P (% DM)	0.09	0.03	0.04	0.05	0.03
Fermentabilities					
VFA (mM)	153.3 ± 21.4	134.6 ± 21.8	149.2 ± 38.1	130.2 ± 22.1	153.4 ± 11.0
NH ₃ (mM)	17.88 ± 3.26	16.70 ± 4.48	14.15 ± 1.61	15.22 ± 4.65	14.31 ± 4.16
Digestibilities					
DMD (%)	45.01 ± 0.93 ^c	56.14 ± 1.47 ^b	42.62 ± 5.80 ^c	65.50 ± 3.78 ^a	69.00 ± 6.25 ^a
OMD (%)	71.21 ± 2.37 ^d	87.76 ± 1.20 ^b	92.26 ± 0.19 ^a	75.32 ± 0.50 ^c	87.82 ± 0.38 ^b
Gas production					
A	1.347	0.895	0.984	0.951	1.124
B	15.502	14.941	14.294	13.597	15.534
a+b	16.849	15.836	15.278	14.548	16.658
C	0.128	0.117	0.107	0.096	0.063
Estimated ME					
Mcal/kg DM	13.71	9.65	10.88	11.17	12.63

Seaweeds were moisture feedstuffs with high contents of ash. The CP content in all species observed similar to Napier grass except for Giant *E. cottoni* which has lower CP content. The seaweeds were not good mineral Ca and P sources for dairy cattle because of

their lower contents. The species observed were fermentable but low to medium digestibilities. *E. cottoni* and giant *E. cottoni* digested better than other species observed. No toxicity effect have been observed for rumen microbes which showed by high fermentabilities values up to 4 hours incubations period.

Conclusion

The seaweeds species observed can be used as feedstuffs for dairy cattle with limitation of their proportion in the ration according to their ash content. The species were not good sources of Ca and P minerals but have potential as other mineral sources.

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Inclusion of Various Levels of Peanut Hay (Rendeng) in the Rabbit Diet

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Abstract

An experiment was carried out to study the inclusion of various levels of peanut hay (rendeng) in the diet for rabbit. One hundred eighty rabbit weanlings of the Rex strain were allocated into 6 treatment groups. Every treatment consisted of 6 replications, each of 3 rabbits. Peanut hay was included at 0, 5, 10, 15, 20 and 25 % in the rabbit diet. Treatment diets were isocaloric (2500-2550 kcal/kg) and isoprotein (18 %). Other nutrients were meet the recommended requirement. Measurements were made on performance of the rabbits raised for 4 weeks, digestibility of diets and the economic analysis based on income over feed cost ratio (IOFC). All data were subjected to analysis of variance and differences between treatments were analysed by LSD following the procedure of SAS. Results showed that feed consumption were not different between treatments ($P < 0.05$) ranging from 59 to 66 g/h/day. Increasing levels of peanut hay up to 10 % increased BWG and dry matter digestibility, (DMD), but thereafter they decreased. FCR was best in rabbit fed 5 % (2.23) and 10 % peanut hay(2.37). Highest BWG and DMD was in rabbits fed 10 % peanut hay, 25.4 g/h/d, and 65.9 %, respectively. At inclusion of 15 to 25 % peanut hay, BWG and efficiency of feed utilization decreased. IOFC ratio was better with rabbits fed 10 % peanut hay. It is concluded that peanut hay is a good source of protein and indigestible fiber for rabbit and can be used at 10 % in the diet.

Keyword: *peanut hay, rabbit, performance*

Introduction

Rabbits is small herbivore which their feed is depending upon forage and agricultural by-product. They utilize crude fibre less efficiently as compared to the large herbivores (Maynard et al., 1979). Generally known that the feed is the largest cost component in the production of a commercial intensive livestock business, so utilization should be optimum. Rabbits can consume forage that comes from the gardens and yards that availability is sometimes not continuous, or feed materials from agricultural waste. Various waste food crops that could be used as feed materials are rice straw, corn straw, soybean hay, peanut hay and cassava leaves. Peanut hay or rendeng have appreciably good nutritional quality, abundantly available at harvest time and inexpensive so its potential for feeding rabbits. Rendeng have high content of fiber so that it can be used as a source of fiber in rabbit feed.

Fibers, especially the 'indigestible' important role in maintaining nutritional balance with the microbiota populations in the digestive process of rabbits (de Blaas *et al.*, 1999; Gidenne, 2003). Fiber deficiency causes diarrhea that resulted in high mortality at weaning rabbits. Fiber types 'indigestible' also allegedly very decisive in maintaining the balance of the digestive process, so it is recommended to use in the formulation of ADF and ADF-lignin (Xiccato *et al.*, 2006). The purpose of this research is to investigate the optimum level of Rendeng use in rabbit diet.

Methodology

This experiment was carried out at rabbitry complex of Research Institute of Animal Production- Bogor. One hundred eighty rabbit weanlings of the Rex strain were allocated into 6 treatment groups. Every treatment consisted of 6 replications, each of 3 rabbits. Peanut hay was included at 0, 5, 10, 15, 20 and 25 % in the rabbit diet. Treatment diets were isocaloric (2500-2550 kcal/kg) and isoprotein (18 %). Other nutrients were meet the recommended requirement. Measurements were made on performance of the rabbits raised for 4 weeks, digestibility of diets and the economic analysis based on income over feed cost ratio (IOFC). Collected data were subjected to analysis of variance and differences between treatments were analysed by LSD following the procedure of SAS.

Result and Discussion

Tabel 1. Nutritional value of peanut hay/ rendeng

Parameter	Nutritional value
Crude Protein	16,41g/100g
DE/ME	1902 cal/kg
Fiber	25,50 g/100g
NDF	41,00 g/100g
ADF	35,37 g/100g
Cell	5,63 g/100g
Lig	9,79 g/100g

Analysis results showed that peanut hay was appreciably high in crude protein (CP: 16,41 g/100g DM), and lower in neutral detergent fiber (NDF; 41,0 g/100g DM). Moreover, peanut hay has 1902 cal/kg and high in fiber (25, 50 g/100g) so that it can be used as alternate fiber source for rabbit diet. This analysis were used in diet formulation.

Animal response to levels of rendeng are shown in Table 2. The all treatments were not different with control basal ($P > 0,05$). There were no significantly difference between treatment to consumption, daily growth and feed efficiency Basal rabbit feed contain approximately 14% of fibre and mostly from grass or cane shoot. Rendeng inclusion does not interfere with the growth and dry matter digestibility. Treatment with 10% rendeng result in an optimal growth performance. Dry matter digestibility of feed showed that all the diet can be digested properly because which is consistent with BWG and feed efficiency.

Table 2. Performance of rabbit in 4 weeks raising.

Levels of rendeng (%)	BW-0 (h)	Cons (g/h/d)	BW-4 (g/h)	BWG (g/h/d)	FCR-4	Cons (g/h)	DMD (%)
0,0	611.2	58.8	1119,2	18.06	2.25	957	64,50
5,0	622.2	63.6	1164,6	19.14	2.23	1039	64,98
10,0	698.2	65.4	1275,6	25.38	2.37	945	65,86
15,0	69,4	63.4	1184,6	17.98	2.90	1109	62,33
20,0	747.0	66.0	1219,2	16.22	3.44	1135	62,59
25,0	729.2	60.2	1150,2	15.46	3.07	773	61,60

The evaluation of bodyweight of rabbits during 4 weeks experiment showed that all treatments can grow well, the increase in body weight were normal (Table 3). Statistic analysis showed no significant differences among treatments ($P > 0,05$), proves that the use of rendeng up to 25 percent still did not interfere on growth, even economically will be very beneficial because it can replace other feed ingredients that have relatively more expensive. The highest body weight at week 4 resulted at treatment with 10% of hay.

Table 3. Bodyweight (g) of rabbits were raised for 4 weeks

Level of rendeng (%)	Bodyweight (g)				
	wk-0	wk-1	wk-2	wk-3	wk4
0,0	611	808	933	1013	1119
5,0	622	835	965	1069	1165
10,0	698	857	972	1036	1275
15,0	692	869	1000	1068	1184
20,0	747	930	1037	1128	1219
25,0	729	923	1043	1093	1150

Conclusion

Based on the obtained results can be concluded that peanut hay is a good source of protein and indigestible fiber for rabbit and can be used at 10 % in the diet.

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The Use of Corn Fodder for Rabbit Production

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Abstract

An experiment on the use of various fertilizers and cutting age of the corn fodder and its use for rabbit production was carried out. The first trial was a 3x3 factorial trial consisting of 3 different fertilizers (soil only, soil with rabbit manure and soil with rabbit manure and NPK-Nitrogen, Phosphorus and Potassium) x 3 cutting ages (14, 21 and 28 d of age) of corn. Each treatment combination had 3 to 12 replication. The corn was planted in a 60x100 cm tray, as a replicate was put in a verticulture system (4 tiers vertically). Fodder production were fed to the rabbit together with a limited pellet feed (50 g/h/d) for 30 days. Measurements were made on fodder production, growth of rabbit and cost per gain, percentage of corn sprouting was 76.9 %. Results showed that dry biomass of fodder increased with the use of fertilizers from 501 to 605 to 769 g and by cutting age from 371 to 596 to 908 g, respectively. Intake of pellet feed was not different between treatments, about 49.1-49.9 g/h/d. Dry fodder intake from 5.9 – 7.7 g/h/d, Bodyweigh gain was from 14 – 20 g/h/d, and was significantly decreased with the increase of cutting age. Feed conversion increased with the increasing cutting age, but not affected by the fertilizers. Results showed that increasing cutting age increased the cost per gain (Rp 19.239 to Rp. 22.780/kg liveweight) and decreased by the addition of fertilizers during fodder growth (Rp 23.430 to Rp. 21.000/kg liveweight).

Keywords: *corn fodder, rabbit production*

Introduction

Unavoidable increase of human population causes less and less land available for agricultural sector, including for forage production for animal feed. The intensification system for forage production, including a verticulture system for forage or fodder production looks promising (and could therefore become an alternative. To improve production, fertilizer may be used. The use of rabbit manure, known as a good organic fertilizer (Sajimin and Raharjo, 2004), for this verticulture system could improve the production, not only for the fodder but also for the rabbit (Figure 1.) Most corn fodder in the verticulture system is harvested at 8 – 14 day-old to increase the nutrient content, especially crude protein and fiber material, but decrease the dry biomass. (Melisa, 2014). The decrease of biomass may not cost effective, and therefore it is necessary to compromise the harvest age, although has to sacrifice a slight reduction in the nutrient content. This trial was carried out to study the effect of different fertilizer and harvest age on the production of corn fodder.



Figure 1. Typical of corn fodder in a verticulture system (Joyfarm, 2014)

Methodology

First trial was a factorial 3 x 3, three levels of harvest age (14, 21 and 28 days) and 3 type of media (soil, soil+organic rabbit fertilizer (SOF) and SOF+NPK). Corn used was obtained from poultry shop. Measurements were made on (i) plant height, (ii) plant biomass, fresh and dry, (iii) chemical composition of the fodder. Treatments in second trial followed the fodder production. Every treatment fodder was applied to six replicates, each of 3 rabbit of 5-6 week-old. Rabbits were fed 50 g of pellet feed daily and fresh fodder was fed *ad lib*. Animal trial was carried out for 30 days. Measurements were made on feed consumption, bodyweight gain, feed conversion FCR) and feed cost over weight gain. Results were subjected to Anova and differences between means were tested by LSD.

Results and Discussion

Except for feed cost per gain, other parameter measured are not interacted significantly between the 2 factors used (media x harvest age). Most of the results are presented in Table 1.

Measured from 3 replication, using each of 1kg of corn seed, the fertility of corn was 76.9 %, lower than that reported by Meilany (2010), which reached 90 % sprouting. The seed used in this trial was obtained from the poultry shop.. Plant height and dry biomass produced significantly increased with the increasing age and with the addition of fertilizers. However, the dry matter of the fodder were almost similar, varied from 10.44 – 12.0 %. On the other hand, other fodder chemical content increased with the increasing age and decreased with the use of fertilizers, except for CF and lignin which slightly decreased with the addition of fertilizers. These results are similar to those reported by Melisa (2014).

Pellet feed was restrictedly fed, 50 g/h/d. However, they were consumed only at 49.4 – 49.8 g/h/d and there was no differences between treatments. On the other hand, fodder consumption decreased with the increase of cutting age, which was due to the increase of fiber intake; but no differences detected due to the addition of fertilizers. Bodyweight gain decreased with the increased of harvest age (19.8 to 14.3-14.7 g/h/d). This is understandable as less feed consumption caused a decrease in weight gain. However, bodyweight gain was not affected by the media or type of fertilizers (13.0-15.5 g/h/d). No interaction nor differences were detected between treatments on the FCR, which varied 3.45 – 4.00.

There were significant interaction on feed cost over bodyweight gain. The lowest feed cost to produce 1 kg of bodyweight was in rabbits fed fodder grown in SOF+NPK and harvested at 14 day (Rp 18,019), while the most costly was rabbits fed fodder grown in soil (no fertilizers) and harvested at 21 day-old.

Table 1. Dry biomass of corn fodder (g) produced from different age of harvest and fertilizers

Measurement	Harvest age			media		
	14	21	28	soil	SOF	SOF+NPK
Plant height, cm	44.0 ^a	52.4 ^{ab}	58.8 ^b	30.5 ^a	48.0 ^b	76.7 ^c
	16.2	22.9	30.9	0.87	6.76	15.34
Dry biomass, g	371 ^a	596 ^b	908 ^c	501 ^a	605 ^{ab}	769 ^b
Sd	49	99	161	75	149	189
Fodder consumption g/h/d	7.72 ^a	5.34 ^b	4.98 ^b	5.86 ^a	5.48 ^a	6.71 ^a
Sd	0.81	0.22	1.45	2.31	1.17	1.25
Bodyweight gain, g/h/d	19.8 ^a	14.7 ^b	14.3 ^b	13.0 ^a	15.5 ^a	14.5 ^a
	0.8	1.2	1.2	15.3	17.1	16.5
Crude protein (%)	13.89	13.30	20.47	10.44	13.3	16.01
Crude fiber (%)	15.50	18.13	20.55	22.88	23.51	23.82
ADF (%)	23.19	30.87	32.67	43.12	41.22	39.95
Lignin (%)	2.63	3.37	5.40	8.62	8.42	8.22

Table 6. Feed cost over weight gain of rabbits fed corn fodder (Rp./kg)

Harvest age	media				Mean	Sd
	soil	SOF	SOF+NPK			
14 d	21.043 ^{ab}	18.655 ^a	18.019 ^a		19.239	1.594
21 d	24.492 ^b	20.968 ^{ab}	22.837 ^{ab}		22.766	1.763
28d	24.758 ^b	21.398 ^{ab}	22.184 ^{ab}		22.780	1.758
Mean	23.431	20.340	21.013			
Sd	2.072	1.475	2.614			

Conclusion

The use of fertilizer and increasing age for cutting increase the fodder production. The use of corn fodder in a verticulture system looks promising to improve growth of rabbit, while reducing feed cost. Further research is needed when more corn fodder is used.

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Development of Beef Cattle by Using Agricultural By-Product in West Java

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Abstract

The development of beef cattle in Indonesia was an attempt to meet the need of meat. Such efforts need to be supported by the potential of the feed. West Java province is one of the provinces that have the potential for beef cattle and agricultural by-product. The aim of research was to assess the potential of agricultural by-product and characteristics of farmers in West Java for the development of beef cattle. The research was conducted in four regencies such as Kuningan, Cirebon, Tasikmalaya and Ciamis in West Java. The study used two types of data, primary data and secondary data. Primary data was obtained from interviews respondents with the structured questionnaires and data from laboratory analysis, while secondary data from government database. Interviews and sampling of agricultural by-product carried out in three districts of each regency within 10 respondents each sub district. The results showed that agricultural by-product in West Java were rice straw, corn straw, banana peels, straw sweet potato and peanut hay. The highest potential of agricultural by-product is rice straw and farmers in West Java perform maintenance using traditional system. Conclusion of this research was agricultural by-product in West Java has potential to support the development of beef cattle and farmers need to be educated adapted technology to improve feed resources.

Keywords: *agricultural by-product, beef cattle, west java*

Introduction

The development of beef cattle production must be followed by an increase of forage quantity, quality and sustainability. Range of forage feeding is 40-70% of feeding, but the forage provision is hardly increase due to land limitation for forage fodder cultivation. The land availability is more important for producing human food than producing forage crops. In addition, uncertainty types of forage in small-scale farm usually feed beef cattle. Farmer gives available forage depends on the season. Based on that case, alternative forage is needed to fulfil beef cattle necessary for growing and producing meat. One of the alternative forage can be obtained from agricultural by-product in massive quantity in Indonesia. Constraint of agricultural by-product usage as beef cattle feed is the lack of quality and information. The quality of agricultural by-product is usually nutrient deficiency and the information of agricultural by-product potency is limited. Information on types of agricultural by-product, nutrient content and production quantity are considered less. In the future, the missing information will impact to difficult utilization of agricultural by-product as feed.

West Java province is one of the provinces which is having potential on livestock and local feed. There are four regencies that have potency to develop livestock; Cirebon, Kuningan, Tasikmalaya and Ciamis. Statistics Indonesia (2014) stated that those regencies have highest potency in both livestock and agricultural by-product. However, the usage of agricultural by-product as fed is still limited due to lack of information and the characteristics of farmer who carry out farming activities. The objectives of this research were to assess the characteristics of beef cattle farmers in

four regencies in West Java, to analysis the potential agricultural by-product as feed and to estimate the ability of addition number of ruminant population.

Methodology

The experiment was conducted in four regencies such as Cirebon, Kuningan, Tasikmalaya and Ciamis. Analysis nutrient content of agricultural by-product was in Laboratory of Feed Science and Technology, Faculty of Animal Science, Bogor Agricultural University. Samples were obtained from twelve observation district with three repetition of each commodity retrieval from three types of agricultural by-product which is widely used as feed. The study used two types of data, primary data and secondary data. Interviews and sampling of agricultural by-product carried out in three districts in each regency within 10 respondents each sub district. Interviews were conducted with 30 farmers which consisted of 10 farmers in each district in each regency (Sugiyono, 2011). Criteria for selection of respondents were the farmers rearing beef cattle at least three and who use agricultural by-product as feed. Interviews were using structural questionnaire. Questionnaire were used as data characteristics of farmers, how maintenance beef and way of feeding. Secondary data was obtained from Statistics Indonesia of four regencies. Data were analyzed using descriptive analysis method (Mattjik and Sumertajaya, 2000).

Results and Discussions

Total production of agricultural by-product must be noticed to ensure the availability of agricultural by-product can fulfil the requirement of beef cattle. The production can be classified according to the fresh condition, dry matter (DM), crude protein (CP) and total digestible nutrient (TDN). The result could be seen on the Table 1.

Table 1. Production and by-product commodity based on dry matter, crude protein and total digestible nutrient

Regency	Commodity	Production (ton/year)			By Product	Potency (%)		
		DM	CP	TDN		DM	CP	TDN
Cirebon	Paddy	595907.33	29735.78	285975.93	Rice straw	97.09	96.56	96.89
	Corn	8444.25	487.23	4286.30	Corn leaves	2.50	2.83	2.63
	Cassava	29.50	1.20	24.00	Cassava	0.01	0.00	0.01
	Banana	2202.87	165.66	1254.09	Banana peel	0.40	0.60	0.48
Kuningan	Paddy	531805.56	26111.65	260850.63	Rice straw	97.03	93.80	96.30
	Sweet potato	7553.83	1108.90	3749.72	Sweet potato straw	1.58	3.93	1.60
	Peanut	1420.62	181.13	861.04	Peanut leaves	0.28	0.70	0.34
	Cassava	5057.97	371.76	4216.32	Cassava	1.10	1.57	1.76
Tasikmalaya	Paddy	1153829.40	48922.37	552453.52	Rice straw	98.06	95.80	98.19
	Sweet potato	1389.02	190.30	768.96	Sweet potato straw	0.12	0.38	0.14
	Peanut	2084.66	308.32	1134.06	Peanut leaves	0.19	0.63	0.22
	Banana	20753.85	1847.09	8830.76	Banana weevil	1.62	3.19	1.45
Ciamis	Paddy	1036715.08	51317.40	523230.10	Rice straw	83.05	83.87	82.48
	Banana	374428.12	16325.07	188112.69	Banana stem	15.55	14.05	15.40
	Cassava	0.00	0.00	0.00	Cassava	1.40	2.09	2.11

DM = Dry matter, CP = Crude protein, TDN = Total digestible nutrient

Based on the Table 1, the highest production by-product used is rice straw. It is because paddy is the common agricultural commodity and production of rice in Southeast Asia is high (approximately 80%) (Sarnklong *et al.*, 2010). DM production of agricultural by-product showed the highest value and CP had the lowest value. In feedlot business, beef cattle that received rations in the form of agriculture by-product is an average shortage of CP around 18.49% and TDN around 18.47 from the standard requirement (Syukur and Afandi, 2009). Agriculture by-product in four regencies is source of fiber based on nutrient content. Energy requirement of ruminant is 70-80% derived from fiber. Rice straw as feed is limited usage about 2% of body weight based on dry matter because hard fermentable carbohydrate and lignin and silica in straw which poorly digested by ruminant (Setiyadi *et al.*, 2013).

Table 2. Estimation capacity of increasing ruminant population based on agricultural by-product

Regency	Description	Production of by-product (ton/year)
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		Fresh	DM	CP	TDN
Kuningan	Total potency	1545209.63	545837.98	27773.45	269677.71
	Actual requirement		59186.08	8704.91	41159.56
	KPPTR (AU)		374520.47	90073.41	289850.51
Cirebon	Total potency	3600989.86	3916447.39	3288475.55	928514.15
	Actual requirement		94912.24	13594.22	76651.15
	KPPTR (AU)		1035396.39	140388.62	611220.52
Tasikmalaya	Total potency	4807958.84	1425169.19	68673.37	722170.85
	Actual requirement		117761.05	17975.23	88350.88
	KPPTR (AU)		1006162.95	239481.09	803931.98
Ciamis	Total potency	3294429.95	1178056.93	51268.08	563187.30
	Actual requirement		124140.04	18709.53	90255.86
	KPPTR (AU)		811079.65	153795.68	599862.30

DM = Dry matter, CP = Crude protein, TDN = total digestible nutrient, AU = Animal Unit

Production of agricultural by-product based on DM, CP and TDN can be used to estimate the capacity ruminant population. Table 2 showed the estimation capacity of ruminant population based on agricultural by-product. Capacity of increasing ruminant population (KPPTR) for the highest value of beef cattle is using rice straw based on CP. KPPTR illustrates the total potential of agricultural by-product which can reach an actual requirement of the lowest value for beef cattle. The effective KPPTR is the lowest value. Kuningan, Tasikmalaya and Ciamis have the lowest KPPTR value. It means the capacity of ruminant population could not be developed while Cirebon has potential to develop beef cattle population.

Conclusion

Agricultural by-products of paddy, corn, cassava, banana, sweet potato and peanut have potency as forage source for beef cattle, especially as source of fiber and energy in four regencies. Cirebon Regency in West Java is most potential to develop beef cattle population. Farmers need to be educated with adapted technology to optimize agricultural by-product as feed.

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Changes in Nutrition and Fibre Silage Water Hyacinth (*Eichornia crassipes*) as Ruminant Feed Fermented with Some Fermentative Materials

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Abstract

Ruminants have the ability to consume a type of hay or forage type which has a low digestibility such as water hyacinth. Water hyacinth beside as bioakumulator, water hyacinth has the potential to become animal feed, fish feed and organic fertilizer because it contains nutrients. Data analysis was conducted in the Laboratory of Chemistry and Nutrition Feed, Hasanuddin University, Makassar. Fermentative materials used were liquid organic supplement, feed burger sauce, microbacter alfaafa-11 and effective microorganism-4. This study used completely randomized factorial design with three factors and four replications. The variables measured were the content of nutrients and fiber content after fermented water hyacinth. Crude protein value increased an average of 2.5% - 3.5%, crude fat percentage increased by an average of 0.4% - 0.8%, the percentage of crude fiber decreased by an average of 2% - 4%, extract ingredients without nitrogen increased by an average of 4% - 5% and the percentage of ash decreased by an average of 2% - 3%. Crude protein increased at 5.4%, crude fiber decreased at 5.6% and BETN increased at .6%.

Keywords: *fermentative, fibre, ruminant, silage*

Introduction

Water Hyacinth, *Eichornia crassipes* (Mart.) Solms (family pontederiaceae) is one of aquatic weeds that have adaptability and high reproductive ability (Wolverton & McDonald, 1999). In some countries, water hyacinth recorded disrupt shipping activities, killing of fisheries, increased incidence of disease caused by a mosquito that is growing faster in waters covered with water hyacinth, and change the composition of the biota of aquatic ecosystems (Toft et al., 2003). In Indonesia, this plant soon became a problem in the waters, such as lakes and rivers. In addition to several lakes on the island of Java, Limboto Lake is one of the lake is quite big and famous with gondoknya hyacinth, and control efforts is difficult. Efforts to control water hyacinth has been done, using either a means of controlling the mechanical, chemical, and biological (Opande et al., 2004). Chemical control is done with the use of herbicides, but this will cause pollution on aquatic biota are higher. In addition to the adverse impacts of water hyacinth on the ecosystem, some research suggests that this weed have some beneficial role ecologically and economically. According to Brix and Schierup (1999), macrophyte water, one of which is the water hyacinth, can be used as the water pollution control. According to Agunbiade et al (2009), water hyacinth can be used as an accumulator of pollutants, especially heavy metals in the water due to the properties of their biology, including reproduction speed. Other studies prove that water hyacinth can accumulate heavy metals Pb, Cr, Zn, Mn, and Cu (Tiwari et al., 2007). The facts show that the water hyacinth has great potential as bioakumulator the polluted waters of pollutants, so that its presence does not need to be destroyed. Potential hyacinth as ruminant feed and fish

feed can be maximized by way of fermentation. To improve the nutritional value and lower crude fiber, water hyacinth plants, fermentation needs to be done. Until now, this has been a lot of fermentative material created by nutrition experts forage fodder in order to improve the nutritional value and ingredients microorganisms in the fermentation process.

Materials and Methode

This research was conducted at the Laboratory of Department of Animal Husbandry, Faculty of Agriculture in June to August 2016. Analysis of the results of research conducted at the Laboratory of Chemistry and Nutrition Feed, Hasanuddin University, Makassar. The materials used are water hyacinth fresh and 4 types of materials fermentative namely: Supplements liquid organic (SOC), Sauce Burger Feed (SBP), microbacter Alfaafa 11 (MA-11) and Effective Microorganism 4 (EM-4) as a comparison. The study design used was completely randomized factorial design with three factors and four replications each. The first factor (A) is using four kinds of materials of fermentation that SOC (A1), SBP (A2), the MA-11 (A3) and EM-4 (A4). The second factor is the long fermentation time is 1 week (B1) and 2 weeks (B2). The third factor is 3 doses of material which is 5 ml (C1), 10 ml (C2) and 15 ml (C3) for every 3 kg of material. The variables measured were: 1) the nutritional components are: crude protein, crude lipid, crude fiber, extract materials without nitrogen and Abu method proximate analysis. 2) fiber components, are: neutral detergent fiber, acid detergent fiber, hemicellulose, and lignin cellulosa analysis method of Van Soest.

Result and Discussion

Table 1. The values of crude protein, fat, crude fiber, extract materials without nitrogen (BETN) and ash.

No	Treatments	% Protein	% Fat	% Crude Fiber	% BETN	% Ash
1	A1 B1 C1	10.45	3.78	25.20	47.40	13.15
2	A1 B1 C2	10.99	3.62	24.99	47.86	12.54
3	A1 B1 C3	11.74	3.85	23.79	46.16	13.12
4	A1 B2 C1	11.73	3.02	24.77	47.06	13.42
5	A1 B2 C2	9.55	3.56	25.72	47.44	13.73
6	A1 B2 C3	9.50	2.94	25.99	48.86	12.71
7	A2 B1 C1	10.42	2.70	23.79	49.95	13.14
8	A2 B1 C2	10.49	2.83	24.45	49.25	12.98
9	A2 B1 C3	9.64	3.01	24.56	49.17	13.62
10	A2 B2 C1	10.76	3.08	24.68	47.74	13.74
11	A2 B2 C2	11.16	3.20	23.92	48.71	13.01
12	A2 B2 C3	10.06	2.91	25.10	49.03	12.90
13	A3 B1 C1	9.18	2.55	25.69	49.10	13.48
14	A3 B1 C2	10.29	2.83	24.09	49.67	13.12
15	A3 B1 C3	10.58	2.59	25.55	48.38	12.98
16	A3 B2 C1	11.13	2.60	24.20	48.49	13.58
17	A3 B2 C2	10.07	3.14	25.55	47.73	13.81
18	A3 B2 C3	10.62	3.09	24.70	47.36	14.23
19	A4 B1 C1	7.55	2.74	28.20	46.93	14.58
20	A4 B1 C2	8.23	2.74	28.47	46.42	14.14
21	A4 B1 C3	8.57	2.92	27.42	46.68	14.41
22	A4 B2 C1	8.29	2.44	28.61	45.58	15.08
23	A4 B2 C2	8.01	2.81	27.80	46.68	14.70
24	A4 B2 C3	8.80	2.74	27.60	45.73	15.13

25	Control	8.38	3.32	28.10	45.06	15.14
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A1 = SOC, A2 = SBP, A3 = MA-11, and A4 = EM-4; B1 = 1 week and B2 = 2 weeks
C1 = 5 ml, C2 = 10 ml and C3 = 20 ml, each 3 kg materials

The results of the analysis of the nutritional value of the use of various materials fermenter indicate the nutritional value of a fluctuating and inconsistent. The percentage value of protein and fat obtained in SOC, either at all doses and in all fermentation, protein and fat values are very significant compared to the other three fermentation ingredients including control. Values lower percentage of crude fiber, BETN high percentage indicates a value nearly equal to all the fermenting material, at all doses and on a long fermentation 1 and 2 weeks, except in percentage of ash impaired, though not significantly. Comparing with the control, the fermenting material (SOC, SBP, MA-11) has increased very significantly to all of the nutritional value. Although overall showed a fluctuating value changes, but specifically on the fermentative material SOC (A1), the linear protein fermentation time increased at 1 week and 2 weeks linear decline in line with the increased dose of 5 ml - 20 ml. Crude protein value increased an average of 2.5% - 3.5%, crude fat percentage increased by an average of 0.4% - 0.8%, the percentage of crude fiber decreased by an average of 2% - 4%, extract ingredients without nitrogen increased by an average of 4% - 5% and the percentage of ash decreased by an average of 2% - 3%. It showed that the process of fermentation or ensilaged going well and fermenting material used mainly SOC can be recommended to change the structure of nutrients and crude fiber hyacinth. The result of changes in the value of nutrients in the water hyacinth (fermentation using SOC) can be compared to the changes of nutrients in rice straw fermented with EM-4 and compared with elephant grass.

Table 2 showed that the water hyacinth plant before the fermented nutrient content better than rice straw, and is a significant change after fermented. Increase nutritional value is very high in water hyacinth using SOC compared to rice straw using EM4. Value was very significant improvement. In crude protein, rice straw increased by only 2.4% while in the water hyacinth increased by 5.4%. In crude fiber, rice straw decreased only 0.9% and the water hyacinth decreased 5.6%. Likewise with BETN, the rice straw increased by only 1.7%, while the water hyacinth increased 12.6%. This shows that the quality of the water hyacinth nutritional value than rice straw so it is better to be a ruminant feed. Comparing the nutritional value hyacinth with elephant grass is fresh, it appears that, the nutritional value of water hyacinth is also better than the nutritional content of elephant grass, although the water hyacinth should not be considered to replace grass as fodder fibrous ruminants because of the material that has been fermented use limited.

Table 2. Comparison of changes in the nutritional value of rice straw fermented with EM-4 and hyacinth fermented with SOC as well as elephant grass as a comparison.

Nutriens	Elephant Grass ¹	Rice Straw		Water Hyacinth	
		Before Fermentation ²	After Fermentation ³	Before Fermentation ⁴	After Fermentation ⁵
Crude Protein	10.1	5.31	7.70	6.31	11.74
Crude Fat	2.5	3.32	2.40	2.66	3.85
Crude Fiber	31.2	32.14	30.90	29.30	23.79
BETN	46.1	36.68	38.36	33.45	46.16
Ash	10.1	22.25	20.21	6.26	13.12

1= Hartadi *et.al.* (1993), 2 and 3 = Sarwono and Arianto (2003), 4 = Nina M. (2001), 5 = Mukhtar, M. (2016). BETN = extract materials without nitrogen

Changes in the water hyacinth fiber (NDF, ADF, Hemicellulosa, cellulosa and Lignin) on average increased compared with the controls even though the value is not consistently good from the fermentation and the dose given material. At the material occurs and the component values increased linearly on NDF and ADF, but on the other hand are experiencing the value of components and other materials will fluctuate but the fluctuating value is higher than the value of the component as well as a linear increase. Namunpun therefore recommended that all types of fermenting material capable of changing the water hyacinth fiber component where the value is the limit of tolerance and that can be consumed by ruminants.

Nutritional characteristics hyacinth fermentation fermented with various materials (SOC, SBP, MA-11 and EM-4) showed an increase in the quality of organic material that is very significant compared to the control. Lignin degradation would release the bound compound lignocellulose complex bond hyacinth ie nitrogen, minerals, cellulose and hemicellulose, thus increasing the content of dry matter and crude protein nutrients EGF. But the growth and degradation of lignin faster than the decline in organic matter and nutrients cellulose.

Conclusions

Fermentation hyacinth using liquid organic supplements at a dose of 20 ml per 3 kg material provides excellent nutritional value that has increased very significant nutrients. Crude protein hyacinth increased 5.4%, crude fiber decreased 5.6%, extract materials without nitrogen increased by 12.6%. Comparing hyacinth fermented rice straw fermentation, water hyacinth fermentation is still better to be a ruminant feed for nutritional value and fiber content comply ruminant feed even equal the nutritional value of elephant grass, although the water hyacinth should not be considered to replace grass as food fibrous ruminant livestock because of the material that has been fermented use is limited.

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Oral Presentation 1 Focus Session:

Feed and Nutrition (2)

Wednesday, 19 October 13:00-14:00

Room: Panderman 2

Performance of Broiler Chickens Fed Diets Supplemented with Several Palm Polysaccharides

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Abstract

Palm polysaccharides, particularly polysaccharides from copra meal and palm kernel meal, have recently been used in broiler diets. A study was conducted to investigate the effect of supplementing the diets with several palm polysaccharides on broiler chicken performance. A total of 200 unsexed broiler chicks was used in this trial as experimental animals. The broiler chicks were kept for 6 weeks. During the first 3 weeks, the broiler chicks were fed with starter diets and the birds were offered grower diets from weeks 4 to 5. Feed and water were provided *ad-libitum*. Five different types of diets (control, palm kernel polysaccharides, copra polysaccharides, antibiotic avylamicin) were used in this trial. A completely randomised design was used with five treatment diets and four replicate cages. Differences among treatment means found in analysis of variance were further tested with Tukey test. The results indicated that the supplementation of feed additives (palm kernel polysaccharides, copra polysaccharides and avylamicin) improved body weight gain, FCR and excreta dry matter. The birds challenged with *E. coli* produced lower body weight gain and feed intake. Interaction between type of feed additives and *E. coli* challenge was found in body weight gain, feed intake, FCR and excreta dry matter. In conclusion, Feed additives improved the quality of the diet and *E. coli* challenge had detrimental effect on bird performance. There was an interaction between type of feed additives and *E. coli* challenge on body weight gain, feed intake, FCR and excreta dry matter.

Keywords: palm polysaccharides, *e. coli*, broilers.

Introduction

Palm trees have commonly been found in many tropical countries. Among the palm trees, coconut, oil palm, sugar palm, sago and snake fruit (salak fruit) are largely available in Indonesia. All these plants have been used either as source of cooking oil or as fruits. As source of cooking oil, by-products was produced when coconut or palm kernel was extracted. The use of palm by-product, such as copra meal and coconut meal as poultry feed has been widely practiced in many tropical countries. However, the results of using these agricultural by products were inconsistent (Sundu et al., 2008).

Sundu et al. (2008) reported the main component of palm carbohydrate is mannose based polysaccharides as found in coconut, palm kernel and date palm. Most of the palm carbohydrates was in the form of non – starch polysaccharides, being 81% in palm kernel cake and 42.2% in coconut meal (Knudsen, 1997). Of the total non-starch polysaccharides found in palm kernel cake, 70% was mannose –based polysaccharides, in the form of linear mannan, 12% cellulose and 6% xylane (Duesterhoft et al., 1991), while in coconut meal was. 87% mannose based polysaccharides with 26% mannan and 61% galactomannan. Coconut

meal had also 13% cellulose (Balasubramaniam, 1976). This fact indicates that polysaccharides in these two agricultural by-products were mannose based or mannan.

The use of mannose based polysaccharides in poultry diets has been successfully practiced as a prebiotic for more than three decades (Lyons, 2002). Since most of the palm carbohydrates was mannose based polysaccharides, these carbohydrates were supposed to have similar properties as found in yeast mannan. Early study of Damry and Sundu (2008) and Sundu et al (2008) indicated that the use of mannose based polysaccharides from copra meal and palm kernel meal in broiler diets increased body weight of birds. Accordingly, a study was conducted to determine the effect of polysaccharides from several palm fruits (coconut, oil palm, sugar palm, sago and snake fruit) on performance of broiler kept for 4 weeks.

Materials and Methods

Mannan extraction

All the palm fruits (coconut, oil palm, sugar palm, sago and snake fruit) were dried and finely ground. The fine ground palm fruits were extracted to remove the oil content. A total of 16 liters of 20% NaOH concentration was added to 2 kg of fine ground palm fruits in a plastic bucket. The mixture between NaOH and fruits was stirred for 24 hours at room temperature. The solution was filtered through a cloth bag. The filtrate was then neutralized with 12 N H₂SO₄ to lower the pH solution up to about 5.5. Resultants precipitate (mannose based polysaccharides) were collected by centrifugation and then, was dialysed against tap water to remove salts. The leftover residue was collected and ready to analyze for carbohydrates profile (Kusakabe and Takashi, 1988).

Birds and Feed

A study was conducted in the poultry station at the Department of Animal Husbandry, University of Tadulako Palu, Indonesia. A total of 200 unsexed broiler chicks was used as experimental animals. They were placed in the brooder cages for a week and then transferred into the 28 pens. The birds were kept for four weeks. The birds were allowed to consume basal feed (Table 1) and the birds were offered experimental diets (Table 2). Water and feed were provided *ad-libitum* throughout the study.

Table 1. Composition of the experimental control basal diet (%)

Ingredients	Starter diet	Grower diet
Full fat soybean meal	18.97	18.97
Corn	62.10	62.10
Fish meal	11.00	11.00
Rice bran	3.9	3.9
Palm oil	1.0	1.0
Dicalcium phosphate	1.2	1.2
Salt	0.2	0.2
Methionine	0.15	0.15
Lysine	0.11	0.11
Vitamine and Mineral Mixture	0.20	0.20
Calculated:		
Crude protein	21.00	21.00
Crude fibre	3.6	3.6
ME (K Cal/kg)	3187	3187
Lysine	1.0	1.0
Methionine	0.4	0.4
Calcium	1.0	1.0
Phosphorous	0.7	0.7

Table 2. Experimental diets

Type of additives	<i>E. coli</i> challenge	Replications
Control	-	4
Control	+	4
Control + 0.05% Palm kernel polysaccharides	-	4
	+	4
Control + 0.05% Copra polysaccharides	-	4
	+	4
Control + 2 ppm avilamycin	-	4
	+	4

Parameters and Statistical analysis

Body weight gain, feed intake and feed conversion ratio were measured as parameters. The study used a completely randomized design with seven treatment diets and four replicate cages Data were analysed by analysis of variance (Steel and Torrie, 1980).

Results and Discussions

The data on the effect of type of feed additives on bird performance, effect of *E. coli* challenge on bird performance and the effect of interaction between type of feed additives and *E. coli* challenge on bird performance were shown in Table 3, 4 and 5 Respectively. The effects of type of feed additives on body weight gain, FCR and excreta dry matter was significantly affected. The effect of *E. coli* challenge significantly affected body weight gain and feed intake. There was an interaction between type of feed additives and *E. coli* challenge on bird performance.

Table 3. Effect of type of diets on body weight gain, feed intake and FCR of broilers kept for 4 weeks

Treatments	Parameters		
	BWG (g)	Feed Intake (g)	FCR
Control	877 ^b	1415 ^a	1.61 ^a
Control + avilamycin	965 ^a	1411 ^a	1.46 ^{ab}
Control + actinogen	878 ^b	1374 ^a	1.56 ^a
Control + copra polysaccharide	973 ^a	1461 ^a	1.50 ^{ab}
Control + “salak” polysaccharide	965 ^a	1322 ^a	1.37 ^b
Control + sugar palm polysaccharide	923 ^{ab}	1398 ^a	1.52 ^{ab}
Control + sago polysaccharide	921 ^{ab}	1388 ^a	1.51 ^{ab}
SEM	23.4	52.2	0.040
P Value	0.026	0.679	0.013

Palm Kernel Polysaccharides (PKP); Control + Copra polysaccharides (CP)

Discussions

The use of prebiotic, either in the form of palm kernel polysaccharides or copra polysaccharides in broiler diets could increase body weight gain of broilers (Sundu et al., 2006; Sundu et al., 2009). These palm polysaccharides produced the same body weight gain as found in the birds fed antibiotic avilamycin. This indicates that the palm polysaccharides could replace avilamycin in the broiler diets. The improvement of body weight gain due to either palm polysaccharides and antibiotic supplementation might be partly due to the increase in the health status of the digestive tract of birds. Our current finding indicated that when the birds were challenged against pathogenic bacteria (*E. Coli*), body weight gain of birds decreased by 40 g. This preliminary study might bring hope for the controversy of the use of antibiotic in broiler diets.

Feed Conversion ratio (FCR) was significantly improved when the diets were supplemented with either palm polysaccharides or antibiotic. Since there was no significant

effect of the type feed additive on feed intake, it can be speculated here that the feed additives used in this current study may be effective in improving the quality of feed. However, the mechanism of improving feed quality is hard to rationalize. It is possibly through the increase in feed digestibility or feed absorption as a result of the increased health status of absorption site in the digestive tract. Feed intake of birds challenged against *E. coli* dropped from 824 g to 774 g. The decrease in feed intake is probably because of impaired digestibility and absorption. However, a study in the area of histology of the digestive tract and digestibility is needed to prove this speculation.

Wetter excreta was found in the birds fed the control diet. The supplementation of the control diet with palm carbohydrate or antibiotic avilamicin increased the dry matter of the excreta. Of eight experimental units in the birds fed control diet, 2 birds were suffering from diarrhea and the birds were in the *E. coli* - challenged treatment. The problem of wet excreta is becoming more crucial as this could not only affect the health of the birds but also rise the environmental issue.

The interaction between type of additive and *E. coli* challenge was found in all parameters investigated. However, the pattern of interaction was relatively the same. The detrimental effect of the challenge of the birds against *E. coli* was only found when the birds fed the control diet. Supplementation of the control diet with palm polysaccharides or antibiotic could eliminate the negative effect of the pathogenic bacteria on body weight gain, feed intake, FCR and excreta dry matter. Since this is only a preliminary study with small number of birds used and few parameters investigated, it is too early to state that these two palm polysaccharides have the same efficacy as found in antibiotic avilamicin. A longer study with large number of birds and more parameters is needed to support this finding. However, this preliminary study produced a promising result.

Conclusion

- Supplementation of the diet with palm polysaccharides or antibiotic avilamicin improved body weight gain, feed conversion ratio and dry matter of excreta.
- The birds challenged against *E. coli* in the drinking water produced lower body weight gain and feed intake.
- The interaction between type of feed additive and *E. coli* challenge was found in body weight gain, feed intake, feed conversion ratio and dry matter of excreta.

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Supplementation of the Diets with Rich – Selenium Feedstuffs on the Performance of 4 Weeks Old Broiler Chickens

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Abstract

Selenium (Se) has been added into diets for many years to increase performance and health status of broiler chickens. A study was conducted to determine the effect of Se from different sources in the diet on broiler chickens performance. A total of 200 day old unsexed broiler chicks were used in this study. The broiler chicks were placed into five brooder cages for 7 days. After 7 days brooding, the broiler chicks were distributed into 20 pens. Each pen were equipped with a drinker and feeder. The basal diets were formulated using UFFF software. The basal diets (T-1) were supplemented with high Se feedstuffs: Se commercial feed additive (Sel-plex; T-2), tuna fish meal (T-3), snail meal (*Melania testudinaria*, T-4) and *Moringa oleifera* seeds meal (T-5). Diets and water were provided *ad-libitum*. A completely randomized design with five treatment diets and four replications was used in this study. Data were analysed with analysis of variance. Results of study indicated that treatments produced significant effects on body weight gain and feed intake. Performance of the broilers fed the diets supplemented with 0,1 ppm Se in T-2 or in T-4 were significantly better than those of birds fed the control diet. In conclusion, Diets containing Se from either Sel-plex or snail meal produced heavier birds and higher feed intake than those of birds fed the control diet.

Keywords: Broiler chickens, Selenium, performance.

Introduction

Selenium (Se) has an important role on human health. McCartney (2005) stated that selenium deficiency in humans might disturb the immune system and raises susceptibility to various diseases, such as cancer, stroke, heart disease, premature aging, cataracts, influenza, and diabetes. In poultry, Several diseases have been reported due to insufficient selenium in poultry diet. Muscular dystrophy, mortality, poor growth (Nesheim and Scott, 1958), myopathies of the gizzard and heart (Walter and Jensen, 1963) were some examples of the diseases found in poultry when the birds was offered a low Se diet.

Reccommendation on Se requirement for broiler chickens has been reviewed by NRC (1994). However, the reccommendation was based on the research that was done long time ago from late 1950 to early 1970 (Nesheim and Scott, 1958; Walter and Jensen, 1963). During the period of time, body weight of broiler chickens were relatively smaller. This reccommendation might also foccus on performance of the poultry. Broilers needed 0.15 ppm Se both in the starter and grower diets (NRC, 1994). Since, a lot of the feedstuffs used for broiler chicken diets contain low amount of selenium, finding out Indonesia's local feedtuffs with high concentration of Se is important to enrich data base of indonesia's feedstuffs.

Since Se mineral is beneficial for improvement of performance and health status of poultry, a study to determine the effect of Se from different feedtuffs on the performance of broiler chickens was carried out. The feedstuffs used in this study were locally available, so this reserach can be applied by local farmers.

Methodology

Four feedstuffs has been selected in this study due to their potential in Se content. The locally available feedstuffs were *Moringa oleifera* seeds, Tuna fish meal and snail (*Melania testudinaria*) meal along with commercial Se (Sel-plex). A total of 200 day old unsexed broiler chicks were used. The birds were distributed into 5 brooder cages for 7 days. After 7 days brooding, the broiler chicks were placed into 20 pens. Each pen were equipped with a drinker and feeder. The basal diets were formulated to meet the nutrient requirements with 23% protein and 13.39 MJ/kg metabolizable energy for starter diet and 21% protein 13.39 MJ/kg metabolizable energy for grower diet. The basal diets were supplemented with high Se feedstuffs: snail meal (*Melania testudinaria*), tuna fish meal, *Moringa oleifera* seeds meal and commercial selenium (sel-plex). Diets and water were available at all times. The experimental diets (Table 1) were offered throughout the study. A completely randomized design with five treatment diets and four replicate cages of ten birds each was adopted in this study. Data were subjected to analysis of variance and differences among treatments found in the analysis of variance were further tested for significance by Tukey Test (Steel and Torrie, 1980).

Tabel 1. Experimental diet

Treatments	High selenium feedstuffs (%)		Addition of protein (%)	
	Starter	Growr	Starter	Grower
T-1; Basal	0	0	0	0
T-2; Basal + 0.1 ppm Se (SP)	0.27	0.27	0.06	0.06
T-3; Basal + 0.1 ppm Se (TM)	5.8	5.8	4.0	4.0
T-4; Basal + 0.1 ppm Se (SM)	11.0	11.0	4.0	4.0
T-5; Basal + 0.1 ppm Se (MOM)	14.5	14.5	3.0	3.0

SP: Selplex; TM: Tuna meal; SM: snail meal and MOM: *Moringa oleifera* meal

Results and Discussion

Four Se sources, such as: sel-plex as commercial Se feed supplement 381 ppm), tuna fish meal (1.75 ppm) , snail meal (0.84 ppm) and *Moringa oleifera* seeds meal (0.69 ppm) were used in this study. It seems that the Se content in the feedstuffs linearly correlated with the protein content. This might be due to the fact that organic Se found in the feedstuffs was in the form of protein, such as seleno-methionine or seleno-cysteine (Power, 2005). Data on body weight gain, feed intake and feed conversion ratio of broiler chickens kept for 2 weeks can be seen in Table 2. The birds fed the T-1 were smaller and consumed less feed than those of birds fed the diet supplemented with 0.1 ppm Se either from snail meal or from sel-plex.

Table 2. body weight gain of broiler at 4 weeks old.

Treatments	Body weight gain (g)	Feed intake (g)	FCR
Control (T-1)	858 ^b	1311 ^b	1.53
Control + selplex (T-2)	1033 ^a	1476 ^a	1.47
Control + tuna fish (T-3)	963 ^{ab}	1407 ^{ab}	1.46
Control + snail meal (T-4)	1039 ^a	1437 ^{ab}	1.38
Control + <i>Moringa olievera</i> (T-5)	953 ^{ab}	1423 ^{ab}	1.53

Supplementation of the diet with organic Se to increase bird performance has been reported by Edens (2001), who found that there was an increase in body weight gain of broilers when the diet was supplemented with sel-plex as a high Se feed additive. The addition of 0.1 ppm of organic Se in the form of sel-plex increased body weight gain by about 160 g in the present study when the broiler chickens were kept for 4 weeks.

It is hard to rationalize this improvement due to the fact that not all the diets supplemented with 0.1 ppm Se could enhance broiler performance. The addition of 0.1 ppm Se in T-3 and T-5 could not increase bird performance significantly. However, the addition of 0.1 ppm Se in T-4 produced better body weight gain than those of birds fed the T-1 and the body weight gain, even, overtook the body weight gain of birds fed the T-2 (Sel-plex). Since the significant improvements of body weight gain of birds were only found in T-2 and T-4, it can be speculated that the main contributor for the improvement was Se addition rather than protein supplementation. This speculation was based on the fact that the T-2 diet with very small amount of protein addition could produced significant increase in body weight gain.

Although, a significant increase in feed intake was only found when the birds fed the diet supplemented with Se in the form of Sel-plex (T-2), the additions of Se from other feedstuffs (T-3, T-4 and T-5) did not enhance feed intake. This may probably due to an increased feed digestibility. Study on this area conducted by (Edens *et al.*, 1999) indicated that Selplex supplementation in the diet increased dry matter digestibility from 74.4% to 82.4% (Nuijten *et al.*, 2010). Feed conversion ratio was not affected by treatments. This fact indicated that increased feed intake led to an enhance in body weight gain.

Conclusions

Diets containing Se from either Sel-plex or snail meal produced heavier birds and higher feed intake than those of birds fed the control diet. Feed conversion ratio was not affected by treatments.

Acknowledgement

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Effects of Different Combination of Water Hyacinth (*Eichornia crassipes* Mart.) Leaves and Sapu sapu Fish (*Hypostomus plecostomus*) on Growth Performances of Local Ducks in Lombok

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Abstract

The main problem faced by duck farmers especially in Lombok Island is a high price of commercial feed. Water hyacinth (*Eichornia crassipes* Mart.) leaves (=WHL) and sapu sapu fish (*Hypostomus plecostomus*) (=SSF) are not used by human, but they are potential and low cost local feed sources. A study was conducted to investigate the effectiveness of combinations of WHL and SSF for growth performance of local ducks. One hundred and eighty four-weeks-old female local ducks were randomly allocated into nine combinations of WHL and SSF with five replicates each and four ducks /replicate according to factorial 3x3 arrangement. The experimental diets were: E1S1 (without WHL and SSF), E1S2 (with 20 % SSF), E1S3 (with 30% SSF), E2S1 (with 5% WHL), E2S2 (with 5% WHL and 20% SSF), E2S3 (with 5% WHL and 30% SSF), E3S1 (with 10% WHL), E3S2 (with 10% WHL and 20% SSF), E3S3 (with 10% WHL and 30% SSF). Observation was done for 6 weeks. The Results showed that the use of combinations of water hyacinth and sapu-sapu fish did not significantly affect final body weight and weight gain, but significantly affect ($P<0.05$) feed consumption and feed conversion ratio. The results indicate that water hyacinth and sapu sapu fish are potential feed sources for ducks feeding.

Keywords: *Water hyacinth, Sapu sapu fish, weight gain, Local ducks*

Introduction

Ducks farming has a good prospect to be developed because their meat and egg consumption is steadily increasing. The main limitation experienced by traditional duck farmers in Lombok are in providing sufficient amount of good quality feed because of high price of commercial feed. Therefore, alternative locally available feed sources should be explored for sustainability of duck production in this Island.

Water hyacinth (*Eichhornia crassipes*. Mart.) is one of the most noxious water weeds in tropical and subtropical regions, and many attempts have been made to eliminate it because its rapid development is economically very harmful. However, a part from its harmful effect, the weed biomass can be fed to poultry as source of carotenoid (Lareo and Bresani 1982; Sharma et al 2016) and other nutrients. Its chemical composition is comparable to rice bran (Hossain et al 2015). The replacement of 5 to 25% of a complete diet with water hyacinth in growing ducks was reported to decreased performance but was economically profitable due to the lower feed cost (Men and Yamasaki. 2005). However, its optimum use in ducks feeding has not been established.

Other feed sources which is locally available in Lombok is sapu-sapu fish (*Hypostomus plecostomus*) (=SSF), whose availability is also quite abundant because it is not

consumed by humans. Purnamasari et al. (2011) reported that this fish contains 33,32 – 41.75% crude protein and 3,59 – 4,26% Ca and 0,29 – 0,99% P. In addition, feeding this fish to ducks given water hyacinth leaves (=WHL) may result in better fiber digestion due to its content of the some fiber degrading enzyme (German and Bittong, 2009 cited by Asnawi et al. 2014). The objective of this study was to evaluate the effects of different combination of water hyacinth and sapu-sapu fish on growth performances of local ducks in Lombok.

Methodology

A total of 180 four-weeks-old-female local ducks were randomly assigned into nine dietary treatments made of different combinations of WHL and SSF with 5 replicates each and 4 ducks per replicate according to 3 x 3 factorial arrangement. The composition of experimental diets are presented in Table 1. Feed was provided *ad-libitum*, mixed with water at a ratio of 2:1 and offered three times a day and the observation was done for 6 weeks. Feed consumption was measured daily and the ducks were weighed weekly. Data were subjected to analyzes of variance using Proc GLM (Sas, 1990) followed by Duncan Multiple Range Test.

Table 1. Ingredients and chemical composition of dietary treatments

Ingredients (%)	E1S1	E1S2	E1S3	E2S1	E2S2	E2S3	E3S1	E3S2	E3S3
Concentrate*	40	20	10	40	20	10	40	20	10
Rice bran	60	60	60	55	55	55	50	50	50
WHL	0	0	0	5	5	5	10	10	10
SSF	0	20	30	0	20	30	0	20	30
Total	100	100	100	100	100	100	100	100	100
<i>Chemical composition</i>									
Crude Protein (%)	19.80	20.61	19.92	19.57	20.38	20.38	19.33	20.15	20.55
ME (Kkal/kg)**	2596.8	2614.9	2377.8	2609.1	2627.2	2636.3	2621.4	2639.5	2648.6
Crude Fiber %	10.40	9.18	7.38	11.13	9.91	9.31	11.86	10.65	10.04
Crude fat %	3.70	6.27	7.21	3.67	6.24	7.53	3.64	6.21	7.49
Ca %	4.44	2.34	1.28	4.46	2.36	1.31	4.48	2.38	1.33
P %	1.30	1.14	0.90	1.26	1.09	1.01	1.22	1.05	0.97

*Produced by PT Japfa Confeed Indonesia, TBK, **calculated value

Results and Discussion

Feed intake, final body weight, weight gain, and Feed conversion ratio of ducks fed on diets with different combination of WHL and SSF is presented in Table 2.

Table 2. Effects of combination^A of different levels of WHL and SSF on feed intake, final weight, weight gain and FCR of local ducks

Treatment	Feed Intake (g)	Final Weight (g)	Weight Gain (g)	FCR
0% WHL	2359.8 ^a	1069.8 ^a	303.5 ^a	7.9 ^a
5% WHL	2116.5 ^a	1079.7 ^a	314.9 ^a	6.9 ^b
10% WHL	1956.9 ^b	1086.7 ^a	324.4 ^a	6.3 ^b
<i>P value</i>	<i>0.002</i>	<i>0.874</i>	<i>0.665</i>	<i>0.006</i>
0%SSF1	2346.8 ^a	1113.1 ^a	333.0 ^a	7.3 ^{ab}
20%SSF2	2179.1 ^b	1078.2 ^a	294.4 ^a	7.5 ^a
30%SSF3	1907.2 ^b	1045.0 ^a	315.4 ^a	6.3 ^b
<i>SEM*</i>	<i>73.79</i>	<i>23.03</i>	<i>16.29</i>	<i>0.34</i>
<i>P value</i>	<i>0.001</i>	<i>0.127</i>	<i>0.258</i>	<i>0.042</i>
<i>P value WHL*SSF</i>	<i>0.644</i>	<i>0.924</i>	<i>0.433</i>	<i>0.311</i>

*SEM = pooled standard error of the means

Feed intake and FCR of ducks given diet with 10% WHL was significantly lower than those given control and diet with 5% WHL, but final weight and weight gain were not significantly affected by levels of WHL. Similar patterns were observed for effect of feeding diet containing 20 and 30% SSF replacing the concentrate. Feed intake and FCR were observed to be significantly lower in the group diet with 30%SSF compared to the control.

Higher feed intake of control group might be associated with higher dietary fiber content compared to diet with 30%SSF (Table 1). The ducks fed on diet with high fiber content increase their intake to satisfy their nutrients need (Fadil et al. 2014). This study demonstrates that WHL can be incorporated in ducks diet up to 10% without negative effect and inclusion of 30% SSF in ducks diet improve FCR. Results of this study is in line with those reported by Men and Yamasaki (2005).

Conclusion

Water hyacinth leaves and sapu sapu fish are potential feed sources for ducks production in Lombok. Water hyacinth leaves can be incorporated up to 10% to replace rice bran and sapu-sapu fish is a good source of dietary protein which can be used up to 30% as an alternative to commercial concentrate.

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Evaluation on the Biological Effectivity of BS4 Enzymes in Laying Hens Diet at Commercial Farms Level

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Abstract

Some studies conducted at research station have shown that BS4 enzyme- an enzyme produced by *Eupenicilium javanicum* was effective to improve nutrient digestibility of some poultry feedstuffs. Therefore, a field trial was conducted to evaluate its effectivity when applied in a commercial farm. Two dietary treatments, i.e., Control (C) and C + BS4 enzyme (C+E) were tested in a commercial laying hen farm. The composition of the two diets were similar, except that the C+E diet was supplemented with 1350 ml BS4 enzyme/ton or 30 Unit/kg. The C diet was fed to 3088 laying hens and the C+E diet was fed to 3111 aged 25 weeks old and each treatment consists of four flocks (replicates). The performances: feed intake, hen-day egg production, feed conversion ratio (FCR) and mortalities of the birds were recorded for 8 weeks. The data were analysed with t-test. Results showed that supplementation of BS4 enzyme did not affect the egg size and feed intake significantly ($P>0.05$). The HD egg production was increased from 56.21% become 62.50% and the FCR was improved from 2.795 become 2.580 as the effect of the enzyme supplementation. Supplementation of BS4 enzyme was also significantly ($P<0.01$) reduced the mortality of the hens. It is concluded that BS4 enzyme supplementation in the feed was effective to improve the performance of laying hens.

Keywords: *BS4 enzyme, laying hens, egg production*

Introduction

Supplementation of exogenous enzymes is widely practiced in poultry feeding at present. Different microorganisms (bacteria, fungi or yeast) and method of fermentation have been used to produce different enzymes. Supplementation of enzymes are expected to improve nutrients digestibility and feed efficiency, and consequently reduce the cost of feed in poultry production (Costa et al., 2008). It is well known that each enzyme breaks down highly specific substrates at specific reaction sites. Therefore, in order to achieve maximal benefits from enzyme addition, it is necessary to ensure that the enzymes are chosen on the basis of ingredients included in feed (Ravindran, 2013). Different origins of enzymes have been reported to have different effectivity in improving nutrients digestibility of feed (Choct et al., 2004).

A new enzyme complex has been produced in our laboratory in order to improve the nutrient availability of local feedstuffs. The enzyme- named BS4 was produced by *Eupenicilium javanicum* with solid substrate fermentation. It consists of α -mannanase, cellulase, α -mannosidase, α -glucosidase, and β -galactosidase (Purwadaria et al., 2011). Some studies at the research station showed that supplementation of the enzyme improved nutrients digestibility of palm oil sludge (Sinurat et al., 2008) and palm kernel cake (Sinurat et al., 2011, 2013) significantly. Feeding trials also showed that

supplementation of the enzyme into the laying hens feed improved the performance of the birds (Sinurat et al., 2008; 2011; 2014; 2016). Results on the research station is often different than on farm trial due to some factors such as involvement of farmers, management (include diet used in the farm) and the environment of the farm. Since the enzyme produced is intended to be used commercially, it is therefore important to evaluate the effectivity of the enzyme in commercial farms as described in this paper.

Methodology

The trial was conducted at Atung Farm in Tangerang, Banten. Two treatments, i.e.: Control diet without enzyme (C) and C + enzyme (CE) were applied. The control diet composed of maize, rice bran, soybean meal, meat and bone meal, full fat soya, rapeseed meal, hominy, DL-methionine, L-Lysine, vegetable oil, minerals and vitamin premixes according to normal practiced in the farm. The enzyme used was the BS4 enzyme (1350 ml/ton feed) produced by *Eupenicillium javanicum*. The kind and activity of the enzyme has been describe (Purwadaria et al., 2003). The diets were fed to Hy-Brown laying hens aged 25 weeks and each treatment was allocated in one house with four blocks (as replicates) each. The C diet was fed to 3088 laying hens and the CE diet to 3111 laying hens. The trial was carried out for 14 (fourteen) weeks but only data of 8 (eight) weeks is presented due to incidence of lice investation. Parameters measured were feed intake, hen-day egg production, mortalities and egg quality. The least significance difference (LSD) was applied to distinguish the effect of the treatment.

Results and Discussions

Results of the trial is presented in Table 1. BS4 enzyme supplementation significantly increased the HD egg production ($P < 0.05$). The improvement in egg production found in this trial was quite high, i.e. from 56.21% become 62.60% or 10.7%. Study at research station also showed an improvement in egg production. The degree of improvement varies with different feedstuffs used in the diet. Diets contain palm oil sludge improve egg production 5.6% (Sinurat et al., 2008) while diets contain corn, rice bran or palm kernel cake improve the egg production 3.1% (Sinurat et al., 2016). High improvement on the performance of hens due to enzyme supplementation in this trial may be related to low quality feed used. Some feed ingredients with high level of anti nutrient factors such as rice bran, full fat soya, rapeseed meal and hominy are included in the diet. According to Ravindran (2013), the lower the ingredient quality, the greater will be the magnitude of improvements with added enzyme.

Feed intake was not statistically ($P > 0.05$) affected by BS4 enzyme supplementation, although it was increased 3.21 g/bird/d. Previous study (Sinurat et al., 2008) showed a significant increased in feed intake of diet contain palm oil sludge, but not in diet with palm kernel cake, rice bran or corn (Sinurat et al., 2011; 2016). The FCR showed an improvement from 2.795 become 2.580, although not significant ($P > 0.05$). Similar results were also reported by Sinurat et al. (2008; 2011) but significant improvement was reported by Sinurat et al. (2016).

The mortality was significantly ($P < 0.01$) reduced by enzyme supplementation, but not in the previous study. The hygienic status of the commercial farm in this trial was less than the research station. Enzyme supplementation have been shown to improve health status of chickens (Bedford and Cowieson, 2012) by alleviating the population of pathogenic bacteria such as *C. perfringens* in the gastro intestinal tract (Liu et al., 2012).

Table 1. The performance and the egg quality of laying hens as affected by BS4 enzyme supplementation

Treatments	HD egg Production (%)	Egg weight (g/egg)	Feed intake (g/bird/d)	Feed Conversion Ratio (g/g)	Mortality %	HU	Yolk color score	Shell weight (g/egg)
Control (C)	56.21	57.60	89.09	2.795	5.05	68.9	4.14	5.70
C + Enzyme	62.60	57.60	92.3	2.580	1.62	69.9	4.36	5.97
Significance (P)	0.03	0.90	0.13	0.14	<0.01	0.08	0.30	0.68

The egg qualities (Haugh Unit, yolk color score and shell weight) were not significantly ($P>0.05$) affected by the BS4 enzyme supplementation. Previous study showed that the BS4 enzyme supplementation improved the yolk color scores (Sinurat et al., 2008; 2016).

Conclusion

Supplementation of BS4 enzymes is effective to improve performances of laying hens at commercial farm, without detrimental effect on the quality of the egg produced.

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Utilization of Palm Kernel Cake Fermented by *Sclerotium rolsii* in the Broiler Ration

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Abstract

An experiment was conducted for the evaluation of palm kernel cake fermented (PKCF) by *Sclerotium rolsii* in the diet of broiler. The experiment used a complete randomize design (CRD) with 5 treatments and 4 replications. The treatments were arranged as follows: 1) 10% PKCF, 2) 15% PKCF, 3) 20% PKCF, 4) 25% PKCF, 5) 30% PKCF in broiler ration. The ration were formulated in iso protein 22% and iso caloric 3000 kcal /kg ration. This study used a completely randomized design with six treatments and four replications. The parameters of this study were feed consumption, body weight gained, feed conversion, body weight, percentage of carcass and abdominal fat. The result of this study showed that feed consumption, body weight gained, feed conversion, body weight, percentage of carcass and abdominal fat were significantly affected ($P < 0,05$) by any treatment. In conclusion the palm kernel cake fermented (PKCF) by *Sclerotium rolsii* can be used up 25% in broiler ration.

Keywords: *fermented, sclerotium rolsii, palm kernel cake and broiler*

Effect of Probiotic Supplementation in Feed on Meat Cholesterol Content and Intestinal Microflora of Broiler

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Abstract

The purpose of this research was to evaluate the effect of probiotic supplementation on meat cholesterol content and intestinal microflora of broiler. Feed which was used consist of corn, soybean meal, corn gluten meal, copra meal, rice bran, palm oil, DL-methionine, lysine and mineral premix. This research was conducted in Tlekung Village, Junrejo Sub-district, Batu City, East Java. Ninety day old chicken (DOC) were reared for 35 says (5 weeks). The method used in this research was Completely Randomized Design (CRD) with 3 treatments and 5 replications (each replication consist of 6 birds), the treatments were T0 = control diet + 0% probiotic; T1 = control diet + 0.2% probiotic and T2: control diet + 0.4% probiotic. Variables observed were meat cholesterol content, total LAB and total *E. coli*. Data were analyzed by Analysis of Variance (ANOVA) and significant difference treatments was then analyzed by Least Significant Differences Test (LSD). The result showed that probiotic had significant effect ($P < 0.05$) on meat cholesterol content, total LAB and *E. coli*. It is concluded that supplementation of 0.4% probiotic (T2) could decrease meat cholesterol content, increase total LAB and decrease *E. coli* population in small intestine of broiler.

Keywords: lactic acid bacteria, e coli, feed supplement

Introduction

Vigilance using Antibiotic Growth Promoters (AGPs) on livestock industry, exactly poultry sector should be considered by all stakeholders. AGPs have produced more than a half century been the most significant effect to enhance food animal productivity through prevention and control of subclinical enteric disease, and finally obtained efficiency productivity (Cervantes *et al*, 2012). Otherwise, effect for longtime-giving an AGPs also be worried, because dangerous risk like residue-produced in heart, meat and egg often found by some researchers. World Health Organization (WHO) has reported that uncontrolled giving AGPs on feed affected to resistance bacteria, pathogenic contamination, potential to human exposure to resistance bacteria acquired from food-producing animals and even reason of foodborne disease. It is reason why the researchers tried to found the alternative growth promoters which expected could be used as AGPs but more safety when applied on animal, several alternative growth promoter such as phytobiotic, symbiotic, enzyme, acidifier or probiotic being developed.

Probiotic is non pathogen life-microorganism which give positive effect into physiology and healthy-host. Probiotic has ability to produce lactic acid, lactase enzyme and characterized as bacteriocin, this specified-character that probiotic could be an alternative growth promoter (Nagao *et al*, 2000). Probiotic expected could increase the population of lactic acid bacteria (LAB) on small-intestine, improve nutrients digestion and absorption, against pathogenic bacteria and decreasing cholesterol content. Therefore, the objective of this research was to evaluate the effect of probiotic supplementation in feed on meat cholesterol content, total LAB and *E. coli* in small intestine of broiler.

Materials and Methods

This research was conducted in Tlekung Village, Junrejo Sub-district, Batu, Indonesia. Ninety day old chicken (DOC) were reared for 35 days (5 weeks). The method used in this research was Completely Randomized Design (CRD) with 3 treatments and 5 replications (each replication consist of 6 birds), the dietary treatments were T0 = control diet + 0% probiotic; T1 = control diet + 0.2% probiotic and T2: control diet + 0.4% probiotic. Variables observed were carcass yield, meat cholesterol content, total LAB and total *E. coli*. Data were analyzed by Analysis of Variance (ANOVA) and significant difference treatments was then analyzed by Least Significant Differences Test (LSD).

Results and Discussions

Result of this research was presented in Table 1. Generally, effect of supplementation probiotic in feed had significant effect ($P < 0.05$) on meat cholesterol content, total LAB and *E. coli*.

Table 1. Effect supplementation of probiotic in feed on meat cholesterol content, total LAB and *E. coli* of broiler at 35 days

Dietary Treatments	Cholesterol (mg/100g)	Total Bacteria (log CFU)	
		Lactic Acid Bacteria	<i>Eschericia coli</i>
T0	78.17 ± 0.27 ^a	7.71 ± 1.4 ^a	4.40 ± 0.05 ^a
T1	76.94 ± 0.87 ^b	7.75 ± 1.5 ^a	3.60 ± 0.21 ^b
T2	75.61 ± 0.44 ^c	8.41 ± 1.2 ^b	3.73 ± 0.15 ^b

^{a-c}Means in same column with different superscripts were differ significantly ($P < 0.05$)

The cholesterol contents in the breast meat was significantly ($P < 0.05$) reduced by additional of probiotic. Recently, researcher was reported that probiotic supplementation had effect on decrease meat cholesterol content (Kalavathy *et al*, 2006), this result may be caused by increasing lactic acid bacteria population on small-intestine, Voet *et al* (1999) and Sudha *et al* (2009) were reported that lactic acid bacteria has an ability to cholesterol-synthesis throughout inhibit enzyme hydroxylmethylglutaryl-CoA reductase (HMG-CoA reductase), meanwhile Liong and Shah (2005) were reported that probiotic bacteria produce bile salt hydrolase enzyme that able to catalyzes the glycine-hydrolysis and taurine-bile salt conjugated become amino acid residue and free bile salt (bile acid). The increase of probiotic supplementation could also increase total LAB population. Daskiran *et al* (2012) reported that giving probiotic *lactobacillus sp.* increased total LAB, it was supposed caused the probiotic in feed that consist of lactic acid bacteria appropriated with intestinal-microflora condition. Meanwhile, the population of *E. coli* was decreased and had a significant effect ($P < 0.05$). Lin *et al* (2011) reported that the use of probiotics in the feed reduces total *E. coli* population in the small-intestine. Boostani *et al* (2013) reported that probiotics are consumed, a large amount of useful microbes enters the animal's gastrointestinal tract. These microbes

produce acids (such as acetic acid and lactic acid) and other compounds that inhibit pathogen bacteria growth (log phase) and be colonized then attach rapidly on gastrointestinal (Fuller, 1989).

Conclusion

Supplementation of 0.4% probiotic could best decrease of meat cholesterol content, increase total LAB and decrease *E. coli* population on broiler.

Acknowledgment

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**Oral Presentation 1 Focus Session:
Genetic Breeding and Conservation
Wednesday, 19 October 13:00-14:00
Room: Semeru**

The Qualitative and Quantitative Characters Identification of Bali Cows Having Different Coat Color in Kupang, East Nusa Tenggara, Indonesia

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Abstract

This research was aimed to identify the qualitative and quantitative characters of Bali cow in Kupang district, East Nusa Tenggara. For data collections, the research used some methods namely observation, measurement and also farmer interviews. About 191 Bali cows age 3-5-year-old were involved in this research. The cows were grouped in four groups based on their color coat characters. The cow groups were sorrel color, black color, white color and white-spot color group. The collected data were analyzed using descriptive statistic for qualitative data and one way ANOVA procedure for quantitative data using SPSS package (version 17). The results showed that the Bali cows in Kupang district was more dominant in sorrel color coat (76.27%) than black coat color (14.41%), white color coat (7.63%) and white-spot coat color (1.69%). The body length for the sorrel color, black color, white color and white-spot color group respectively 108,41±8,19cm, 111,14±6,34cm, 111,67±6,44cm, 107,50±8,81cm; heart girth respectively 142,51±9,74cm, 141,57±8,36, 149,42±7,18cm, 152,50±12,45cm; and height respectively 108,48±5,72cm, 108,49±5,37cm, 113,75±b1,14cm, 108,75±6,70cm. In conclusion, the linear size of the Bali cows in Kupang district were increasing. It might be caused by negative selection, in breeding pressure and traditional breeders.

Keywords: *Bali cow, coat color, selection, breed, traditional*

Introduction

Bali cattle (*Bossondaicus*) is Indonesian native cattle which is domesticated from bison (*B. javanicus javanicus*). The cattle are rapidly growing in Bali. Bali cattle are known as potential commodities in supporting the availability of meat and also to increase the incomes of the community in the East Nusa Tenggara province. Statistic shows that, beef cattle population in Kupang district is the second largest population in East Nusa Tenggara, for example in 2013 (151.112), in 2014 (149.244) and in 2015 (154.814) (BPS, 2015).

Coat color differences in Bali cows is caused by pigmentation, which is affected by expressed the Melanocortin 1 Receptor (MC1R) gene, and is shown on the surface of melanocytes. Melanin is substance which controls and the skin color, hair and eyes. *Eumelaninis* responses to black/brown color and *phaeomelanin* responses to sorrel, red and yellow color.

Tabun et al. (2013), the coat color pigmentation of Bali cow in Kupang district affected by the MC1R gene is monomorphic (99%) and Polymorphic (1%). Furthermore, the coat color in Bali cows are also affected by the breeding system of extensively and semi-intensive, inbreeding pressure and color deviations. This study aims to identify the qualitative and quantitative characteristic Bali cows of different coat color in Kupang district.

Methodology

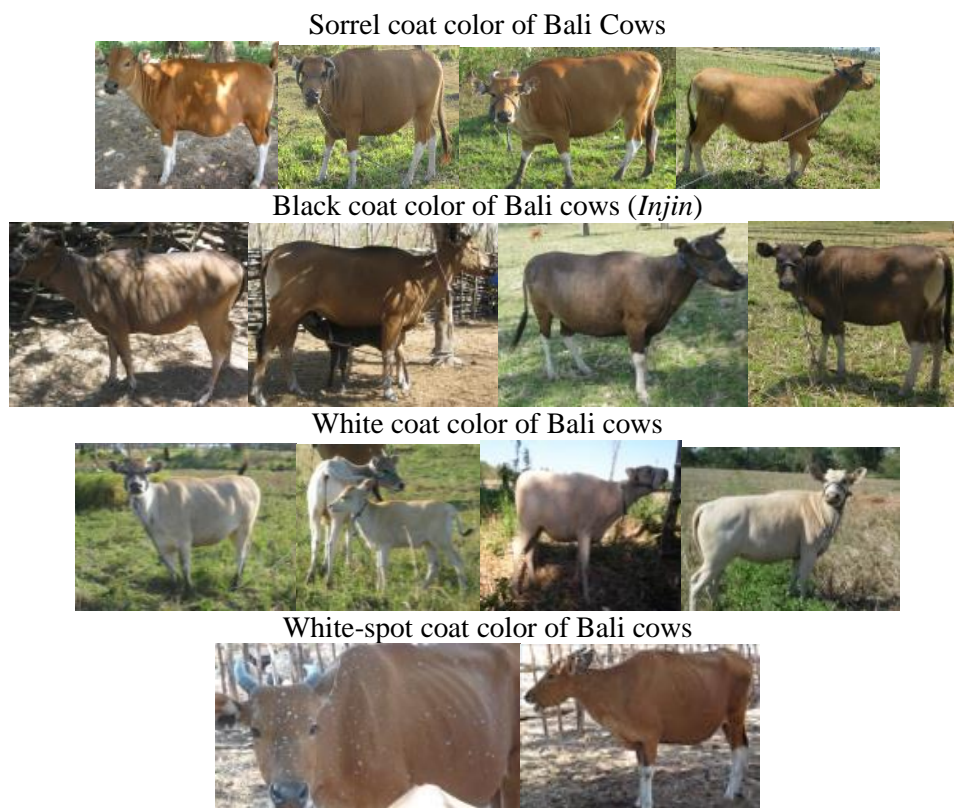
The methods used in this research were measurement, observation and interviews. The qualitative data were analyzed with statistics descriptive. The quantitative data were analyzed by One Way Anova. If significant differences are found among the treatment, then, Duncan test using SPSS software version 17 is used.

Result and Discussion

Qualitative characteristics of Bali cows

Bali cows in Kupang district are characterized by the dominance of sorrel color (76.27%), black color (*Injil*) (14.41%), white color (7.63%) and white-spot color (1,69%). Coat color changes on Bali cows in Kupang district is as a result of mating Inbreeding, which increase recessive genes and cause changes/mutations in specific genes. Sukardono et al. (2009) states that deviations of coat colors is an indication of the decrease of quality of cattle in NTB.

The deviations of coat color may be due to the influence of hormones to the formation of skin pigment and coat, in which they are decreased and unsmooth in the whole parts of the cattle body, as result of mutations in genes that control the hormonal system in the formation of pigmentation and perhaps also as a result of the emergence of recessive genes. The qualitative nature of Bali cows in Kupang district shows characteristics that can be seen in Figure 1



Picture 1. Sorrel, black, white and white-spot coat Color of Bali cows

The shape of the horns of Bali cows are grown in line with the forehead and the tip of the horns lead upward and downward. The observations shows that the horns lead upward 161 cows (68,22%), lead downward 74 cows (31,36%) and bend forward is 1 cow (0.42%). While the horns in black colors are 233 cows (98,73%) and brown colors are 3 cows (1.27%). Hardjosubroto (1994) states that, the shape the horns of Bali cow is called *manggulgangsa*, and the growth of the horn is in line with the forehead, downward and bend inside with black

color. The horns for the Bali bull is called *regakranjung*, and the growth of the horn is from starting from the forehead, bend upward, and then, the tip of the horn is bend outward.



Quantitative characteristics of Bali cows

The results of the analysis of body size (length, the height of hip, hip width and length of the head) indicate that there is no noticeable difference ($P > 0.05$) of Bali cows. It is assumed that the presence of genetic similarity caused by natural breeding in the grazing and extensive and semi-intensif of breeding system are the caused. The body size of Bali cows in Kupang district can be seen in the Table 1 below

Table 1. Statistic of female Bali cows of different coat color at the age of 3-4 in Kupang District

body size	Different Coat Color of Female Bali Cows			
	sorrel colour	black color	white color	Spotted
N (191)	140	35	12	4
age	4,14 ± 0,76	4,11 ± 0,93	4,00 ± 0,47	4,00 ± 0,82
Body length ^{ns}	108,41 ± 8,19	111,14 ± 6,34	111,67 ± 6,44	107,50 ± 8,81
heart girth	142,51 ± 9,74 b	141,57 ± 8,36 b	149,42 ± 7,18 ab	152,50 ± 12,45 a
Higth	108,48 ± 5,72 b	108,49 ± 5,37 b	113,75 ± 1,14 a	108,75 ± 6,70 b
Hip height ^{ns}	106,16 ± 13,08	108,46 ± 5,35	113,75 ± 1,14	108,75 ± 6,70
Hip width ^{ns}	29,26 ± 10,18	28,29 ± 3,28	29,83 ± 3,41	33,75 ± 3,59
Length of head ^{ns}	37,54 ± 2,41	37,54 ± 1,96	39,17 ± 3,27	38,75 ± 3,20
Width of head	15,95 ± 2,07 ab	14,94 ± 1,19 b	15,88 ± 1,45 ab	17,50 ± 0,58 a
Head indexes	42,54 ± 4,95 b	39,90 ± 3,70 b	40,59 ± 2,53 ab	45,37 ± 3,51 a

The Average of body length, heart girth, and height of Bali cows in Kupang is 109.95 cm; 146.50 cm; 109.87 cm; 109.27 cm. The results of the measurement of the body's vital statistics has been decreased in the size compared to Jan (2000) who states that the average body length, heart girth and height of Bali cows is 115.06 ± 4.73 ; 160.19 ± 7.38 ; $110.236 \pm 112.21 \pm$ and 4.46 ± 4.37 . Hartati et al, (2007) reports that the size of the morphology of adult Bali cows in breeding center of body length is (119.6 cm), the height is (114.4 cm) and heart girth is (74.2 cm) while in P3 Bali, the body length is (118.7 cm), the height is (113.8 cm) and heart girth is (166.1 cm).

The average of heart girth, the height of the cow back of Bali cows indicates a real difference ($P < 0.05$). This difference is likely due to the fact that white Bali cow has bigger size of body compared to sorrel and black Bali cows. The body size of Bali cows is influenced by its' environment which is closely related to the breeding management in East Nusa Tenggara, the height of the cow back is 105-114 cm height, body length is 117-118 cm and heart girths 158-160 cm (Pane, 1990 in Sampurna, 2013).

The decrease in the body's vital statistics of female Bali cows in Kupang district is caused by negative selection of breeders, and also the extensive and semi-intensive breeding system. Tonbesi et al (2009) suggest that the decrease in body weight and body size of Bali cow in the North Timor Tengah Regency and West Timor because of the decrease of genetic quality due to inbreeding and negative selection process, environment, management, availability of food and disease.

Head size parameters include head length, head width and the head index. The length of the head of different colors Bali cows have no noticeable difference, but the width of the index and the head index show the difference ($P < 0.05$) between the white spot color cow and black color but no noticeable difference between sorrel and white color. This is likely caused by the presence of genetic similarity.

Conclusion

1. Bali cows population, raise by the breeder in Kupang regency with sorrel color (76.27%), black color (14%), white color (7.63%) and white-spot coat color (1.69%)
2. The average of body size of different coat color of Bali cows in Kupang regency is body length 109.95 cm; 146.50 cm; height 109.87 cm and height 109.27 cm.

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Mitochondrial D-Loop Nucleotide Sequence of Indonesian Gayo Buffalo: Variation and Phylogeny Studies

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Abstract

The objective of this research was to find the basic data on genetic diversity of mtDNA D-Loop on Gayo buffalo breed and its association with two local buffalo from Aceh (Aceh Besar and Simeulue). To the best of our knowledge this is the first published data on the mitochondrial D-Loop sequence of Gayo buffalo. There were 53 samples of DNA which had been sequence; i.e. 5 from Simeulue, 3 from Aceh Besar, and 45 from Gayo buffalo. Result shows that Gayo Buffalo have a closest relationship to Aceh Besar Buffalo, while Simeulue Buffalo have their own clusters. The total nucleotide of Gayo, Aceh Besar and Simeulue Buffalo was 317. The closets genetic ranges among Gayo buffalo from BenerMeriah – Aceh Besar (0.005), Aceh Tengah-Aceh Besar (0.010), Gayo Lues-Aceh Besar (0.013), Bener Meriah-Simeulue (0.025). D-Loop mtDNA analyses showed that Gayo buffalo from Aceh tengah, Bener Meriah and Gayo Lues have a close maternal genetic with Aceh Besar buffalo, while Simeulue Buffalo have their own cluster. These finding could be assumed that Gayo Buffalo were form a specific breed and it can be conclude that Gayo Buffalo as animal genetic resources from Gayo high land.

Keywords: *Gayo buffalo, DNA, D-Loop, phylogeny*

Introduction

Buffalo is one of the importance domestic animals in Indonesia. To increasing demand for its products, attention has been focused on the genetic improvement of these species. The mitochondrial genome (mtDNA) of vertebrates has become a common tool for resolving phylogenetic relationships at different evolutionary depths due to its peculiar properties (Carmela *et al.*, 2000). The study of mtDNA polymorphisms has found tremendous usage in the studies of genetic variation and evolution of various species (Kumar *et al.*, 2007). This is facilitated by the ease and speed of genotyping large number of individuals and by the complete absences of genetic recombination in mtDNA which is inherited through maternal lineage only. The mtD-loop sequences have provided significant insight into the domestication and past migration history of swamp and river buffaloes (Kierstein *et al.*, 2004; Lei *et a.*, 2007; Kumar *et al.*, 2007). The information of mtD-Loop Gayo buffalo had never been reported. Therefore, the objective of this research was to find the basic data of the mtDNA D-Loop genetic varieties and phylogenetic analysis of Gayo buffalo and its association with the Simeulu buffalo and Aceh Besar buffalo. It is hoped that

this research is able to give thorough information which is beneficial for the progress and development policies in improving the genetic quality of Gayo buffalo.

Methodology

The DNA samples used for sequencing were taken from Gayo (45), Simeulue (5), and 3 from Aceh Besar. The process of isolation, extraction, and purification of DNA were carried out in Genetic and Animal Breeding Laboratory, Faculty of Animal Science Bogor Agricultural University. The sequencing of DNA was conducted in Laboratory First Base Singapore. The blood sample of Gayo buffalo was taken using *venojact* (EDTA) 5 ml on *vena jugulars*. The extraction of DNA Genome was conducted using Sambrook *et al.* 1989 method which had been modified using *buffer lyses* cell (400 µl 1 x STE, and 40 µl 10% SDS and 10 µl *proteinase-K*. DNA was purified using *fenol-chloroform* that was added 40 µl 5 M *NaCl* and 400 µl phenol and chloroform iso amyl alcohol (CIAA). The DNA was precipitated using 40 µl 5M *NaCl* and 800 µl *ethanol absolute*. Precipitation was then washed by adding 800 µl 70% *ethanol*, centrifuged with 12000 rpm speed for 5 minutes, the ethanol was discarded and evaporated. Then, the DNA precipitation was dissolved in 10 µl 80% TE (Elution buffer). Each PCR reaction was made with the volume of 40 µl with the composition of 20 µl buffer (2 x master mixes PCR PHIRE); 0.1 µl PHIRE Taq Polymerase; 1 µl Primer Forward and 1 µl Primer Reverse; 1 µl DNA; and 16.9 µl dH₂O. PCR engine used for *Gene Amp PCR System 9700 Applied Bio system*. The initial denaturation at 95 °C for 5 minutes was done once and then 35 times repetition, each with denaturation step on 95 °C for 20 seconds, 30 seconds annealing at the temperature of 60 °C, extension at 72 °C in 40 seconds, and continued with extension at 72 °C for 5 minutes. PCR product was stored at the temperature of 4 °C for 25 minutes. The primer used based on Parma *et al* (2004). The PCR product was electrophoresed by a machine of *Alpha Imager (Alpha Innotech)* and analyzed by *Alpha Imager EP* software. The D-Loop data analysis was done by parallelizing nucleotide D-Loop using software MEGA program version 4.1 (Tamura *et al.*, 2007).

Results and Discussions

The analysis of nucleotide sequence varieties was made after the sequence of Gayo buffalo was parallelized with the standard sequence from Gene Bank (JN632607) which would be used to be analyzed using Neighbor Joining (NJ) tree. The Neighbor-Joining (NJ) phylogenetic tree of Gayo buffalo, Simeulue and Aceh Besar buffalo was contracted (Figure 1)

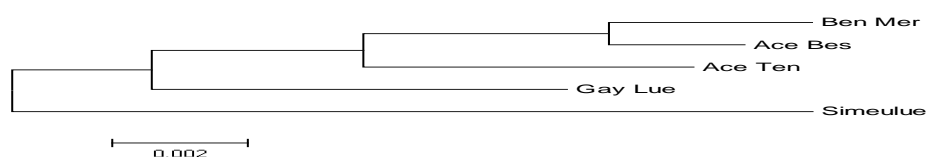


Figure 1. NJ phylogenetic tree of Gayo, Simeulue and Aceh Besar buffalo

The NJ tree indicated that two lineage being designated lineage A and lineage B. The lineage A was defined among Gayo and Aceh Besar buffalo, while lineage B was defined only Simeulue buffalo. These results showed that two different maternal lineage views involved in the origin of domestic swamp buffaloes in Indonesia, particularly in Aceh Province. The maternal lineage B appeared in one type (Simeulue breed).

Genetic Distance of Gayo, Simeulue, and Aceh Besar buffalo

The analysis of *Pairwise Distance Calculation* with the model of parameter Kimura was applied to analyze the genetic distance or the closeness of genetic association of Gayo, Simeulue, and Aceh Besar buffalo. (Table 1).

Table 1. Genetic distance of Gayo, Simeulue, and Aceh Besar buffalo

	Bener Meriah	Aceh Tengah	Gayo Lues	Aceh Besar	Simeulue
Bener Meriah					
Aceh Tengah	0.012				
Gayo Lues	0.014	0.016			
Aceh Besar	0.005	0.010	0.013		
Simeulue	0.025	0.020	0.020	0.025	

The lowest genetic distance belonged to Gayo buffalo from Bener Meriah with the Aceh Besar buffalo was about 0.005. Meanwhile, the highest genetic distance was between Simeulue buffalo and Gayo buffalo from Bener Meriah and Aceh Besar buffalo, about 0.025. It can be conclude that Gayo buffalo have a closest maternal genetic with Aceh Besar buffalo, but further analysis still need.

Conclusion

Based on the research of D-Loop mtDNA region, it is shown that Gayo buffalo have a closest maternal genetic with Aceh Besar buffalo, while Simeulue buffalo have their own clusters.

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Morphology of Indonesian Native Ducks

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Abstract

Morphology are keys to differentiate breed, other than genetics. The unique nature of Indonesian ducks hasn't been properly documented. Hence, this study was proposed to compare the morphology of Indonesian native ducks. A number of 191 ducks from six varieties namely Alabio, Magelang, Rambon, Pegagan, Pitalah, and Bayang were recorded for 19 traits: bill color, bill pattern, nostrils color, bean color, eyes (bright part & dark part), crown color, cheek color, neck color, breast color, abdomen color, back color, wings secondary, wings primary, tail color, thigh color, webbed color, shank color. The result showed that a hundreds percent of bill color in Alabio duck is yellow while other ducks were dominated with black color. For nostrils color three ducks having 100% black color, only Magelang and Bayang have yellow (3.3%) and black color (3%), respectively. All the ducks have black color for bill nail except Magelang duck. The bright part of eye were vary from blue, grey, brown, and yellow. The bright eye in Rambon and Bayang duck were dominated with yellow color (100%). The dark part of eye indicated 100% having black color in all ducks. Crown, cheek and neck color were covered with 100% white brown in Alabio ducks. The others ducks were vary from brown, light brown, dark brown and black color. Alabio duck seems more uniform among population based on their morphological appearances. In conclusion, the morphological among Indonesian native ducks have various color and pattern.

Keywords: *duck, morphology, native, Indonesia*

Introduction

Duck production included meat and eggs products are relished and consumed by many Asians. It indicates the duck production plays an important part in the agriculture economy of many Asian countries. The duck population is well ahead of chicken and other poultry species that have been increasing over the years. Global duck meat production in 2010 was towards 4 million tonnes (FAO, 2007). Asia dominates world production with China account for 68 per cent of the world total.

According to Indonesia Livestock Statistic (2012), the duck population is 44.3 million and arises along 33 provinces of Indonesia. Indonesian ducks have a dual purpose for meat and egg. The meat production from duck increase 6.64 % in 2012 due to increasing of Indonesia consumer's demand. Total Indonesia egg production in 2012 was 1628.74 thousand tones. The largest egg production was contributed by laying chicken (69.99%)

followed by duck eggs (16.27%), local chicken eggs (12.10%), quail eggs (0.97%) and ducks manila (0.67%).

Indonesia has various local duck that arise along Indonesia archipelago. Most of them have been certified by Indonesian Agricultural Ministry. In Java island, there are three local duck namely Tegal, Magelang and Mojosari. In Bali Island is well known as Baliness duck and Alabio duck in South Borneo. Sumatera island has spesific ducks namely Pegagan Bayang, Pitalah and Talang Benih. Mostly, the duck's name refers the location of the duck have been domesticated. The ducks have various plumage colour, body size and pattern. It may due to Indonesian ducks are the hybrids ducks which the result of crossing between local and imported ducks. For breeding purpose to produce the high quality of both meat and egg production, the analyzing of morphology of the ducks is a basic and important to study.

Methodology

This study conducted in 5 regions in Indonesia; Pelaihari (South Kalimantan province) for Alabio duck, Magelang (Center of Java province) for Magelang duck, Cirebon (West Java province) for Rambon duck, Palembang (South Sumatera) for Pegagan duck, and Padang (West Sumatera) for Pitalah and Bayang ducks. A total of 191 ducks of the females sex from six Indonesian local ducks were used in this study, including Alabio (39 heads), Magelang (30 heads), Rambon (32 heads), Pegagan (30 heads), Pitalah (30 heads), and Bayang (30 heads). They were reared by farmers under a traditional system in the different area. Ninety morphological traits have been collected included bill color, bill pattern, nostrils color, bean color, ryes (bright part & dark part), crown color, cheek color, neck color, breast color, abdomen color, back color, wings secondary, wings primary, tail color, thigh color, webbed color, shank color. The data collected were descriptively analysed.

Results and Discussion

A total of 191 ducks from six Indonesian local ducks were used in this study, included Alabio (39 heads), Magelang (30 heads), Rambon (32 heads), Pegagan (30 heads), Pitalah (30 heads), and Bayang (30 heads). Nineteen morphological traits have been recorded (data are not presented). Some morphological traits such as head, neck, back, abdomen, primary and secondary feather of wings, and tail have spesific color and pattern among the ducks. In Magelang duck indicated having white ring in their neck and no indicated in others. Magelang ducks have 11 types based on their plumage pattern, those are Jarakan Polos, Bosokan, Kalung Ombo, Kalung Ciut, Gambiran, Jarakan Kalung, Jowo Polos, Klawu Borok, Cemani, Wiroko, and Putih Polos (Ayu, et.al., 2016). Pegagan duck also have 3 different strain based on their feather namely Kelabu Tampu, Jarak Coklat, dan Jarak Hitam. Alabio duck seems have uniformity compared to other due to they reared and controlled by using breeding program which conducted by breeding research center belong to government. Figure 1 showed the physical appearnces of six Indonesian native ducks. The pattern of feathers among some varieties were described in Figure 2. Generally, a higher phenotypic variation of traits indicates a higher genetic variation. This condition can be able guarantees for a sufficient selection response. This is important because directional selection on morphological traits, which commonly occurs in natural populations (Kingsolver et al., 2001).

Figure 1



Alabio

Magelang

Rambon

Pegagan

Bayang

Pitalah

Figure 2



Alabio

Pegagan

Bayang

Pitalah

Conclusion

The Indonesian native ducks were having different morphology and fully evidenced through this study. Characterisation of these ducks at molecular level will be the best approach for proper selection and conservation of these unique germplasm in the future.

Acknowledgement

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Variation of Quantitative Traits of Kamang Duck as Local Genetic Resources in Kamang Regency West Sumatera

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Abstract

This aims of this research was to collect the information about the variation quantitative traits of Kamang duck as local animal genetic resources in West Sumatera as a data base. This research was held in Kamang regency Agam District West Sumatera. using 169 head of Kamang ducks consist of 50 male and 119 female mature sex. Survey method was used in this research. The variable as body weight and morphological oh body were measured in this study. Data were analyzed using statistic descriptive method. The result indicated the mean and standard deviation of quantitative traits of male and female Kamang Ducks were body weight $1,34 \pm 0,10$ kg, $1,32 \pm 0,10$ kg, beak length $5,41 \pm 0,36$ cm, $5,24 \pm 0,26$ cm, beak width $2,52 \pm 0,09$ cm, $2,46 \pm 0,13$ cm, neck length $19,38 \pm 1,03$ cm, $17,47 \pm 1,64$ cm, back length $23,53 \pm 0,96$ cm, $22,63 \pm 1,72$ cm, chest circum $28,06 \pm 1,16$ cm, $27,41 \pm 1,91$ cm, wing length $29,13 \pm 1,55$ cm, $28,58 \pm 2,32$ cm, femur length $9,05 \pm 0,81$ cm, $9,09 \pm 1,14$ cm, tibia length $10,91 \pm 0,84$ kg, $10,84 \pm 1,34$ kg and pubis width $2,78 \pm 0,40$ cm. The highest variation of quantiatave traits of male Kamang ducks were femur length 8,97 % whereas in female Kamang ducks were at pubis width 14,46 %. The good selection was conducted by Kamang duck farmer, therefore it as spesific genetic resources can be sustained.

Keywords: Kamang ducks, variation, Quantitative traits, Local genetic

Introduction

The local ducks represents a large pool of untapped genetic resource. There are many local breeds of ducks in Indonesia, and they can be found widely spread across the country. The local ducks as descendants of the Indian Runner have the potential of high egg production, but they have not shown their egg production optimally. There are many local breeds of ducks in Indonesia, and they can be found widely spread across the country. Ducks in Indonesia get name with the name of the place where the duck were bred for generations or domesticated as Tegal duck, Bayang duck, Pitalah duck. In west Sumatra Tilatang Kamang regency have ducks that are named with the name of the place where the Kamang ducks are bred. Kamang ducks maintained by farmers in small groups as a producer of egg. and the male breed as a ameat. the demand of male duck high enough. Itiak Balado is a famous food origin bukittinggi. Existence of different indigenous duck varieties namely (Sabrina et al. 2015) with distinct phenotypic characters and better production potential. It is important to have knowledge of the variation of morphometric traits in local genetic resources as such measurements have been discovered to be very useful in comparing body size and by implication, shape of animals (Latshaw and Bishop, 2001). Such comparison could be used as basis for selection and improvement programmes.

Methodology

A total number of 50 male and 119 female of Kamang ducks were used in this research. These Kamang duck were raised by small holders in the Tilatang Kamang Regency, Agam District of West Sumatera Province. This research utilized the survey method and intensive direct examination. In sample selection, mature sex the purposive sampling method was utilized. The variation of quantitative traits on base data. The variable as body weight, beak lenght, beak width, the length of shank, back length, chest depth and chest width the wing lenhgt, femur lenght, tibia lenght, neck lenght, beak length, back length, chest depth and chest dan width of pubis, back length, chest depth and chest width were measured in this study. Data were analyzed using discriptive statistic analysis to compute means and their standard errors and coefficients of variation for quantitative traits.

Result and Discussion

The variation of quantitative traits such as, body weight, neck length, femur length and shank length were recorded for 119 female adult ducks. The means with standard deviation (SD) is of female Kamang duck presented in Table 1.

Table 1. Mean and standard deviation of quantitative traits of female Kamang ducks in Tilatang Kamang Regency, Agam District of West Sumatra

No	Quantitative traits	Mean	SD	Max	Min	CV(%)
1	Body weight (kg)	1,32	0,10	1,552	1,126	7,60
2	Beak lenght (cm)	5,24	0,26	5,85	4,35	4,91
3	Beak width (cm)	2,46	0,13	2,65	2,12	5,43
4	Neck lenght (cm)	17,47	1,64	20,6	15,1	9,39
5	Back lenght (cm)	22,63	1,72	25,6	16,4	7,61
6	Chest circum (cm)	27,41	1,91	29,8	18,8	6,96
7	Wing lenght (cm)	28,58	2,32	34,5	24,5	8,13
8	Femur lenght (cm)	9,09	1,14	12,24	7,21	12,55
9	Tibia lenght (cm)	10,84	1,34	15,21	9,18	12,35
10	Pubis width (cm)	2,78	0,40	3,30	1,70	14,46

CV: coefficient of variance

Cinneke et al. (2002) reported that the relationship existing among body characteristics provides useful information on performance, productivity and carcass characteristics of animals and that these quantitative measures of size and shape may be used for estimating genetic parameters in animal breeding plans. Beak lenght, beak widht and chest circumference and wing length, in female duck generally having less variability. this is in line with the results of research in poultry (Liyanage et al. 2015)

The variation of quantitative traits such as, body weight, neck length, femur length and shank length were recorded for 50 male adult ducks The least square means with S.E. is presented in Table 2

Table 2. Mean and standard deviation of quantitative traits of male Kamang ducks in Tilatang Kamang Regency, Agam District of West Sumatera

No	Quantitative traits	Mean	SD	Max	Min	CV(%)
1	Body weight (kg)	1,34	0,10	1,532	1,119	7,54
2	Beak lenght (cm)	5,41	0,36	5,83	4,42	6,57
3	Beak width (cm)	2,52	0,09	2,62	2,09	3,44
4	Neck lenght (cm)	19,38	1,03	20,7	14,7	5,33
5	Back lenght (cm)	23,53	0,96	25,3	20,6	4,07

6	Chest circum (cm)	28,06	1,16	30,5	25,7	4,13
7	Wing lenght (cm)	29,13	1,55	34,8	25,8	5,34
8	Femur lenght (cm)	9,05	0,81	10,32	7,12	8,97
9	Tibia lenght (cm)	10,91	0,84	12,45	9,18	7,73

The morphometric information for a particular species or breed is important for breed or species identification and economic valuation in its utilization. The traits that show less variability within breeds/types indicate homogeneity and identity of those categories. However, traits showing wider variation could be used for prediction purposes such as live weight prediction (Assan, 2013). Because of its strong correlation with meat yield, body weight is used as a proxy indicator of production (FAO, 2012). Body weight and body measurements can be as a reference for evaluating the performance and productivity of livestock. Body measurements have utility for estimating the body weight and carcass percentage, so it can show the value on livestock (Cole, 1970). Based on table 1, 2 the mean of body weight of Kamang duck for male 1.32 ± 0.10 kg and female 1.34 ± 0.10 kg with coefficient of variance 7.60% and 7.54%. The present study showed males always have a larger values for body weight and morphometric than females. The higher body weight and morphometric measurements in male chickens compare to the females in this study is in line with the report of Sabrina et al. (2014).

Conclusion

The quantitative traits of Kamang duck have varied. Based on the research results the coefficient of variance of Kamang ducks is small to moderate. The highest variability on female duck were in femur, tibia length and pubis width with coefficient variance about 12.55, 12.35 and 14.5%. While the diversity of male Kamang ducks the lowest in half width was 3.44% and the highest for the length of the thigh 8.97%. Therefore, further investigation on the performance traits and the molecular analysis need to be done to identify the genetic variability and to complete a set of characterization of the Kamang duck.

Acknowledgment

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Flock Composition, Effective Population Size, Actual Population Size and Rate of Inbreeding of Kamang Duck in Kamang Magek Regency Agam District

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Abstract

Duck (*Anas platyrhynchos*) is one of the most important domestic avian species in the world. This study aims to obtain the flock composition, effective population size, actual population size and rate of inbreeding of Kamang duck. This study was used a sample Kamang duck raised from 126 small farmers in Kamang Magek Village. This research conducted was survey method with purposive random sampling. The variables were calculated in the study, namely the number of adult male ducks (N_m), number of adult female ducks (N_f), number of young male and young female ducks, number of male and female ducklings, actual population size (N_a), effective population size (N_e), and the rate of inbreeding per generation (ΔF). The result of this study showed that the Kamang duck population in the Kamang Magek regency was 4.298 head. The flock composition of the Kamang duck in the Kamang Magek regency was an adult male ducks (7.58%), adult female ducks (42.46%), grower male ducks (8.45%), grower female ducks (12.77%), ducklings (28.73%). Effective population size (N_e) Kamang ducks was 1.106 head and the rate of inbreeding per generation is 0.04%.

Keywords: *Flock composition, effective population size, actual population size, Kamang duck, rate of inbreeding.*

Introduction

An animal germ plasm conservation program will require decision on the population. The local ducks represents a large pool of untapped genetic resource. There are many local breeds of ducks in Indonesia, and they can be found widely spread across the country. The local ducks as descendants of the Indian Runner have the potential of high egg production, but they have not shown their egg production optimally. There are many local breeds of ducks in Indonesia, and they can be found widely spread across the country. Ducks in Indonesia get name with the name of the place where the duck were bred for generations or domesticated as Kamang duck, Bayang duck, Pitalah duck. Many of them, however, are often maintained in small populations, owing to their comparatively poor performance in egg production and growth rate (Amini et al., 2015). Facing the challenge from much more efficient commercial duck strains, almost all of the indigenous duck breeds are decreasing in population size, and even of more concern, some of the indigenous duck breeds are on the verge of extinction. The reduction of effective population size would reduce genetic variation and the ability of a population. A population is a summation of all the organisms of the same group or species, which live in a particular geographical area, and have the capability of interbreeding (Falconer and MC Kay, 1996). Knowledge of the size population and the rate of population decline a clumps of ducks is very important to classify the status of the cattle

population. One of an early stage in the preservation germplasm program is to determine the status of livestock population. Population status can be determined by counting the number of adult depicted on the number of adult females and the effective population size (Subandriyo, 2004).

Methodology

This research utilized the survey method . A total some 126 smal farmers used as respondents in this study in Kamang Magek regency, Agam district of West Sumatera Province. and intensive direct examination. Data on flock composition were estimated using the mean procedure of statistic using SPSS (2010). Furthermore, rate of inbreeding was calculated in the population. Effective population size (N_e) for a randomly mated population was calculated as $N_e = (4N_mN_f)/(N_m+N_f)$ where N_e = effective population size, N_m = number of breeding males in the flock and N_f = number of breeding females in the flock. The rate of inbreeding (F) was calculated from N_e as $F = 1/2N_e$ (Falconer and MacKay, 1996). The ratio of the effective population size to actual population size (N_e/N_a) is an indicator of the extent of genetic variation expected in a population. Male: female ratio (N_m/N_f) is defined as the number of inbreeding males upon the number of breeding females in a population (Lariviere et al., 2011).

Result and Discussion

The size of population is simply the number of individual in it. However, scientist are more concerned with the flow of genes within the number of individuals contributing gametes to the next generation (NRC, 1993). The flock composition of Kamang ducks in household farmer in the study area, estimated N_e , N_e/N_a and N_m/N_f and the rate og inbreeding is given in Table 1.

No	Villages	N_m	N_f	N_m/N_f (%)	N_a	N_e	N_e/N_a	F (%)
1	Kasiak	57	322	17.70	379	193	50.92	0.25
2	Gatah	29	129	22.48	158	94	59.49	0.53
3	Kubang	22	114	19.29	136	73	44.78	0.61
4	Koto Kaciak	26	143	18.18	169	88	52.07	0.56
5	Lurah Bawah	19	70	27.14	89	59	66,28	0.84
6	Ambacang	19	80	23.75	99	61	61.61	0.81
7	Kampung Bawah	6	16	37.50	22	17	77.27	2.94
8	Sawah Ladang	36	226	15.93	262	124	47.33	0.40
9	Lurah Ateh	10	253	3.95	263	38	14.14	1.31
10	Simpang Kacang	22	98	22.44	120	71	59.16	0.70
11	Guguak Pincuran	15	78	19.23	83	50	60.24	1.00
12	Pulai	23	83	27.71	106	72	67.92	0.69
13	Cubadak	39	196	19.89	235	130	55.32	0.38
	Kamang Magek	323	1808	17.86	2121	1070	50.45	0.04

Flock structure and dynamics help in the identification of the age and number of animals to be maintained breeding population (Okeno et al., 2012). The proportion heads of mature hens in a flock is used to estimate egg and poultry production (Yakubu, 2010). The low sex ratio on the farms studied is an indication that the breeding flock is an indication that the population is not controlled by the farmers (Zahraddeen et al., 2011). The N_e/N_a and

Nm/Nf ratio on Kamang ducks were 50.45% and 17.86% (1:6), respectively. It is important to assess effective population size (N_e). The relative number of effective parents of each sex in a population. There are a few breeding males in a population, then the effective size will be much smaller than its actual population size. This finding was relatively similar to what had been found in research of Bayang duck conducted by Liza *et al.* (2016). Nm/Nf ratios 1: 7 is in line with Meuwissen and Woolliams (1994) suggested that N_e between 30 and 250 is needed for natural selection to prevent inbreeding depression. The effective population size (N_e) and the rate of inbreeding (F) calculated for the indigenous Kamang duck flock considering the existing flock size and management practice were N_e 1070 head. N_e is a measure of genetic variability within a population where large values of N_e indicate more variability and small values of N_e indicate less genetic variability (Maiwashe *et al.*, 2006; Cervantes *et al.*, 2008).

When the inbreeding rate of Kamang ducks in this study was 0.04% per generation, it is assumed that 0.04% of heterozygosity is lost in one generation. Inbreeding is also an indication for the probability that two alleles at any locus in an individual are identical by descent relative to a base population (Falconer and MacKay, 1996). The rate of inbreeding in the free-range of Kamang duck population was low. The low value of F is an indication that the KBC population is not at the risk of extinction.

Conclusion

The flock composition of the Kamang duck population in the Kamang Magek regency was an adult male ducks (7.58%), adult female ducks (42.46%), young male ducks (8.45%), young female ducks (12.77%), ducklings (28.73%). Effective population size (N_e) Kamang ducks was 1.106 head and the rate of inbreeding per generation is 0.04%. Ratio (Nm/Nf) was 17.86% (1:6) and ratio N_e/N_a 50.45%

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Performance and Polymorphism of Silkworms *Bombyx Mori* of Two Breeding Centers (Soppeng and Temanggung) in Indonesia

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Abstract

There were different performance between silkworms *Bombyx mori* bred from Soppeng and Temanggung Breeding Centers, Indonesia. There might be different proportion of parent stock and environment which causing polymorphism. This experiment was to know the genetic band pattern as the effect of the silkworm origin to the genetic characteristics. Restriction fragment length polymorphism (RFLP) method was applied by using restriction enzymes of Pst1, EcoR1 and Sau3A1. Based on DNA running by RFLP method using those enzymes, there was no different DNA slice fragment, either between breeding site or genetic polymorphism of each breeding site. This may be caused by the mutation happened in position DNA arrangement which was not recognized by the two enzymes. By Sau3A1, the DNA band was cut in fragment 1700 bp and 2154 bp for Temanggung, and in fragment 1031 bp and 2154 bp for Soppeng. The polymorphism was detected by Sau3A1. The silkworm of Soppeng had difference genetic arrangement than of Temanggung. It is suggested to follow this research for silkworm DNA in Indonesia by using more restriction enzymes that have precise cutting part

Keywords: *polymorphism, RFLP, restriction enzymes, genetic band pattern*

Oral Presentation 1 Focus Session:

Livestock Production System

Wednesday, 19 October 13:00-14:00

Room: Anjasmoro

Chickens Population and Production and Their Contribution to Human Population in Indonesia

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Abstract

Chickens are found everywhere around the world; every culture knows them and how to husband them. They are the world's major source of eggs and are a meat source that supports a food industry in virtually every country. Population and production of broiler chickens, laying chickens, and native chickens in Indonesia in the past few years is increasing rapidly along with the development technology, especially in the farming sector (*on farm*) which too sophisticated so the production process becomes faster. With such level of population and production, the per capita of consumption of the Indonesian consumers of chicken meat is still lower (< 6.0kg) compared to those of Brunei (53kg), Singapore (42kg), Malaysia (38kg) and per capita consumption of eggs in Malaysia in 2016, for example, 428 eggs. Indonesia with its population is over 258.71 million people in 2016 has an annual level of protein consumption from poultry meat of 12.9 kg/capita/year and poultry eggs of exceeded 190 eggs/capita/year. In the years 2016 - 2019, the projected demand of chicken meat consumption tends to increase the average 1.56 % per year or a total of 4.69 kg/cap/year, bringing the total the need for direct consumption of chicken meat in 2016 forecast of 1.19 million tons and in 2017 amounted to 1.24 million tons, in 2018 amounted to 1.27 million tons and in 2019 reached 1.30 million tons.

Keywords: chickens, population, production, consumption, Indonesia

Introduction

Chickens are found everywhere around the world; every culture knows them and how to husband them. They are the world's major source of eggs and are a meat source that supports a food industry in virtually every country. They are extremely useful on a worldwide basis because they offer great potential for improving the nutritional levels of all the world's peoples. They have been utilized for so many centuries that in most societies their use is ingrained (Henuk, 2015). Indonesia is ranked 3rd in the world for the chicken population and almost all of Indonesia's population is still consumers of meat and eggs produced either by commercialized chicken breeds or native chicken breeds (AgriFlo, 2013). Chicken meat and eggs are consumed in almost every country in the world. There are no religious or social customs which discourage such consumption, and even some vegetarians eat eggs as a valuable source of protein. These poultry products are natural candidates to meet emerging consumer demands because they have a high nutrient content and relatively low caloric value compared to other livestock products. The need for these high-quality nutrients, and

increasing levels of income and standard of living have thus created a tremendous demand for poultry products (Parkhurst and Mountney, 1988). In Indonesia, chicken is one source of animal food that contains high enough nutrition in the form of protein and energy. The demand for chicken food tends to be steadily increased in addition to increasing population and income levels, as well as the development of other sectors that support chicken farm, for example, the opening of new restaurants, hotels, diners and supermarkets are increasing, the higher its awareness the public will be nutrition, the growing needs of society in certain moments such as birthday parties, weddings, the tendency of high prices at certain moments such as the fasting month, Idul Fitri, Christmas and others. Chicken meat is consumed more than beef meat as its prices more affordable to consumers (Muliiany, 2015). This paper reviews literature which identifies chickens population and and production and their contribution to human population in Indonesia.

Chicken Population and Production in Indonesia

Population and production of broiler chickens (Table 1), laying chickens (Table 2), and native chickens (Table 3) in Indonesia in the past few years is increasing rapidly along with the development technology, especially in the farming sector (*on farm*) which too sophisticated so the production process becomes faster (Muliiany, 2015) . With such level of population and production, the per capita of consumption of the Indonesian consumers of chicken meat is still lower (< 6.0kg: Table 4) compared to those of Brunei (53kg), Singapore (42kg), Malaysia (38kg) and per capita consumption of eggs in Malaysia in 2016, for example, 428 eggs (Ngee, 2016). It has been estimated that Indonesia with its population is over 258.71 million people in 2016 has an annual level of protein consumption from poultry meat of 12.9 kg/capita/year and poultry eggs of exceeded 190 eggs/capita/year (Henuk, 2016). In the years 2016 - 2019, the projected demand of chicken meat consumption tends to increase the average 1.56 % per year or a total of 4.69 kg/cap/year, bringing the total the need for direct consumption of chicken meat in 2016 forecast of 1.19 million tons and in 2017 amounted to 1.24 million tons, in 2018 amounted to 1.27 million tons and in 2019 reached 1.30 million tons (Muliiany, 2015).

Table 1. Broiler chicken population and production in Indonesia (1984 – 2015; Muliiany, 2015).

Wilayah	Tahun	Populasi (Ribuekor)	Pert. (%)	Produksi (RibuTon)	Pert. (%)
Jawa	1984-2015	410.235	35,03	476,13	12,98
	2011-2015	955.820	9,70	1.081,57	-6,51
Luar Jawa	1984-2015	204.126	7,80	204,13	9,55
	2011-2015	400.381	7,63	400,38	7,36
Indonesia	1984-2015	680.190	11,98	680,19	11,98
	2011-2015	1.341.512	8,83	1.481,55	6,05
Kontribusi Terhadap Indonesia periode 2011-2015 (%)					
Jawa		71,25		73,00	
Luar Jawa		29,85		27,02	

Table 2. Laying chicken population and production in Indonesia (1984 – 2015; Muliiany, 2015).

Wilayah	Tahun	Populasi (Ribuekor)	Pert. (%)	Produksi (RibuTon)	Pert. (%)
Jawa	1998-2015	57.184	6,14	31,88	10,70
	2011-2015	82.143	8,09	43,21	5,53
Luar Jawa	1998-2015	42.950	7,23	25,32	28,04
	2011-2015	59.467	2,04	36,42	21,09
Indonesia	1998-2015	100.134	6,74	57,20	17,73
	2011-2015	141.611	7,75	79,63	11,03
Kontribusi Terhadap Indonesia periode 2011-2015 (%)					
Jawa		58,01		54,26	
Luar Jawa		41,99		45,74	

Table 3. Native chickens population and production in Indonesia (1984 – 2015; Muliiany, 2015).

Wilayah	Tahun	Populasi (Ribuekor)	Pert. (%)	Produksi (RibuTon)	Pert. (%)
Jawa	1984-2015	102.467	1,74	139,62	0,07
	2011-2015	114.817	3,33	142,34	3,77
Luar Jawa	1984-2015	139.038	2,04	148,78	0,98
	2011-2015	160.347	1,22	166,28	9,16
Indonesia	1984-2015	241.504	0,41	261,85	0,41
	2011-2015	275.164	6,31	292,71	6,31
Kontribusi Terhadap Indonesia periode 2011-2015 (%)					
Jawa		41,73		48,63	
Luar Jawa		58,27		56,81	

Table 4. Total consumption of meat chickens from both commercial and native breeds of chickens in Indonesia (2011 – 2015; Muliiany, 2015).

Tahun	Ayam Ras (Kg/Kap/Th)	Pertumb. (%)	Ayam Buras (Kg/Kap/Th)	Pertumb. (%)	Total (Kg/Kap/Th)	Pertumb. (%)	Konnas Ayam (Ton/th)	Pertumb. (%)
2011	3.650		0.626		4.276		1.034.683	
2012	3.494	-4,286	0.521	-16,667	4.015	-6,098	985.382	-4,765
2013	3.650	4,478	0.469	-10,000	4.119	2.597	1.024.953	4,016
2014	3.988	9,260	0.499	6,374	4.487	8,932	1.131.514	10,397
2015*)	3.973	-0,369	0.522	4,561	4.495	0,180	1.148.366	1,489
Rata-rata	3,751	2,271	0,528	-3,933	4,278	1,403	1.064.980	2,784

Conclusions

Indonesian chicken population and production growth in the last five years is quite volatile and tend to increase with an average growth of 6.21 % per year . Average per capita consumption of chicken meat people of Indonesia in 2011 - 2015 amounted to 4,28kg/capita/year, derived from chicken meat consumption of 3.75kg/ capita/year and native chicken meat consumption of 0.53kg/capita/year. Our per capita consumption of eggs is exceeded 190 eggs. Indonesia with its population is over 258.71 million people in 2016 has an annual level of protein consumption from poultry meat of 12.9 kg/capita/year and poultry eggs of exceeded 190 eggs/capita/year.). In the years 2016 - 2019, the projected demand of chicken meat consumption tends to increase the average 1.56 % per year or a total of 4.69 kg/cap/year, bringing the total the need for direct consumption of chicken meat in 2016 forecast of 1.19 million tons and in 2017 amounted to 1.24 million tons, in 2018 amounted to 1.27 million tons and in 2019 reached 1.30 million tons.

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Prospects of Broiler Industry in Indonesia

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Abstract

Broiler chicken is one kind of birds that many farmed and supplier majority (55%) of meat production in Indonesia with a population of over 255.08 million people in 2016, followed by cattle (19%), native chicken (10%), pigs (8%), goats (7%) and other livestock (1%). Total consumption of broiler meat in Indonesia is above 5.0kg/ capita/year and is still very low when compared to many ASEAN countries as well as developed countries, but only above the India. Population, production and consumption meat of broiler chickens in Indonesia in the past few years is increasing rapidly along with the development technology, especially in the farming sector (*on farm*) which too sophisticated so the production process becomes faster. The commercial broiler DOCs are grown in company farms owned by the large integrators (10%), contract farms (70%), or independent farms (20%). Recently, seven companies of about 956 companies in the broiler industry in Indonesia controls 53.52% in 2003 and in 2012 has increased from 108 companies broiler scattered throughout the country, seven companies control about 60.32%. Actually broiler industry still has large growth potential and good prospects in Indonesia, given the low number of national consumption of broiler meat compared to other countries. Some other contributing factors that increase the demand of broiler meat products is mainly because of most the majority Muslim population of Indonesia, the relatively lower prices of broiler meat than beef and the belief that white meat is healthier than red meat.

Keywords: prospects, broiler industry, Indonesia

Introduction

Broiler chicken is one kind of birds that many farmed and supplier majority (55%) of meat production in Indonesia with a population of over 255.08 million people in 2016, followed by cattle (19%), native chicken (10%), pigs (8%), goats (7%) and other livestock (1%). Total consumption of chicken meat in Indonesia is above 5.0kg/ capita/year and is still very low when compared to many ASEAN countries as well as developed countries, but only above the India (USAID, 2013; Henuk and Bakti, 2015 - Figure 1).

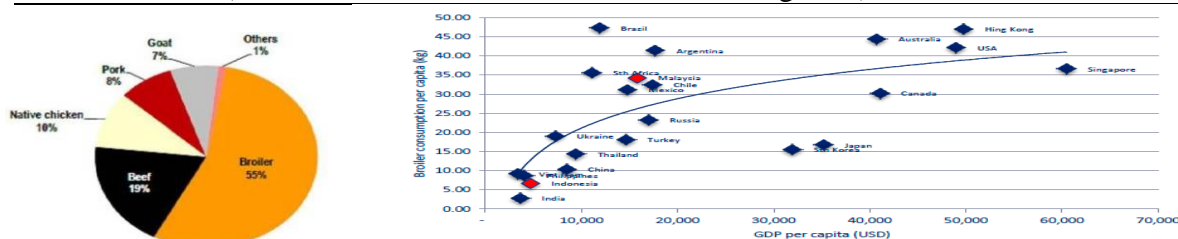


Figure 1. Broiler meat consumption in Indonesia compared with other countries.

The broiler industry is profitable due to the short cycle, which is less than two months. Broilers are chickens slaughtered at the age of approximately seven weeks and weight 1.8 kg. The ever-present demand causes the quick capital turn-over. The highest cost in broiler production is the expenses on feed. The feed itself takes up 70% of the total production cost. The 2% reduce in feed price will increase the profit up to 8%. The expensive price of feed is mainly caused by the imported ingredients, such as corn. Chicken feed consists of 40%-50% corn; the remainder is bran, by products of copra, and fish meal. Therefore, corn price will determine chicken feed price. The fluctuations of input and global competition are currently the two factors affecting the development of the broiler industry in Indonesia (Firdaus and Komalasari, 2010). This paper reviews literature which identifies prospects of broiler industry in Indonesia.

Prospects of Broiler Industry in Indonesia

Population, production and consumption meat of broiler chickens (Table 1a) in Indonesia in the past few years is increasing rapidly along with the development technology, especially in the farming sector (*on farm*) which too sophisticated so the production process becomes faster (Mulianny, 2015). The commercial broiler DOCs are grown in company farms owned by the large integrators (10%), contract farms 70%), or independent farms (20%). The average farm size is small, with a capacity for 5,000-20, birds. Birds are grown to 1.0 – 2.0kg (average of around 1.4kg at 30 days of age). Mortality on broiler farms is 6 – 7%. Average feed conversion ratio (FCR) is about 1.6 – 1.7: 1, with significant variation throughout the country due to widely differing housing, animal health, and management practice. A typical flow of activities in the commercial broiler sector in Indonesia is presented in Figure 2 (USAID,2013).

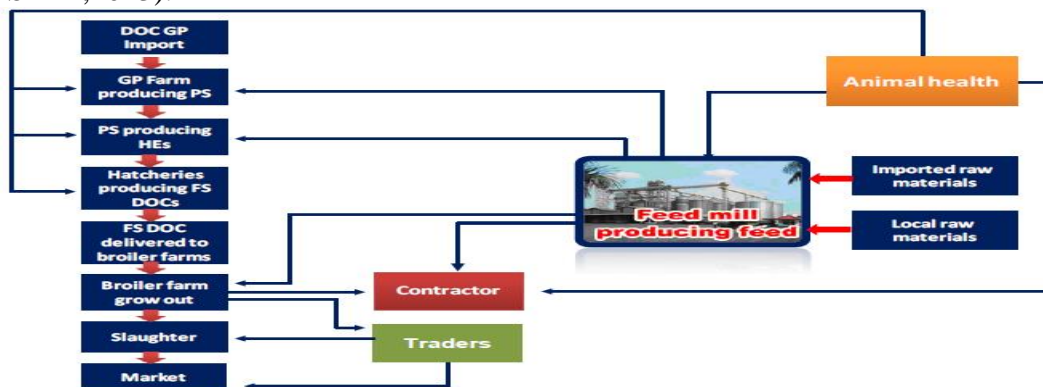


Figure 2. A typical flow of activities in the commercial broiler sector in Indonesia.

Table 1a. Broiler chicken population and production in Indonesia (1984 – 2015; Mulianny, 2015).

Wilayah	Tahun	Populasi (Ribuekor)	Pert. (%)	Produksi (Ributon)	Pert. (%)
Jawa	1984-2015	410.235	35,03	476,13	12,98
	2011-2015	955.820	9,70	1.081,57	-6,51
Luar Jawa	1984-2015	204.126	7,80	204,13	9,55
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	2011-2015	1.341.512	8,83	1.481,55	6,05
Kontribusi Terhadap Indonesia periode 2011-2015 (%)					
Jawa		71,25		73,00	
Luar Jawa		29,85		27,02	

Table 1b. Total consumption of meat chickens from both commercial and native breeds of chickens in Indonesia (2011 – 2015; Muliiany, 2015).

Tahun	Ayam Ras (Kg/Kap/Th)	Pertumb. (%)	Ayam Buras (Kg/Kap/Th)	Pertumb. (%)	Total (Kg/Kap/Th)	Pertumb. (%)	Konnas Ayam (Ton/th)	Pertumb. (%)
2011	3,650		0,626		4,276		1.034.683	
2012	3,494	-4,286	0,521	-16,667	4,015	-6,098	985.382	-4,765
2013	3,650	4,478	0,469	-10,000	4,119	2,597	1.024.953	4,016
2014	3,988	9,260	0,499	6,374	4,487	8,932	1.131.514	10,397
2015*)	3,973	-0,369	0,522	4,561	4,495	0,180	1.148.366	1,489
Rata-rata	3,751	2,271	0,528	-3,933	4,278	1,403	1.064.980	2,784

Nowadays, when viewed from either the number of integrated companies, non-integration and small farmers, broiler industry in Indonesia consists of very large number of players. However, the company that operates the integration only slightly and increasingly dominate, such CPIN and JPFA, which has business lines ranging from DOC nursery, feed mills and processing. Growers usually buy DOC and feed from the company's integration. Some players are not integrated in the business only has a nursery or in the manufacture of feed. Recently, seven companies of about 956 companies in the broiler industry in Indonesia controls 53.52% in 2003 and in 2012 has increased from 108 companies broiler scattered throughout the country, seven companies control about 60.32%. Actually broiler industry still has large growth potential and good prospects in Indonesia, given the low number of national consumption of broiler meat compared to other countries (Figure 1). Some other contributing factors that increase the demand of broiler meat products is mainly because of most the majority Muslim population of Indonesia, the relatively lower prices of broiler meat than beef and the belief that white meat is healthier than red meat (Fitriani *et al.*, 2014).

Conclusions

Broiler industry still has large growth potential and good prospect in Indonesia, given the low number of national consumption of broiler meat compared to other countries. Some other contributing factors that increase the demand of broiler meat products is mainly because of most the majority Muslim population of Indonesia, the relatively lower prices of broiler meat than beef and the belief that white meat is healthier than red meat

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Structural Adaptation and Concentrating Capacity of Ruminant Kidney: Buffalo, Cattle and Goat

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Abstract

The structural adaptations and urinary concentrating capacity of the kidneys are examined in the three ruminant species: buffalo, cattle and goats; it was designed as a factorial experiment of 3 (species) x 2 (sex) x 2 (position) with 5 animals as replication of a species. External and internal dimensions were measured, and used to determine some indices: Specific Density (SD), Percentage of Medullary Thickness, Relative Medullary Thickness and Medullary-Cortex ratio, and urine osmolality were estimated. Data were analysed using variance analysis and continued by Duncan Multiple Range Test. The results indicated that all indices within the same species were not significantly different (male vs female, and left vs right), while all these indices were significantly different in different species, and these differences were consistent that goats > cattle > buffalo, and these structural features are attributable with kidney urinary concentrating capacity of these three ruminant species.

Keywords: *ruminant, kidney, urinary concentrating capacity*

Introduction

Buffalo, cattle and goats are belonging to ruminant species. Different species have been developing different adaptive strategies to face environmental stress (Rahardja et al., 2011), which involved the specific development of structural, functional, behavior or life style as a whole. Buffalo, for example, developed wallowing behavior in mud or pond as a homeostatic effort to regulate and to maintain body temperature and body fluid particularly under hot and water scarcity, while cattle and goats did not develop this behavior. According to functional aspects under dehydration condition, publication of Maloiy et al. (1979) elucidated that water turnover rates of buffalo, cattle and goats were 535, 348 and 136 ml/kg^{0.82}/24 h respectively; Urine/Plasma osmolality ratios were 4, 6 and 7 – 8 respectively; fecal water content of these ruminants were >80, 65-75, and 40-50 %. All measures above indicated that water utilization by the goats was the most efficient compared with cattle and buffalo. These functional aspects have apparently been supported by structural aspects which developed evolutionary.

Kidney is the main organ regulating and maintaining homeostatic system of the body fluid (volume and osmotic pressure) which then the functions of various organs in the body may be maintained normally. Although goats, cattle and buffalo were not included in a research involving more than 30 species of mammal, Brownfield and Wunder (1976) and Munkacsi and Palkovits (1977) revealed that there is a close positive relationship between medulla thickness and urine concentrating ability of the kidney. It is, therefore, in addition

to this pivotal function of the kidney, the study reported herein is to validate the relationship between functional and structural aspects of the kidney in buffalo, cattle and goats.

Methodology

All kidneys used in this study were collected from animals slaughtered in Tamangapa Slaughter house – Makassar, which included left and right kidneys of 5 male and 5 female of buffalo, cattle and goat, and their ages varied between 3 and 5 year old based on dentis examination.

After removed from the body, some exterior dimensions of the kidney measured before and after fixation (10% formalin) were weight, length, width, breadth at 2-3 positions using micro-meter, Dimensions of kidneys (length, width and thickness) by using “digital vernier caliper ruler”, and the coefficient of variation attributed with fixation of each measure varied between 1 and 2 %; therefore, the results of these exterior dimensions were not corrected.

Archimedes principle was used to determine the volume of the kidney, which then the volume was used to estimated the density of the kidney.

$$\text{Specific Density (SD)} = \frac{\text{Kidney weight (gr)}}{\text{Volume (ml)}}$$

After fixation, hand microtome was used to slice the kidney into an even number slices, but the slice thickness could be varied. The thickness of the renal cortex and medulla, were measure at 4-5 positions using micro-meter on the longitudinal section of the kidney median line; there were three indices measured, which were

1. Percentage of medulla thickness (Brownfield dan Wunder, 1976):

$$\text{PMT} = \frac{\text{Absolute Medullary Thickness (mm)}}{\text{Absolute Kidney Thickness (medulla+cortex)(mm)}} \times 100\%$$

2. Relative Medullary Thickness (Brownfield dan Wunder, 1976)

$$\text{RMT} = \frac{(\text{Medullary Thickness}) 10 (\text{mm})}{\sqrt[3]{(\text{length} \times \text{breadth} \times \text{width})(\text{mm})}}$$

3. Medulla-Cortex Ratio (M/C rasio) (Munkacsi dan Palkovits, 1977) M/C ratio

$$= \frac{\text{Absolute Medullary Thickness (mm)}}{\text{Absolute Cortex Thickness (mm)}}$$

4. Estimated Maximum Urine Osmolality (mosmol/kg) = 204 + 488 RMT (Brownfield dan Wunder, 1976)

Data were analyzed using analysis of variance and continued by Duncan Multiple Range Test (Statistical Package of Systat for Window vs.6)

Results and Discussion

The results indicated that the sd and all indices of the male (M) vs female (F) kidney within the same species of ruminants were not significantly different ($P > 0.05$); all indices of left vs right kidney within the same species were not significantly different ($P > 0.05$), while their were significantly different ($P < 0.05$) between different species; and these differencies were consistent that Goat > Cattle > Buffalo;

According to these results of structural aspects, it can be concluded that water economy of the goats were more effecient compared with cattle and buffalo.

Attributed to functional features, study of Brownfield dan Wunder (1976) involving more than 30 species of mammal reported that there is a significant positive relationship between PMT and maximum urinary osmolality ($r = 0,72$); between RMT and maximum urinary osmolality ($r = 0,80$); additionally, Munkacsi dan Palkovits (1977)

also indicated a significant positive relationship between M/C ratio and maximum urinary osmolality ($r = 0,77$). Kidney structural features varied among different species, which were developed along adaptation processes. The kidneys of ruminant, like other mammals, contain both a cortex and a medulla. The renal medulla enables concentrated urine to be produced, so it is not surprising that goat, cattle and buffalo have different capacity to produce such urine (Bankir and de Rouffigna, 1985; Braun and Dantzler, 1997).

Table 1. Mean values of kidney indices (PMT, RMT, M/C ratio and Estimated) of buffalo, cattle and goats.

KIDN INDEXES	SEX	GOAT		CATTLE		BUFFALO	
		LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT
SPECIFIC DENSITY	Male	1.29 ± 0.10 a	1.21 ± 0.13 a	1.16 ± 0.06 b	1.15 ± 0.02 b	1.09 ± 0,03 c	1.08 ± 0.03 c
	Female	1.25 ± 0.03 a	1.18 ± 0.08 a	1.14 ± 0.03 b	1.14 ± 0.02 b	1.07 ± 0,06 c	1.07 ± 0.05 c
	M vs F	NS	NS	NS	NS	NS	NS
PERCENTAGE MEDULLARY	Male	70.4 ± 2.81 a	72.62 ± 3.28 a	61.01 ± 1.71 b	59.89 ± 4.49 b	51.95 ± 3.22 c	52.57 ± 3.49 c
	Female	67.71 ± 2.43 a	68.39 ± 0.57 a	59.99 ± 2.29 b	56.81 ± 2.49 b	52.59 ± 3.27 c	52.24 ± 3.34 c
	M vs F	NS	NS	NS	NS	NS	NS
RELATIVE MEDULLARY THICKNESS	Male	3.88 ± 0.02 a	3.75 ± 0.10 a	2.97 ± 0.15 b	2.82 ± 0.08 b	1.73 ± 0.12 c	1.75 ± 0.11 c
	Female	3.56 ± 0.03 a	3.64 ± 0.08 a	2.92 ± 0.09 b	2.75 ± 0.08 b	1.75 ± 0.13 c	1.75 ± 0.14 c
	M vs FML	NS	NS	NS	NS	NS	NS
M / C RASIO	Male	2.43 ± 0.33 a	2.70 ± 0.38 a	1.57 ± 0.12 b	1.53 ± 0.30 b	1.14 ± 0.15 c	1.21 ± 0.19 c
	Female	2.11 ± 0.23 a	2.16 ± 0.06 a	1.51 ± 0.15 b	1.37 ± 0.15 b	1.17 ± 0.22 c	1.13 ± 0.13 c
	M vs F	NS	NS	NS	NS	NS	NS
ESTIMATED URINE OSMOLALITY (mosml/kg)	Male	2097.44	2034.00	1653.36	1580.16	1048.24	1058.00
	Female	1941.28	1980.32	1628.96	1546.00	1058.00	1058.00

Mean values in the same row with different letters indicated significant different ($P < 0.05$)

Conclusion

Accordingly, these structural aspects markedly proved that water economy of the goat was more efficient compared with that of cattle and buffalo. Therefore, it can be concluded that the goats with their kidney structures have higher concentrating capacity to produce a lower volume with higher osmolality of urine compared to that of cattle and buffalo. As an implication for particularly the small herder, that understanding these characteristics (attributed with water availability) may be useful to improve the rural farmer livelihood and to boost the incomes in the regions where these three species of ruminants are mostly managed.

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Doe Productivity of Etawah Grade Does Based on Hair Color Differences

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Abstract

The study was conducted to identify the productivity of Etawah grade does based on hair colors differences. Twenty seven Etawah grade does with 1.5-2.0 years old were classified into three based on the hair color differences, black-head; brown-head and mixed colors. Service per conception, length of pregnancy, post partum mating, litter size and kidding intervals were recorded. Kid crop, reproduction index and productivity then calculated. One way analysis was applied to analyze the variation between the means. All parameters related to doe reproduction and productivity did not significantly differ. Service per conception from 1.25 to 1.37 times, litter size from 1.11 to 1.37 head and kidding intervals was 223.87 to 229.27 days. Kid crop was 181.03; 142.88 and 177.40%; and doe productivity was 21.95; 18.92; and 23.09 kg/doe/year for black-head, brown-head and mixed color, respectively. Doe with black-head, brown-head and mixed colors had a similar productivity performances.

Keywords: doe, reproduction, productivity, hair color.

Introduction

In developing countries, goats have made a significant contribution to the rural economy as a whole (Devendra, 2001; Morand-Fehr et al., 2004), play a significant role in the poor rural households (Nimbkar et al., 2000; Lebbie, 2004) and contribute a substantial amount to the farmer's total income. Goats play an important role on the agricultural practices in Indonesia. There are many goat breeds kept by famers, one of them is called Etawah grade. Etawah grade goats can be found in all agro-ecological zones, although many farmers argues that Etawah grade goats are said to be more suitable for farming systems in the middle zone and uplands, because of the abundant availability of tree leaves (Budisatria 2006). Budisatria et al. (2015) stated that in recent years, there is a tendency that farmers prefer to keep Etawah grade goat with black head color instead of brown or mixed colors. Farmers perceived that keeping black head color will gain more benefitted, because they have relatively higher prices than the others. It was supported by the study of Baskoro (2014) who found that more than 65% of farmers interest on keeping black-head of Etawah grade does compared to brown-head or mixed colors. Based on the scientific reason, those perceptions could be caused by the variation of their ancestor, the blood composition of Etawah grade was dominated by pure Etawah goat, therefore the productivity of Etawah grade almost similar with the productivity of pure Etawah goat. There was a few information available in regard with the productivity of Etawah grade based on their differences hair colors, therefore this study evaluates the productivity of does based on different hair-colors.

Methodology

The study was conducted for twelve months. In total, 27 heads of Etawah Grade does of 1.5-2.0 years old were used for this study, it was divided into three groups based on their color, namely black head color, brown head color and mixed color, therefore, each group consisted of nine Etawah Grade does. The does were kept on slatted floor of individual housing (1.5 x 1.0 m). Basal feed offered were consisted of groundnut straw and concentrate feed, the ratio was 40:60%. Feed were given 3.5% on dry matter based. The does were mated with the bucks which have the similar hair color pattern. The service per conception and pregnancy length were recorded. The numbers of kid born per delivery were also recorded. Based on those parameters, the kidding intervals, kid crop, reproduction index and doe productivity were calculated. Doe performances in terms of kid crop, doe reproduction index, and doe production over a period of one year, were calculated for each doe by the following equations (Amir and Knipscheer, 1989).

One way analysis of variance were used to analyze the variation in does performances, including service per conception, post partum mating, pregnancy length, litter size, kidding intervals, kid crop, reproduction index, doe productivity and kids growth including mortality, birth weight, absolute and relative daily gain and milk consumption.

Results and Discussions

The productivity of Etawah grade does in terms of service per conception, post partum mating, pregnancy length, litter size, kidding intervals, kid crop, reproduction index and doe productivity is presented in Table 1. The statistical analysis showed that doe with black head color had a similar service per conception with the brown head and mixed color. The non significant effect of head color could be caused by the fact that Etawah grade originally come from the same breed, as stated by Maharani et al. (2015) that Ettawa Grade goats with different head and neck color have the same AG genotypes based on MC1R gene. Olfaz *et al.* (2011) also stated that the differences on the hair colors did not affect production of goat, therefore it is not recommended to use the hair colors differences as a kind of selection criteria. Service per conception of local goat breed in Indonesia is generally low and it was around 1.5 times. Budisatria and Udo (2012) however, found that under traditional management, Etawah grade goats kept by small farmers in Indonesia tend to have high service per conception, it was 1.8-1.9 times, it is indicated that the farmers have to mate their goat twice times before pregnant.

Table 1. Productivity of Etawah grade does based on hair color differences

Variables	Hair color		
	Black-head	Brown-head	Mixed color
Service per conception (time) ^{ns}	1.37±0.74	1.25±0.46	1.33±0.70
Post partum mating(d) ^{ns}	80.62±7.02	78.00±0.00	80.83±6.81
Pregnancy length (d) ^{ns}	146.37±3.29	145.87±3.18	148.44±0.88
Litter size(h) ^{ns}	1.37±0.51	1.37±0.51	1.11±0.33
Kidding intervals (d) ^{ns}	227.00±4.30	223.87±3.18	229.27±7.44
Kid crop (%) ^{ns}	181.03±103.69	142.88±57.77	177.24±54.60
Reproduction index (h/y) ^{ns}	1.81±1.03	1.42±0.57	1.77±0.54
Doe productivity (kg/h/y) ^{ns}	21.95±13.21	18.92±8.29	23.09±8.42

Post partum mating and the length of pregnancy of black, brown head colors and mixed color of Etawah grade does did not significantly differ. The interval between parturition and the first post partumo estrus is an important trait which contributes to the productive efficiency (Greyling, 2000). The prolonged kidding interval was responsible for a decrease in productivity of goats (Awemu et al., 1999). Budisatria and Udo (2012) found that

post partum mating of Etawah grade does kept by farmers in Yogyakarta province was 125 days.

The numbers of kid born per parturition did not significantly differs amongst black-head, brown-head and mixed colors of does. However, there is a tendency that litter size produced in his study relatively lower than previous study conducted by Sodiq et al. (2002) who found that the average litter size at birth of Etawah grade doe was 1.56 kids; 1.4-1.81 (Widi, 2002); and 1.7 (Budisatria and Udo, 2012). Low litter size could be caused by does in this study was relatively young (1.5-2 years old) and under first or second parturition. Study done by Das and Sendalo (2006) found that litter size increased significantly from first to fifth parturition, and decreased when the does reach the sixth parturition onward.

Kidding intervals of Etawah grade does with different hair color was not significantly differs, it was ranged from 223.87 days in brown head colors to 229.27 days in mixed colors. Budisatria et al. (2010) found that kidding intervals of Etawah grade was around 274 days, while other study was 10.21 months (Aka, 2008). Non significant result of kidding crop in this study caused by the fact that Etawah grade does have similar genetic traits (Maharani et al., 2015), however, kidding intervals was primarily affected by liter size, pregnancy period, weaning age and post partum mating.

There were no significant differences found on kid crop, reproduction index, and doe productivity of Etawah grade does. Kid crop was 181.03; 142.88 and 177.40% for black-head, brown-head and mixed color, respectively, while average reproduction index ranged from 1.43 (brown-head) to 1.81 head/doe/year (black-head). Doe productivity resulted in this study was 21.95; 18.92; and 23.09 kg/doe/year, respectively for black-head, brown-head and mixed color. Litter size, mortality, and kidding intervals are the main factors affecting kid crop, reproduction index and productivity. High litter size, short kidding intervals and low pre-weaning mortality rate will increased the reproduction and productivity, vice versa. Other study found that kid crop of Etawah grade doe was 176.6% (Aka 2008), while doe reproduction index was 2.36 (Utomo et al., 2005); 1.65 (Adhianto et al., 2013) and doe productivity was 24,82± 2,58 kg/doe/year (Aka, 2008); 23.51 kg/doe/year (Utomo et al., 2005).

Conclusions

The finding of the study concluded that although Etawah grade doe had variation in their head color, the reproduction and productivity remain similar as indicated by the same service per conception, post partum mating, pregnancy length, litter size, kidding intervals, kid crop, doe reproduction index and doe productivity.

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The Effect of Duration of Photoperiod and Light Intensity Toward First Age of Laying, Feed Consumption, Daily Egg Production, and Feed Conversion

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Abstract

Quail is a species sensitive to light stimulation. Light has a very important role in hormones production that is very essential on growth and reproduction. The objectives of this research was to analyze the effects of duration of lighting and the intensity of the light toward the first age of laying, feed consumption, and daily egg production of quail. The experiment was subjected to completely randomized design with 2 x 3 factorial patterns. The first factor (A) was duration of lighting consist of three levels; 16 hours, 20 hours, and 24. The second factor (B) was light intensity consist of three levels; 5 watt, 10 watt, and 15 watt from a bulb lamp. Based on the research, it was concluded that the duration of lighting give a significant different to the age of the first laying, feed consumption and daily egg production, while, the different light intensity contribute to significant different to feed consumption. There was no different among the treatment caused by the interaction between the two factors. It was suggested to give 24 hours of lighting for quail during pre layer and egg production period.

Keywords: *duration of light, light intensity, quail, performance*

Introduction

In Indonesia, quail (*Cortunix cortunix*) is a commodity developed for egg production. Market demand for quail eggs is not only for human consumption but also for additional feed for canaries and parakeets. In terms of investment, quail is a commodity that can be developed with relatively small capital, but the return of investment (RoI) is better as compared to laying hens, because it can produce eggs at forty days with over than 90% of egg production. Quail management is also very easy and simple. Based on those reasons make this commodity become more popular as a business sector for both a breeding and egg production.

There is one thing that is very interesting from quail behaviour. These birds are very sensitive to light stimulation compared with other laying birds such as ducks and laying hens. Based on the observations (Subagyo, personal communication, June 15, 2013) reduction in duration of lighting on layer quail period can reduce egg production dramatically. Scientifically, the light has a major role in the growth and reproduction for all livestock commodities. Response to light for Aves class begins when the embryo is still in the process of hatching. The main function of light for quail is not only to facilitate the animal for eating and drinking but also the light has a very important role in hormones production that are very essential on growth and reproduction. Light stimulation in quail may affect hypothalamus cells to produce Gonadotrophin Releasing Hormone (GnRH). These hormones affect the cells in the anterior pituitary to produce Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH). Both hormones are secreted and transported to the ovary through the bloodstream to activate the ovaries.

There are three important aspects in lighting that work together in order to activate hormone production in quail including; light intensity measured in lux , the duration of lighting (photo periodic) measured in units of time, and wavelength measured in nanometres. Wavelength and intensity of light are very influential on the stimulation received by the retina of birds, while heat produced by light intensity can affect the response of the skin to identify the environmental conditions. The duration of lighting stimulate the animal to climate changes (Hullet, M. and Darre, M., 2014)

Since the light has a very important role on the growth and reproduction of quail, it is very interesting to study the effect of duration of lighting and light intensity. This study used light bulbs with different light intensities; 5 watt, 10 watt, and 15 watts. The variables measured are involving; age of the first laying, daily quail egg production, feed intake, and feed conversion quail ratio.

Material And Method

Animal and experimental design

The strain of quail used was *Cortunix cortunix* japonica obtained from PT. Malindo Kediri. A total number of 135 female 1-d old quail were kept in wire cages (25 x 30 x 40 cm for each unit of experiment). The experiment was done by using completely randomized design with 2 x 3 factorial pattern and each treatment was three times repeated with 5 birds on each unit of experiment (27 units). The first factor (A) was duration of lighting consist of three levels; 16 hours, 20 hours, and 24 hours. The second factor (B) was light intensity consist of three levels; 5 watt, 10 watt, and 15 watt. Ambient temperature and relative humidity was recorded daily and adequate curtain was performed to assure adequate environment conditions to the birds. Feed and water were given *ad libitum*.

Experimental diet and equipment

This experiment used complete feed obtained from PT. Charoen Pokh Phand. Vitamin (vita stress) was given during the experiment. The quail was vaccinated with New Castle Diseases (ND) obtained from Medivax company. The lamp used was bulb lamp with the trademark of Chiyoda.

Statistical Analysis

Statistical analysis was performed by Analysis of Varian (Anova) two factor using Microsoft excel program on Microsoft office and differences between treatment means were evaluated by Duncan test Significance levels ($p < 0.05$ and $p < 0.01$) were indicated.

RESULT AND DISCUSSION

The effect of duration of lighting and light intensity to the first age of laying

Based on the analysis of variance with two factor (length of lighting and light intensity), it was found that the age of first laying in quail was influenced by two factors, whereas the length of lighting gave a very significant difference , while the different light intensity in each treatment gave a significant effect on age of the first laying . The interaction between the two factors did not contribute to different. Based on the average of age to the first laying (see Table 1), it was showed that quail produce eggs faster (41.33 days) when given lighting for 16 hours with a light intensity of 10 watts (A2B2).

Table 1. The average of age of the first laying of quail

Light Intensity (B)	Long light exposure (A)			Average
	16 Hours	20 Hours	24 Hours	
5 Watt	44,67 ± 0,58	42,67 ± 0,58	43,33 ± 0,58	43,56 ± 1,02 ^a
10 Watt	45,67 ± 0,58	41,33 ± 1,53	42,33 ± 0,58	43,11 ± 2,72 ^{ab}
15 Watt	44,33 ± 0,58	41,67 ± 0,58	41,33 ± 1,53	42,44 ± 1,64 ^b
Average	44,89 ± 0,69 ^b	41,89 ± 0,69 ^a	42,33 ± 1,00 ^a	

Due to the presence of light, quail respond through the sense of sight (eyes) which stimulates the hypothalamus to produce Gonadotropin Hormone to stimulate the pituitary gland to produce FSH and LH, these hormones play a role in the reproductive process (Elfiandra, Ulupi, N., and Purwanto, B.P., 2007). Lighting also facilitates the animal for feed consumption. Based on the Duncan test, it was found that 16 hour of lighting different to 20 hours and 24 hours. However, 20 hours of lighting was not significantly different to the 24 hours. It can be concluded that, the lighting for 20 hours (presented in figure 1) gives the best results in terms of energy savings. Giving the light for 16 hours makes quail slower to mature than the other two treatments. The results of this study are substantiated with the findings of Putra, S.V.H, Peniati, E., and Marianti, A. (2013) who reported that the size of ovarium of quails provided with 16 hours (bulb lamp with red colour) were much more bigger (3.46 ± 2.71 g) than those on 12 hours of natural lighting (0.06 ± 0.02 g).

Light intensity influence the age of the first time for laying in quail. The difference in the level of light intensity gave a different level of light stimulation for the brain that might be different in hormone production. Based on the Duncan test, the use of 15-watt bulbs was not significantly different compared with the use of 10-watt bulbs, while 5 watt bulbs lamp led to slightly slower quail compared with the two other treatments.

The effect of duration of lighting and light intensity to the daily feed consumption

Based on the analysis of variance, it was found that feed intake in quail was significantly influenced by both factors. Table 2 shows that the duration of lighting gave a significant different ($P < 0.01$) to feed intake, by which quail consume more feed on 24 hours of lighting 22.05 ± 0.18 g (A3). Based on the Duncan test, it was found that the duration of lighting gives a very real effect on each treatment (16 hours, 20 hours and 24 hours). Feed consumption was increased proportionally as the duration of given lighting. Lowest feed intake (based on Table 4) was on 16 h lighting followed by 20 hours and 24 hours. This could be attributed to photoperiod, by which lighting give a chance for quail to feeding. The results reveal that the mean daily feed intake under 24 hours continuous lighting was $22,05 \pm 0,18$ g, which was significantly ($p < 0.01$) higher than that of the quails under other light regimens.

Different intensity of light gave a significant different ($P < 0.01$) to feed intake. Based on the Duncan test, it was found that different light intensity gave a significant influence on each treatment (5 watts, 10 watts and 15 watts). The lowest feed intake (based on Table 4) was in 5 watts lamp followed by 10 watts and 15 watts. On the other hand, the combination between the two factors did not contribute to a different.

Table 2. The average of daily feed consumption of quail during the treatment

Light Intensity (B)	Long light exposure (A)			Average
	16 hours	20 hours	24 hours	
5 Watt	$21,66 \pm 0,03$	$21,80 \pm 0,02$	$22,03 \pm 0,04$	$21,83 \pm 0,05^a$
10 Watt	$21,63 \pm 0,05$	$21,86 \pm 0,05$	$22,01 \pm 0,01$	$21,83 \pm 0,08^a$
15 Watt	$21,74 \pm 0,03$	$21,97 \pm 0,01$	$22,10 \pm 0,03$	$21,94 \pm 0,04^b$
Average	$21,68 \pm 0,18^a$	$21,87 \pm 0,19^b$	$22,05 \pm 0,18^c$	

The effect of duration of lighting and light intensity to daily egg production

Based on the analysis of variance, it was found that daily egg production in quail was significantly influenced by the duration of lighting. The different light intensity and the interaction between the two factors did not contribute to a different. Based on the Duncan test, the duration of lighting gives a significant different to each treatment. The highest daily egg production was appointed to the third treatment (24 hours of lighting) as much as 91,33% followed by second and the first treatment respectively (see table 3). Triyanto, Ulupi, N., and

Purwanto, B.P. (2007), reported that giving 22 hours of lighting to quail on laying period (6 to 13 weeks) contribute to a better egg production compared with 20, 18, and 16 hours of lighting per day. Jatoi, A.S., Khan, A.K., Sahota, A.W., Akram, M., Javed, K., Jaspal, M.H., and Khan, S.H. (2013) reported that the longest photoperiod (16L; 8D) significantly produce more egg production than in other experimental treatments.

Table 3. The average of daily egg production of quail during the treatment

Light Intensity (B)	Long light exposure (A)			Average
	16 hours	20 hours	24 hours	
5 Watt	72,00 ± 1,73	77,00 ± 0,00	88,67 ± 2,51	79,22 ± 8,55
10 Watt	73,00 ± 1,73	76,00 ± 1,73	90,33 ± 1,15	79,78 ± 9,26
15 Watt	72,33 ± 2,88	77,00 ± 3,00	95,00 ± 1,73	81,44 ± 11,96
Average	72,44 ± 0,50 ^a	76,67 ± 0,57 ^b	91,33 ± 3,28 ^c	

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Integrated Rice-Duck Farming System in Asia

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Abstract

Asia has accounted for the vast majority of rice and meat-duck production in the world. As regards rice production, among the top 5 rice exporters in the world with their shares, namely Thailand (27%), Vietnam (16%), India (14%), United States of America (10%) and Pakistan (9%), top 4 rice exporters in the world are came from Asia shared 67% of the global output. As the leading producer of meat ducts, Asia shared 83.8% of the global output. Rice farmers in tropical and subtropical Asia have practised various forms of rice–livestock integration. Among others has the wisdom of making use of the omnivorous and scavenging nature of ducks been inherited. It is no wonder that about 80% of the world’s duck meat is produced in Asia. The most common practice of integrated rice–duck farming is to herd ducks into rice paddies after harvest so that ducks can feed on spilled rice grains. Rice-duck farming can be classified into three types based on the degree of interaction between rice farming and duct. Most rice-duck integration takes place in the form of Type 1 or Type 2 mainly because of the trend of agricultural specialization. An overwhelming majority of ducts are raise now by those farmers who are specialized in duct growing with a density of 200 – 300 birds per hectare. In conclusion, integrated rice-ducts farming system is not only helpful in reducing contemporary land degradation and agricultural pollution caused by the excess of agrochemicals, but it is also conducive to food security in Asia where the vast majority of the world’s rice and duct-meat is produced.

Keywords: *rice-duck, farming system, Asia*

Introduction

Asia has accounted for the vast majority of rice and meat-duck production in the world (Suh, 2015). As regards rice production, among the top 5 rice exporters in the world with their shares, namely Thailand (27%), Vietnam (16%), India (14%), United States of America (10%) and Pakistan (9%), top 4 rice exporters in the world are came from Asia shared 67% of the global output (Henuk and Bakti, 2016). As the leading producer of meat ducts, Asia shared 83.8% of the global output (Chen and Applegate, 2016). Rice farmers in tropical and subtropical Asia have practised various forms of rice–livestock integration. Among others has the wisdom of making use of the omnivorous and scavenging nature of ducks been inherited. It is no wonder that about 80% of the world’s duck meat is produced in Asia. The most common practice of integrated rice–duck farming is to herd ducks into rice paddies after harvest so that ducks can feed on spilled rice grains. It is observed in China that rice fields just before a new rice season were utilised to feed ducks with a great abundance of angleworms. In some Asian countries including China and Vietnam, ducks used to be herded into paddies

even during rice vegetation periods in order to feed ducks with animal pests (Suh, 2014). Integrated rice-duck farming system in Asia are described in the following sections.

Integrated Rice-Duck Farming System in Asia

In the integrated rice-ducts farming system, duckling are grown in rice paddies during vegetation periods in such a way that the two otherwise separate elements become mutually beneficial. Weeds and pests in rice paddies serve as food for ducts, and ducts manure furnishes soil nutrients for rice production. This system is conducive to both rice yield and sustainable agriculture. The significance and merits of the system being recognized, *Dong's Rice Fish Duck System* in China has been designated as a Globally Important Agricultural Heritage System by FAO. Integrated rice-duct farming system has been a flagship of sustainable-agriculture movements in Asia since the early 1990s. The integrated rice-ducts farming system has been reintroduced from Japan into many other Asian countries including China, South Korea, Vietnam and the Philippines thanks to rapid information dissemination through symposiums, videos, books and mass media. Nevertheless, the concept of integrated rice-duct farming system has yet to be embraced by more than a tiny minority of rice farmers in Asia so as to put it in place as an ecologically and economically sustainable agriculture (Suh, 2015). Traditional rice-duct farming focused on fattening ducts. One of the important characteristic of it is that releasing ducts into rice paddies is not only to fatten ducts, but also intended to make creative use of ducts for the purposes of weeding, pest controls and rice yields. For these purposes, paddy fields need to be puddle and leveled in such a way that the surface is evenly flat and has no islands or shallow spots. The water level also needs to be maintained as deep as the feet of bills of ducts can barely touch the paddy bed (Suh, 2014). The economic estimation of rice and duct-meat production in some selected countries in Asia is presented in Table 1 (Suh, 2014).

Table 1. The economic estimation of rice dan duct-meat production in Asia (Suh, 2014: 76).

Country	Per capita GDP (US\$)	Rice production (thousand tonne)	Duct-meat production (thousand tonne)
South Korea	27,000	5804	65
Vietnam	2874	39,989	75
Malaysia	13,186	2548	116
Asia	-	607,328	3331
World	9889	672,016	4031

Rice-duct farming can be classified into three types of the degree of interaction between rice farming and duct as presented in Table 2. Most rice-duct integration takes place in the form of Type 1 or Type 2 mainly because of the trend of agricultural specialization. An overwhelming majority of ducts are raise now by those farmers who are specialized in duct growing with a density of 200 – 300 birds per hectare (Suh, 2015). Mollison and Slay (1991) explained that ducts are excellent permaculture animals and has many advantages. They can be raised without elaborate housing, and will readily thrive on natural foods. They clean up waterways of green algae, water weeds, and tubers, at the same time fertilizing watercourses which aids in fish and eel production. They eat snails, insects, worms and weeds in orchards and gardens, and because they do not scratch or eat mature greens, can let into the garden at appropriate time to consume insects.

Table 2. Classification of rice-duct farming (after Suh, 2015: 296).

Ty-pe	Degree of inte-gration	Characteristics	Countries practised
1.	Inde-pendence of minimal interaction	Ducts are free-grazed in natural or human-made water resources such canals, ditches, swamps, or ponds but are kept out of rice fields at all times. Ducts are fed with rice bran and rice grains. This type of rice-duct farming can improve economic resilience for a farm, but the benefits	

		from one component do not carry into the other. Thus, interactions between the two agricultural activities are minimal.	
2.	Loose integration	Ducks are herded in rice fields between harvest and planting so that they can feed on spilled rice grains as well as insects and worms.	South-east and East Asian countries, including China, Cambodia, Vietnam, the Philippines and Indonesia.
3.	Functional integration	A rice crop (<i>Oryza sativa</i>) is concurrently cultivated with ducks. Ducklings are allowed in rice fields at tillering stage to feed on insects and worms that cling to the base of rice plants. It also be called “rice-duck joint production”, because rice and ducks are grown on the same tract of land simultaneously so that farmers can benefit from the synergy of the two complementary components.	China, Vietnam

Conclusion

Integrated rice-ducks farming system is not only helpful in reducing contemporary land degradation and agricultural pollution caused by the excess of agrochemicals, but it is also conducive to food security in Asia where the vast majority of the world’s rice and duck-meat is produced.

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**Oral Presentation 1 Focus Session:
Socio-Economics and Agribusiness
Wednesday, 19 October 13:00-14:00
Room: Welirang**

An Assessment of Indonesia's Beef Supply Chain

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Abstract

The objective of this article is to assess Indonesia's beef supply chain and its evolution. Methods of information and data analyzes were descriptive, analytical or assessment based on evidence from the existing condition of Indonesia's beef supply chain and its evolution. From the 2011 census it is estimated there are approximately 6 million livestock farmers in Indonesia, with a cattle population of approximately 14 million. Accordingly, the vast majority (99.80%) of these producers have only one or two head of cattle so do not see beef as a trade business, but more a means for holding and growing wealth, only selling cattle for slaughter when money is needed for special occasions or needs. This means they tend to be unreliable sources of beef production. Indonesian beef demand estimated at more than 3.80 million (of live cattle) in 2016, with a lack is about 30.00 percent of domestic beef production capacity. The gap between local consumption and production was traditionally filled by live cattle and beef imports. The vast majority of cattle in Indonesia are sold through an 'open' (spot marketing system), comprised of a plethora of actors including a hierarchy of traders, butchers and inter-regional traders. Despite wider access to modern retailers, Indonesian consumers still prefer 'warm' (freshly cut) meat from traditional 'wet' markets that sell local produce. Wet market meat is perceived to be fresher than frozen imported boxed beef.

Keywords: *self sufficiency, demand, consumption, production, market*

Feasibility of Sugarcane - Cattle Integration Model in Supporting Farmers Self Sufficiency and Prosperity in Kerinci Regency, Province of Jambi

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Abstract

The study was aimed to assess the feasibility of sugarcane–cattle integration model in terms of technical, institutional, social, commercial, financial and economic feasibility to farmers self sufficiency and prosperity in Kayu Aro Barat District, Kerinci Regency. This study was conducted with survey method. Stratified Random Sampling consisted of two strata was used, i.e. strata I was sugarcane farmers which integrated to cattle production, and strata II was sugarcane farmers which not integrated to cattle production. Each index used present value from cost and benefit flows that were NPV, Net B/C ratio and IRR. Path analysis was used to assess the effect of integration model to farmers self sufficiency and prosperity. The study found that integration sugarcane-cattle production was feasible. Institutional, commercial, and economic aspects were partially affect to farming self sufficiency. Technical, commercial, financial and economic aspects were partially affect to farmers prosperity in sugarcane-cattle integration in Kayu Aro Barat District, Kerinci Regency.

Keywords: integrated farming system, feasibility, cattle production, sugarcane

Introduction

The new paradigm of livestock development is based on the development of livestock region by utilizing local resources. Utilization of local resources implemented efficiently based on the principle of mutual support through the development pattern of integrated farming system toward "zero waste management".

Crop - Livestock Integration System (CLI) is the intensification of agricultural systems through the management of natural resources and environment integrated with livestock component as part of business activities. The concept of CLI is to provide a synergistic advantage, a multiple advantage derived from crops and livestock and results of their interaction. The interaction of these two farming commodities may be occurred if there is utilization of crop plants by products (the remaining crops) for cattle feed and manure for crops, vice versa (Hardianto, 2008).

One of the integration farming systems which potential to be developed in Kerinci regency in Jambi province is the cattle production integrated with sugarcane farming. The community in Sungai Asam village, Kayu Aro Barat district as the center of sugarcane in Kerinci regency, use cattle power as generator for their traditional refineries or sugarcane processing machine. The farmers also use the sugarcane by product such as bagasse and molasses for feeding cattle.

Materials and Methods

Kayu Aro Barat District is one of a highland vegetable production center in Kerinci regency. But not only vegetable, there's also sugarcane plantation center which is lied in Sungai Asam village where this research was conducted. The farmers who planting sugarcane plant, some of them also raising cattle.

The method of this study was survey. Sampling technique used in this study was *Stratified Random Sampling* (Rasyid, 1994), consisted of two strata that were Strata I was sugarcane farmers which integrate sugarcane farming practice with cattle production, and strata II was sugarcane farmers which not integrate sugarcane farming practice with cattle production. From each strata then it was selected sampling unit through *simple random sampling technique*.

The Model and Analytical Framework

Descriptive statistics was applied on the basic characteristics of the sampled households included number of cattle and land owned by the farmers, and also cane production. The validity test was conducted by correlate each question score to total question for each variable. The reability test was addressed to reveal whether data collecting tools indicated level of sensitivity, accuracy, stability or the consistence of the tools in revealling a certain symptom from a group of individual, eventhough it was done in different periode of time. Instrument of reability test in practice used split half methods, with steps as followed:

Data Transformation through Method of Succesive Interval (MSI)

Measurement scale from collected data was vary that were ordinal and ratio scale. Ordinal data in this research were transformed in to interval scale by using MSI (Sutawidjaya, 2000)

Analyses Model

Analyses model in this study included feasibility, sensitivity analysis, and path analyses. In order to find out the overall measurement of whether or not the sugarcane – cattle production integration model used a wide variety of indices called Investment Criteria. Each index used *present value* from cost and benefit flows, that were *Net Present Value* (NPV), *Internal Rate of Return* (IRR), and *Net Benefit-Cost Ratio* (Net B/C). *Sensitivity analysis* was done to avoid the unaccuracy in calculation and to anticipate the changes in accepted variable and input cost. This analyses aimed to reveal how the feasibility of integration model of sugarcane-cattle if there's some changes in the basic calculation cost or benefit. To find out how the impact of integration model of sugarcane-cattle on farming self sufficiency and farmers' prosperity in Kayu Aro Barat District, Kerinci Regency used *path analysis*.

Results and Discussions

Technical Aspect

Technical aspect from integration model of sugarcane-cattle in the study area was input and output which required and produced. The input in integration model of sugarcane-cattle is cattle. The ownership level of cattle relatively vary in a range of 1 – 4 heads. The number of cattle owned and land owned by the farmers and cane product are depicted in Table 1.

The farmers who integrated their sugarcane farming practice with cattle production used the animal for milling the cane to produce extract sugar juice, and manure produced from cattle used for sugarcane fertilizer, where this reduced the cost for chemical fertilizer (Phoska, KCl). According to Hartono (2011) cattle farming may support and fullfil the need of households. Farmers use the family workers to find forage (grasses) or collect agricultural by product for feed. Then as the output, cattle produce calves, cattle itself and manure for fertilizer.

Table 1. Number of cattle owned and the owned of land by the farmers, and cane product in sugarcane-cattle integration model at Kayu Aro Barat District, Kerinci Regency

Variables	Range	Percentage (%)
Number of cattle (heads)	< 2	29,23
	2	43,08
	>2	27,69
The land owned (ha/farmers)	< 1	12,00
	1	49,33
	>1	38,67
Cane product (cane/year)	20000	65,33
	20000 – 30000	30,67
	30000	4,00

Another input is land for planting sugarcane. An average of land owned by the farmers was 1,36 ha/farmer with a range between 0,5 – 3,0 ha/farmer. Preston (1983) explained that sugarcane is one of successful tropical crops which have high production and wide range of agronomic factor such as soil type and pest and disease. Sugarcane is another input for processing sugar. The amount of cane produced by the farmers in a range of 7200 – 43200 cane/year with an average of 20531 cane/year. By product from sugarcane mills is bagasse used for fuel to cook sugar and the residue in the form of filter mud send back to the soil for sugarcane fertilizer. Preston (1983) stated the high moisture and ash (from soil contamination) contents of the filter mud preclude its use as livestock feed other than in exceptional circumstances. Overall, from technical aspect point of view that input and output required and produced in this integration model was feasible.

Institutional Aspect

Most of the farmers in the study area are belong to a certain farmer group organization (82.67%). Farmer group organization in this study assesed by the formed of social capital and the owned of physical resources, in spite of the ability of team work of the farmer group member which was reflected on farmer group dynamic. From institutional aspect where as included social resources, physical resources and the dynamic of farmer group, this integration model was feasible.

Social Aspect

Social aspect feasibility represented from community response dan another related institution and also distribution of benefits of the sugarcane-cattle integration model to community. Here, the benefits were consisted of *direct benefits* dan *indirect benefits*. *Direct benefit* from this integration model in average was Rp. 75.894.613,- /farmer/year, ranging from Rp. 34.376.000,- up to Rp. 138.000.000,-. Around 56 % farmers received direct benefit less than Rp.75.000.000,- /year, and 44% received more than Rp.75.000.000,- /year.

Indirect benefits or secondary benefits from this integration model were the development of sugarcane farming, cattle production and sugar processing/refinery. The sugarcane farming had been established within 17 years, meanwhile for cattle production within 16 years, in average. Wibowo et al (2006) stated that periode of time in establishing and conducting farming practice might increase the skill and knowledge of the farmers in adopting and applying technology. Another indirect benefit occured if there's some efficiency in farming system in terms of input costs such as fertilizer, feed and fuel.

Commercial Aspect

Commercial feasibility in this integration model included the availability of required input and marketing of produced output. In this integration model, cattle value was around Rp. 11.590.769,- /head/year, in average. Meanwhile sugar value was around Rp. 49.559.040,-

/farmer/year, in average. Commercially, the integration model of sugarcane-cattle in this study was feasible. According to Preston (1983) sugarcane is still an exclusive for sugar production. In sugar refinery industry, some different process will result by product which have significant commercial value and potential as cattle feed.

Financial Aspect

The feasibility of financial aspect included cost and revenue earning from sugarcane-cattle integration model. *Net Present Value* (NPV) from this integration model in average was Rp. 48.880.832,- of 12% discount factor. Based on that result, it could be concluded that this integration model was feasible because the revenue earning from this farming practice was bigger than the expenditure cost. The feasibility criteria from this integration model financially could also be calculated from Net B/C value. The study found that Net B/C value was 1,50 at 12% discount factor. It mean that this integration model was feasible to be developed because at each Rp 1.000.000,- expenditure cost would be earned around Rp 1.500.000,- revenue. IRR value from this integration model was 30,50%. It mean that this integration model was feasible to be developed. Limited rate which can be applied in this model was 30,50%. Gradiz (2007) stated that feed and fertilizer cost at sugarcane-cattle integration model where cattle was fed with cane top as main feed and manure was used for supplementing inorganic fertilizer is lower than scenario model (cattle was fed with *Lolium perene* as main feed and manure was not used).

Economic Aspect

Economic feasibility of sugarcane-cattle integration model in the study area play an important role in regional economic development. This integration gave the benefits to the farmers around Rp. 46.983.707,- /farmer/year. In terms of economic aspect, this integration model was feasible. Gradiz (2007) stated that the use of cane top for feeding cattle and manure from cattle for supplementing inorganic fertilizer, economically was feasible.

Impact of Sugarcane-Cattle Integration Model on Farming Self Sufficiency and Farmers' Prosperity

Table 2. Direct and Indirect Effect on Farming Self Sufficiency in Sugarcane-Cattle Integration Model at Kayu Aro Barat District, Kerinci Regency

Endogenous Variable	Direct Causal Effects	Indirect Causal Effects through Variable			Total Causal Effects
		X ₂	X ₄	X ₆	
X ₂	3,03	0,00	1,25	-4,12	0,16
X ₄	22,47	1,25	0,00	-4,78	18,94
X ₆	47,75	-4,12	-4,78	0,00	38,84
<i>Total Causal Effects of Farming Self Sufficiency</i>					57,94

Which as :

X₂ = Institutional Aspect

X₆ = Economic Aspect

X₄ = Commercial Aspect

Path analysis obtained that the farming self sufficiency was affected by institutional, commercial and economic aspects. It was determined by 0,16% of institutional aspect, 18,94% of commercial aspect and 38,84% of economic aspect (Table 2).

The indigenous variables from path analysis which affected farmers' prosperity were technical, commercial, financial and economic aspects. Farmers' prosperity in integration model was determined by 35.44% of technical aspect, 5.20% of commercial aspect, 55.20% of financial aspect and 3.44% of economic aspect (Table 3).

Tabel 3. Direct and Indirect Effect on Farmers' Prosperity in Sugarcane-Cattle Integration Model at Kayu Aro Barat District, Kerinci Regency

Endogenous Variable	Direct Causal Effects	Indirect Causal Effects through Variable				Total Causal Effects
		X ₁	X ₃	X ₄	X ₅	
X ₁	19,54	0,00	-1,94	16,60	1,25	35,44
X ₄	2,56	-1,94	0,00	4,46	0,13	5,20
X ₅	32,38	16,60	4,46	0,00	1,77	55,20
X ₆	0,29	1,25	0,13	1,77	0,00	3,44
<i>Total Causal Effects Farmers' Prosperity</i>						99,29

Where as :

X₁ = Technical Aspect

X₅ = Financial Aspect

X₄ = Commercial Aspect

X₆ = Economic Aspect

Conclusion

The study could concluded that the integration model of sugarcane-cattle was feasible. Institutional, commercial, and economic aspects were partially affect to farming self sufficiency. Technical, commercial, financial and economic aspects were partially affect to farmers' prosperity in sugarcane-cattle integration model in Kayu Aro Barat district, Kerinci regency.

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Profile Analysis and Application of Technology in The Farmer's Group of Ettawa Crossbred Goat in Yogyakarta Indonesia

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Abstract

The potential profile of Ettawa crossbred goat in farmer's group and application of technologies that have already done and important to know the strength of the resource group. This research aims to identifying characteristic farmers and the application of technology of maintenance, feed, waste processing, and reproduction of goat. Research conducted in Kulon progo and Sleman Regency which is Ettawa crossbred goat production center in Yogyakarta and taken 2 Sub which is a center for breeding and milking that is Sub Kokap and Turi. Sampling of respondents groups carried out a census of livestock as 6 groups in the villages of Hargotirto and 10 groups in the village of Girikerto. The results showed that the village of Hargotirto have lower average land area (4.70 ha) but higher livestock populations (142 goats) compared to the village of Girikerto Sleman. The application of technology of maintenance and feed the village Hargotirto is better in all groups already apply the selection male and doe and the fermentation of the feed (100,00%), but on the other hand waste processing technology (80.00%) and reproduction of goat that is the males for mating naturally belongs to itself, the litter size is higher than the village of Hargotirto. This is because of the high school equivalent. The implications of the research are the need for measuring the goat carrying capacity and socialization for the increased application of technology in order to increase the productivity of Ettawa crossbred goat.

Keywords: *profile of farmer's group, technology, livestock productivity*

Profile of Farmers' Groups and Its Affectivity in Supporting Agribusiness on the Smallholder Beef Cattle in Yogyakarta Province, Indonesia

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Abstract

Cattle as a supplier of local beef in Indonesia, almost all of them was maintained by smallholder. An effort to develop business scale and efficiency are formed farmer groups has been since 20 years ago. This study attempts to understand the current group profile and explore the extent to which the effectiveness of the group in bringing the farmers to apply the agribusiness system for increase their welfare. Seventy farmer groups in Sleman and Bantul Regency of Yogyakarta as a sample and primary data was collected with survey method through depth interviews using a structured questionnaire. An effectiveness of the farmers' groups was divided into four major components such as implementation of activities related with upstream, on farm, downstream and the supporting sub system. Frequency tables and simple percentage analyses were used for analyses. An index for calculating the effectiveness of the farmer group was developed by weighing average method using judges' opinions to measure the four components. Ten experts were asked to weigh each component so that the total became hundred percent. Results of the research showed that age of the farmers' groups was 11.94 ± 6.43 years, number of members was 29 ± 14 farmers and the number of beef cattle was 59 ± 36 heads per group. Effectiveness of the Farmers' groups was the total effectiveness of the four components and found to be 49.77%.

Keywords: *farmers' groups, smallholder beef cattle, agribusiness implementation, effectiveness of farmers' group*

Socioeconomic and Productive Performance of Smallholder Dairy Farming Lampang Province, Northern Thailand

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Abstract

Thirty-nine small holder dairy farms in Lampang province were randomly selected then using questionnaire, interview and farm records as data collection tools in different quarterly year 2014. Milk sample was pooled taken monthly from each farm to determine milk composition. The result revealed that most dairy farmers were male, ranged 50-59 years of age with a primary educational level ($P < 0.05$). The main roughage was a scaled sweet corn husk with cob, available residue from a whole kernel sweet corn canning factory nearby. Hybrid Napier grass was grown for cut and carry supplementation while extra rice straw was supplemented in the last quarter due to inadequate amount of the main roughage. Each farm, herd size was ranged from 43.12 to 46.26 animals with 18.11 to 20.35 of milking cows. Milk yield averaged 9.74 to 11.08 kg/cow/day ($P < 0.05$). Milk yield and income over feed cost were higher in early year ($P < 0.05$) while milk quality increased in the last two quarters ($P < 0.05$).

Keywords: smallholder, dairy, Lampang, Thailand

Introduction

Dairy production has been one of among the food production systems of animal origin which produces milk to support the demand of milk consumption in northern Thailand. The total number of milking cows in this area was 33,008 heads which produced 122,824 tons of raw milk or contributed to 11.51% of the gross milk production in the country. Lampang milk production was approximately 2,592 tons, contributed to 2.11% of upper northern gross production and ranked the fourth in milk production after Chiang Mai, Lamphun and Chiang Rai (Office of Agricultural Economics, 2014). Like other parts of the country, milk production systems in upper northern Thailand are mostly operated by smallholder cooperative dairy production systems which are sustainable and mature. However, research data of smallholder dairy farms in Lampang province is limited. The objective of the study was to survey their socioeconomic characteristics, productive performance and economic return.

Methodology

Lampang province is located at latitude: 18°16'N, longitude: 99°30'E or 18.3°, 99.5° in decimal degrees (about 500 km north of Bangkok or 90 km south of Chiang Mai). The population of smallholder dairy farms was 43 households and registered to the Lampang Dairy Coop, Ltd. The sample size was calculated using the formula: $n = N/(1+Ne^2)$ where n = sample size, N = population size, e = margin of error at 95% confidence interval (Yamane

,1973). The sample size in this study was: $43/[1+(43 \times 0.05^2)] = 38.83$ or 39 households or 90.70 % of the population. The questionnaire consisted three sections. Section A elicited data on general characteristics of dairy farm entrepreneur including gender, age, educational background, career path and dairy raising experience. Section B elicited data on available feed stuffs and feed purchases by dairy farm entrepreneurs. Section C elicited data on productive performance of dairy cows which obtained from farm records provided by the Lampang Dairy Cooperative. Milk sample from each farm was incorporated and pooled taken monthly to analyzed for fat, protein, lactose, solid-not-fat and total solid by Combi Foss 6000 (Foss Electric, Hillerød, Denmark) and somatic cell count by Fossomatic (Foss Electric, Hillerød, Denmark). Feed cost was estimated from ration allowance in kg/cow/day. Milk income was estimated from kilograms of milk produced per cow per day and actual milk price received from the milk collecting center. Income over feed cost was selected as the measure for comparing the financial performance (Buza *et al.*, 2014). The data from section A and B was analyzed using descriptive statistics, non-parametric method and Chi-square by SPSS while mean comparison was done using Wilcoxon signed rank test (SPSS, 2006). Data on milk yield and composition in section C was analyzed using the general linear model procedure which treatment means were compared by Duncan's new multiple range test and significance was declared when P-value <0.05 (SPSS, 2006).

Results and Discussion

The socio-economic characteristics and animal performances are shown in Table 1 to 4.

Table 1: Characteristics of smallholder dairy farmers in Lampang province, northern Thailand in 2014.

Items	Frequency	Percentage	Chi-square	P-value
Gender				
Male	33	84.61		
Female	6	15.38	18.692	0.001
Age of farmers, year				
20-29	2	5.13		
30-39	12	30.77		
40-49	4	10.26		
50-59	19	48.72		
60-69	2	5.13	28.821	0.001
Educational background				
Not educated	1	2.56		
Primary school	13	33.33		
Junior high school	6	15.38		
Senior high school	5	12.82		
Higher certificate diploma	7	17.95		
Bachelor degree	7	17.95	11.615	0.040
Career path				
Main career	35	89.74		
Supplementary career	4	10.26	24.641	0.001
Dairy raising experience, year				
1-5	16	41.02		
6-10	16	41.02		
11-15	7	17.95	4.154	0.125

Table 2: Number of animals in smallholder dairy farms in Lampang province, northern Thailand.

Items	Period				Chi-square	P-value
	Q1	Q2	Q3	Q4		
Herd size, head/farm						
Total	46.26 ^a	44.38 ^{bc}	43.12 ^b	45.53 ^{ac}	10.646	0.014
Milking cow	19.55 ^a	20.35 ^b	18.11 ^c	18.36 ^c	20.700	0.001
Dry cow	3.45 ^a	2.74 ^b	4.54 ^c	3.93 ^{ac}	26.075	0.001
Heifer	11.19	11.54	11.44	11.79	0.584	0.900
Female calves	8.69	8.30	7.76	8.96	6.635	0.085
Male calves	3.32 ^a	1.37 ^b	1.63 ^{bc}	2.63 ^a	27.093	0.001
Herd size, %						
Milking cow	43.86 ^a	48.46 ^b	44.43 ^a	42.01 ^a	29.363	0.001
Dry cow	7.33 ^a	6.19 ^b	10.59 ^c	8.55 ^{ac}	24.545	0.001
Heifer	21.99	22.42	23.87	23.32	2.811	0.422
Female calves	19.23	19.37	18.35	20.32	3.179	0.365
Male calves	7.55 ^a	3.42 ^b	3.96 ^{bc}	6.20 ^a	25.033	0.001

Q1=January to March, Q2=April to June, Q3=July to September and Q4=October to December.

^{abc}Within rows, means followed by different letters are significantly different at (P<0.05).

Table 3: Feed sources of smallholder dairy farmers in Lampang province, northern Thailand.

Items	Period			
	Q1	Q2	Q3	Q4
Available feed sources				
Scaled sweet corn husk with cobs	Purchase	Purchase	Purchase	Purchase
Hybrid Napier grass	Cut & carry	Cut & carry	Cut & carry	Cut & carry
Rice straw	-	-	-	Purchase
Commercial concentrates	Purchase	Purchase	Purchase	Purchase
Amount of purchase feed, dry matter basis				
Roughage, metric ton/farm				
Sweet corn husk with cobs	20.57	20.73	20.54	11.67
Rice straw	-	-	-	9.63
Concentrates, metric ton/farm				
Commercial concentrate	8.12	8.09	8.12	8.15
Frequency of feeding/day	2	2	2	2
Size of green fodder plot, ha/farm	0.46	0.46	0.46	0.46

Q1=January to March, Q2=April to June, Q3=July to September and Q4=October to December.

Table 4: Performance and economic return of smallholder dairy farms in Lampang province, Thailand

Items	Period				S.E.	P-value
	Q1	Q2	Q3	Q4		
Milk yield						
Head/d, kg	10.77 ^{ab}	11.08 ^a	9.77 ^b	9.74 ^b	2.02	0.015
3.5% FCM, kg/head/d	11.05 ^{ab}	11.28 ^a	10.03 ^b	10.13 ^b	2.02	0.027
Milk composition						
Fat, %	3.66 ^a	3.62 ^a	3.67 ^a	3.76 ^b	0.16	0.010
Protein, %	2.96 ^a	2.96 ^a	3.02 ^b	3.04 ^b	0.09	0.001
Lactose, %	4.85	4.93	4.86	4.87	0.19	0.366
Solid-not-fat, %	8.48 ^a	8.53 ^b	8.59 ^c	8.60 ^c	0.08	0.001
Total solid, %	12.14 ^a	12.19 ^{ab}	12.26 ^{bc}	12.36 ^c	0.02	0.001
Somatic cell count, ×10 ³ cell/ml	312.08	412.35	412.51	406.04	211.06	0.164
					Chi-square	P-value
Economic return						
Feed cost, \$/cow/d	2.32 ^a	2.23 ^b	2.55 ^c	2.62 ^c	24.938	0.001

Milk income, \$/cow/d	5.62 ^a	5.63 ^{ab}	5.18 ^c	4.99 ^c	10.238	0.017
IOFC, \$/cow/d	3.30 ^a	3.40 ^a	2.63 ^b	2.38 ^b	15.375	0.002

Q1=January to March, Q2=April to June, Q3=July to September and Q4=October to December.

IOFC=Income over feed cost. Thai Baht to USD Exchange rate 2014: Jan-Mar=0.030677, Apr-June=0.030873, July-Sept=0.031203, Oct-Dec=0.030627.

^{abc}Within rows, means followed by different letters are significantly different at (P<0.05).

Conclusion

Male was mostly dominated in smallholder dairy farmers. They fed scaled sweet corn husk with cobs as primary roughages for cows. Milk yield and income over feed cost were the highest in early period of the year. Both quantity and quality of supply roughages to dairy cows may be essential factors to enhance milk yield and income over feed cost especially in the last two quarters. Further research should be conducted to monitor farm management aspects and other related costs to maximize the profit margin and farm sustainability.

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Analysis of Maize Feed Industry: A Supply Chain Perspective

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Abstract

Maize have strategic role in feed industry. This paper aimed to analysis highlight and find out of important issues in maize supply chain which affected competitiveness of fee industry. We conduct a survey method. A framework Food Supply Chain Network (FSCN) was used to analysis the supply chain. Result of this paper are *firstly*: there are 3 structure of maize feed supply chain; *second* : farmers, village collectors, middleman, wholesaler, feed industry and poultry farmer were the primary member of the supply chain. Secondary member were seed producers, suppliers of farm equipment and transportation providers; *third* the supply chain face any threats especially at farm level. We highlight are several issue along the supply chain, there are: low of productivity, low of product quality, and limited supporting facilities can be threat competitiveness of feed industry.

Keywords: *maize, chain, feed industry*

Oral Presentation 2 Focus Session:

Feed and Nutrition 1

Wednesday, 19 October 14:00-15:00

Room: Panderman 1

Production and Milk Composition of Crossbred Etawah Goats Fed on Basal Diet Containing Different Levels of Sesbania (*Sesbania Grandiflora*) Leaves

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Abstract

The study was aimed to evaluate the effect of feeding different levels of sesbania leaves (*Sesbania grandiflora*) on production and milk composition of crossbred Etawah goats given basal diet of field grass with 0% (T0), 7% (T1), 14% (T2) and 21% (T3) sesbania leaves. Sixteen lactating crossbred Etawah goats with initial body weight of 36.7 ± 0.76 kg were randomly assigned into four dietary treatments so that each treatments had four replicates. Every day, each goat in all treatments was given 500 g concentrate made up of by-product of fried traditional snack; rice bran; urea and mineral mix (in proportion of 47.5%; 47.5%; 3% and 2% respectively) and 1 kg fresh banana peel. The results showed no significant difference ($P > 0.05$) in total dry matter (DM) intakes among treatments. But, the DM intake of concentrate of goats fed on 21% sesbania leaves was significantly lower than those fed on control (T0) diet. Similar pattern was observed for milk production. It was significantly increased by enhancing the sesbania leaf levels, but milk protein content reduced for goats fed on 21% sesbania leaves. Milk fat content did not affected by dietary treatments, but there was a trend that it decreased as levels of sesbania leaves increased. This finding indicates that feeding less than 21% sesbania leaves in basal diet does not result in significant improvement in productivity of lactating crossbred Etawah goats.

Keywords: crossbred Etawah goat, milk production and composition, levels of sesbania leaves, feed intakes

Introduction

Crossbred Etawah Goats in West Nusa Tenggara, Indonesia are being developed as a dual purposes goat type (meat and milk) to enhance nutritional status of local people (Asih *et al.*, 2015). However, not all farmers milking their goats for their nutritional status and their income due to low milk production of those goats, particularly in dry season due to lack of feed availability. Vice versa, to get an optimum milk production, the goats should be fed sufficient amount of good quality feeds. This forces farmers to spend much money which is impossible thing to do. To solve this problem, an exploration of potential locally by-product available feed were done on milking Crossbred Ettawa Goats (Asih *et al.*, 2014) and on growing-female Crossbred Ettawah Goats (Asih *et al.*, 2015) fed a concentrate consisted of 1:1 by-product of traditional fried snack industry (*rontokan gorengan*) and rice bran with 3% urea and 2% mineral mix could increase milk production and maintained the growth rate of the goats. The weaknesses of the results were the low concentrate intakes due to the high fat content of the by-product of fried traditional snack. It is expected that when the concentrate intake could be higher than the former results, the goats' productivities could also be enhanced because of increasing total dry matter intakes. To achieve this purpose, it is

therefore very important to look for alternative feed locally available as a supplement to improve milk quality and production.

Sesbania leaf is one of the tree legumes could increase milk production in humans (Widiyanti, 2009). It also a potential forage which has a high complete nutrient content (crude protein: 30.1%; fiber: 5.1%; carbohydrate: 42.3%; and ash: 10.4%) for milking goats, but its availability is very limited. Its production is relatively lower compared with other forage. It is only about 2 – 3 tons/hectare/year lead to its price to be expensive, so its' use must be efficient. Therefore, to find out the optimum level of *Sesbania grandiflora* leaf in basal diet to improve the quality and production of Crossbred Ettawa Goats milk without disturbing their digestive system, it was conducted a study to evaluate the feed intakes, milk production and composition of Crossbred Ettawa Goats given similar concentrate as previous studies (Asih *et al.*, 2014; Asih *et al.*, 2015) and basal diets containing different levels of sesbania (*Sesbania grandiflora*) leaves.

Methodology

The study was conducted in "Gopala goat farm" located in Sengkongo Village, West Lombok, by using sixteen lactating crossbred Ettawah Goats (2 to 3 years old with the initial body weight of $36,7 \pm 5,3$ kg; for a period of one month lactating) were divided into four groups of four goats and each group was fed on one of four additional level sesbania treatments (T0 = 0%; T1= 7%;T2 = 14% and T3 = 21% sesbania leaves on DM basis based on the preliminary study according to Completely Randomized Design.

Table 1. The amount of feed implementation to each treatment on lactating goats on DM basis, except for banana peel on fresh basis

Types of feeds (kg/head/day)	Treatments				Frequencies and times feeding
	T0 (0%)	T1 (7%)	T2 (14%)	T3 (21%)	
Field grass	1 kg	1 kg	1 kg	1 kg	3 x a day (morning; noon; afternoon)
Sesbania leaf	0 kg	0.07 kg	0.14 kg	0.21kg	1 x a day (morning)
Banana peel	1 kg	1 kg	1 kg	1 kg	1 x a day (morning)
Concentrate*	0.5 kg	0.5 kg	0.5 kg	0.5 kg	1 x a day (morning)

* Theconcentrate was made up of by-product of fried traditional snack; rice bran; urea and mineral mix in proportion of 47.5%; 47.5%; 3% and 2% respectively.

The goats were penned in individual cages and the feeding technique is shown in Table 1. Daily feed intake of each feed type and total daily DM intakes were measured for 6 weeks, while milk production was measured for three weeks at last 3 weeks of the study and milk samples were taken in the last week of the study to measure the milk composition (total solid, protein and fat content). Data were analyzed using PROC ANOVA (Sas, 1990) and differences between treatment means were separated using Duncan multiple range test.

Results and Discussion

Responses of milking crossbred Ettawah goats fed additional sesbania leaf levels on dry matter (DM) intakes of each feed, total DM intakes, milk production and composition is presented in Table 2. Increasing levels of sesbania leaf in the forage did not significantly ($P>0.05$) influence DM intakes of each feed, except for DM intake of concentrate. It reduced when the treatment levels increased due to the goats prefer to finish sesbania leaf first than consume the concentrate. However, milk production enhanced significantly ($P<0.05$) with increasing sesbania leaf levels up to 21%, although the total DM intakes were not differ among the treatments (Table 2). This indicates that the nutrient content of the 21% sesbania leaf level played an important role in milk production, and lower levels was not efficient.

In contrary, milk protein contents decreased significantly when the goats given additional sesbania level of 21% and the milk fat content also declined, although it was not significant ($P>0.05$). This result was in accordance to the basic dairy theory that when the milk production increase, milk composition reduced.

The best response of the 21% sesbania treatment on milk production and in body condition of the does until the end of the study indicated that those levels is a minimum level in the basal diet of field grass fed to lactating crossbred Ettawah goats. Further study is still needed to find the optimum sesbania level in the diet of milking goats.

Table 2. Nutrient intakes, water consumption, ADG, and FCR of growing-female crossbred Ettawah goats.

Parameter	T0 (0%)	T1 (7%)	T2 (14%)	T3 (21%)	Sign
DM Intake of feed					
Field grass (kg/day).	0.9020	0.8450	0.8900	0.7250	Ns
Banana peel (kg/day)	0.1375	0.1400	0.1400	0.1375	Ns
Concentrate (kg/day)	0.3200 ^a	0.2875 ^{ab}	0.2925 ^{ab}	0.2475 ^b	**
Concentrate (g/kg BB)	8.9 ^a	8.0 ^{ab}	7.8 ^{ab}	6.7 ^b	**
Sesbania leaf (kg/day)	0.00 ^d	0.07 ^c	0.13 ^b	0.20 ^a	***
Total DM intakes (kg/day)	1.3600	1.3350	1.4525	1.3100	Ns
Productivity					
Milk production (ml/day)	587.00 ^b	651.50 ^{ab}	763.30 ^{ab}	853.80 ^a	**
Milk protein content (%)	3.57 ^a	3.68 ^a	3.62 ^a	3.07 ^b	**
Milk fat content (%)	7.66	6.27	6.58	5.94	Ns
Body Weight Changes					
Initial weight (kg)	36.00	36.13	37.63	37.00	Ns
Final body weight (kg)	36.38	37.25	38.88	38.50	Ns

Ns: not significantly different; **: significant different; ***: highly significant different

Conclusion

Feeding *sesbania grandiflora* leaves with the level of less than 21% of the basal diet does not result in significant improvement in productivity of lactating crossbred Ettawah goats. It needs further study to find out the optimum levels of this feed in different types of basal diets given to lactating goats.

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The Fermentation of Bagasse with Fungi *Ganoderma lucidum* and Its Ligninolytic Enzyme Activity

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Abstract

Fermentation of bagasse with fungi *Ganoderma lucidum* was designed to determine the optimum time to get the best growth and the optimum laccase activity of *G. lucidum*. Treatments were combination of inoculums dose (4% and 8%) and incubation time (0, 2, 4, 6, 8 week). The treatments were arranged in factorial 2x5 and allocated in completely randomized design with three replications. *G. lucidum* was grown in potato dextrose agar (PDA) medium for 7 d and was inoculated to make inoculum of *G. lucidum* in rice bran medium. The result showed that there was interaction of inoculums doses and fermentation time ($P < 0.01$) on laccase activity. The activity of laccase produced by *G. lucidum* increased by increasing fermentation time from 2 weeks up to 6 weeks; after 6 weeks the laccase activity gave different response; start to decrease in 4% inoculums, while in 8% inoculums was increased. The highest laccase activity was occurred at 8% inoculums dose and 8 weeks fermentation time, with value 6.93 U/mL. It can be concluded that *G. lucidum* used lignocellulosic substrate for its growth and produce laccase enzyme to degrade lignin of bagasse. The optimum fermentation to produce laccase enzyme and the optimum laccase activity were 6 weeks and 4% inoculums dose with value 6.44U/mL.

Keywords: ligninolytic enzyme, *ganoderma lucidum*, bagasse, fermentation

Introduction

Bagasse is a major by-product of sugar making. Bagasse contain nutrients which can be used as source of cellulose for animal feed, but it contain high lignin, while lignin is a limiting factor to digestibility of fibrous feed. Bagasse can also be used as substrate for growing fungi *Ganoderma lucidum*, which can degrade lignin by producing ligninolytic enzyme (Agustin *et al.*, 2015). Therefore, the digestibility of bagasse can be done by fermentation process using *Ganoderma lucidum*. *Ganoderma lucidum* (Curt, Fr) P. Karst (Ling zhi in Chineses) is a white-rot fungi, a species of the class Basidiomycetes, which can degrade substances which contain lignin by producing ligninolytic enzyme, such as laccase (EC 1.10.3.2) (Chang and Milles, 2004; Maciel *et al.* 2010).

Previous studies have shown that *G. lucidum* can degrade raw material such as rice straw (Agustin *et al.* 2013), palm by-product (Agustin *et al.*, 2010), bagasse (Agustin *et al.*, 2015) The ability of *G. lucidum* to degrade lignin is depended on the nutrients contain of substrate and the ability of *G. lucidum* to produce ligninolytic enzyme i.e laccase, lignin peroxidase and manganese peroxidase are affected by incubation time. Moreover, the effect of incubation time and nutrients content of the substrate on the development of *G. lucidum* and optimum condition need to increase enzyme activity, have not available yet. Therefore, this study was conducted in order to determine the optimum fermentation to produce laccase

enzyme and to find the optimum laccase activity based on inoculums dose and fermentation time on bagasse substrate.

Methodology

The experiment was carried out in 2x5 factorial design in completely randomized design, using three replicates (Gomez and Gomez, 1995). The first factor was inoculums dose: 4% and 8%; and the second factor was fermentation time: 0, 2, 4, 6, 8 week. Laccase enzyme activity was determined by measuring the oxidation of 2,2'-azinobis (Buswell *et al.*, 1995). The data were analyzed statistically according to two-way Analysis of Variance (ANOVA) and the difference between treatment means was determined using Duncan's Multiple Range Test.

Result and Discussion

The growth of *G. lucidum* have been observed, started from PDA medium to make starter. *G. lucidum* grew rapidly on PDA on the fourth until 7 d of incubation (Figure 1). The water content in rice bran substrate for making inoculums was 65% and this is still in range of recommended by Chang & Miles (2004) that is 60-65%. The starter of *G. lucidum* ready to be inoculated for making inoculums. In making inoculums, the mycellial grew well (Figure 2), because it was incubation at 16⁰C. Temperatuer for mycelia growth range from 15 t0 350C (Chang & Miles, 2004). The water content of bagasse which have been fermented with *G. lucidum* was 70%, and this was higher than recommended by Chang & Miles (2004) which was 60-65%. This is because the substrate for cultivation of *G. lucidum* was different. The growth of *G. lucidum* varied widely, depending on the kind of substrate and its composition (Rodrigues *et al.*, 2002; Erkel, 2009). The mycellial running well at the optimum pH 5.0 (Figure 3).

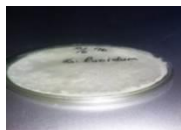


Figure 1. Starter



Figure 2. Inoculum

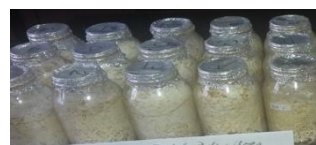
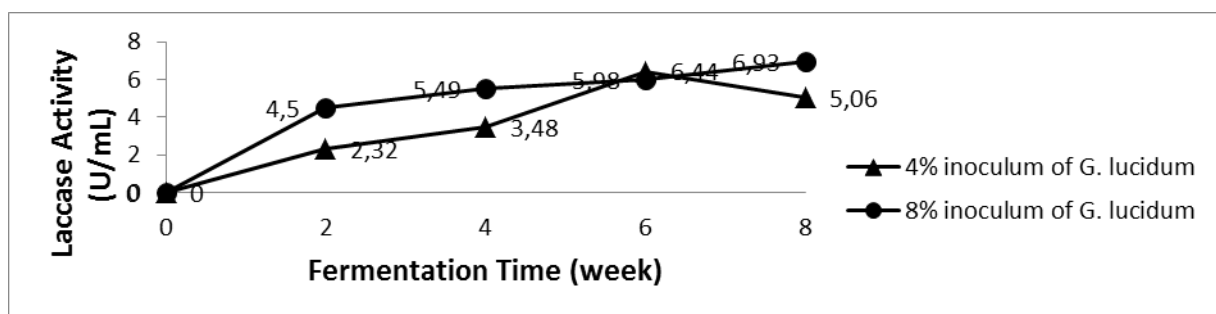


Figure 3. Bagasse Fermentation

The result showed that the laccase activity in substrate with 4% inoculums dose was higher than substrate with 8% inoculum. The activity of laccase prodced by *G. lucidum* increased by increasing incubation time from 2 week up to 6 week; after 6 week the laccase activity stardet to plateau (Figure 4).

Both of inoculums dose inoculated in bagasse substrate indicated the different trend (Figure 4). The laccase activities in 8% inoculums was increased continuesly until 8 week, but in 4% inoculums, the laccase activity decreased after 6 week. The laccase activity in 4% inoculums was higher than 8% inoculums at 6 week (6.44 vs 5.98 U/mL). The highest of laccase activity was occurred at 8% inoculums dose and 8 week fermenttion time, with value 6.93 U/mL. It can be concluded that *G. lucidum* used lignocellulosic substrtae for its growth and produce laccase enzyme to degrade lignin of bagasse. The optimum fermentation to produce laccase enzyme and the highest laccase activity were 6 week and 4% inoculums dose.



The ligninolytic enzyme are highly regulated by several nutrients (Kamitsuji, 2005), and their production is also affected by many typical fermentation factors, such as substrate composition, concentration of carbon and nitrogen, pH, temperature (Rodriguez *et.al.*, 2002).

Conclusion

G. lucidum used lignocellulosic substrate for its growth and produce laccase enzyme to degrade lignin of bagasse. The optimum fermentation to produce laccase enzyme was 6 week and 4% inoculums with the value of laccase activity was 6.44 U/mL.

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Encapsulated Biomineral Supplementation in Dairy Cattle Ration on *In Vitro* Fermentability and Digestibility

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Introduction

Supplementation is a technique that can be applied to improve dairy cattle productivity. Supplement can be made up of rumen fluid as the rumen fluid contain nutrients such as protein, vitamin, mineral and other nutrients produced by rumen microbes. This supplement is named as biomineral that differs from organic mineral (Tjakradidjaja *et al.* 2007; Tjakradidjaja *et al.*, 2009). Biomineral had high fermentability and degradability in the rumen (Tjakradidjaja *et al.*, 2007). To increase its availability and provide more bypass protein in post ruminal digestive tract, biomineral needs to be protected from degradation by rumen microbes in the rumen. Protection is conducted using 4 % (v/w) xylose through heat treatment. Xylose is a pentose sugar, $C_5H_{10}O_5$ (McDonald *et al.*, 2002); it is a byproduct of paper industry (as lignosulfonat) (Tarmansyah, 2009; Windschitl and Stern, 1988). Xylose can bind feed protein by heat treatment through Maillard reaction or caramelisation (Cleale *et al.*, 1987). This process is applied to encapsulate the biomineral and the optimum level of xylose for biomineral encapsulation is 4 % (v/w) (Mulyawati, 2009). This xylose - encapsulated biomineral had been applied as a supplement in ration of dairy cattle (Pipit, 2009); however, its effects on rumen fermentation and digestion have not been known. Therefore, this experiment is conducted to study effect of xylose - encapsulated biomineral supplementation in dairy cattle ration at different levels on *in vitro* fermentability and digestibility.

Methods

Biomineral was made up of rumen fluid obtained from beef cattle that was slaughtered in a slaughter house in Faculty of Animal Science, Bogor Agricultural University. Processing rumen fluid to produce biomineral was conducted following a procedure described by Tjakradidjaja *et al.* (2007). A procedure explained by Tjakradidjaja *et al.* (2007) and Mulyawati (2009) was applied for encapsulating biomineral. The biomineral was encapsulated using xylose black liquor (4 % v/w) that was heated using autoclave (121 °C, 15 min). After heat treatment, biomineral was added with a carrier material, and was dried under the sun (2 - 3 days) and in an oven (60 °C; 1 - 2 days). The dried biomineral was ground to become encapsulated biomineral powder. Original and encapsulated biominerals were then used in *in vitro* fermentability and digestibility experiment.

Two stage procedure of Tilley and Terry (1963) modified by Sutardi (1979) was used to study *in vitro* fermentability and digestibility. *in vitro* fermentation was done following the first stage by fermenting 1 g of each ration in 12 ml artificial saliva solution (McDougall solution) and 8 ml rumen fluid. Fermentation was conducted anaerobically at pH 6.9 (39 °C; 4 h) in a shaker water bath. Before stopping fermentation with saturated HgCl₂ solution (2

drops), samples were taken for bacterial (0.05 ml) and protozoal (1 ml) enumerations using Ogimoto and Imai method (1981). Fermentors were then centrifuged (3 000 rpm; 15 min). Supernatants were taken for determining ammonia and VFA concentrations, respectively using Conway microdiffusion and steam distillation methods (General Laboratory Procedure, Department of Dairy Science, University of Wisconsin, 1969). Residues were filtered through Whatman filter paper No. 41 using vacuum pump and then were used to analyse dry matter (DM) and organic matter (OM) degradabilities. DM degradability was calculated as follows: $\frac{\{\text{dried sample before incubation} - (\text{dried residue} - \text{dried blnk}) \text{ after incubation}\}}{\text{dried sample before incubation}} \times 100 \%$. This formula was also applied to calculate OM degradability by replacing DM with OM samples, residues and blanks. Moisture and DM contents were measured using an oven (105 °C, 24 h); ash and OM contents were measured after ashing those samples in a furnace (600 °C, 6 h). *in vitro* digestibility study was carried out following two stage procedure. The first stage was fermentation of treatment ration with rumen microbes using the same procedure as before, but the incubation time was extended to 24 h. Fermentation was stopped by adding 2 drops of saturated HgCl₂ solution, and fermentors were centrifuged (3 000 rpm; 15 min). Supernatants were discarded, the residues were added with 20 ml of pepsin - HCl 0.2 % (w/v). The residues were incubated aerobically at 39 °C for 24 h in a shaker water bath. The digested samples were filtered using a Whatman filter paper No. 41 with a vacuum pump. The digested samples were then treated with the same procedures as those applied for DM and OM degradabilities.

Rations consisted of field grass, KPS concentrate and tofu waste at ratio of 63.50 %, 11.32 % and 25.18 % on DM basis. Rations contained 10.79 % ash, 12.50 % crude protein, 1.13 % ether extract, 41.99 % crude fibre and 33.59 % non nitrogen free extract (NFE). These rations were typical rations used by dairy farmers in Cibungbulang, Bogor.

Treatments were R1 = control ration (field grass + concentrate); R2 = R1 + 1.5 % commercial mineral mix; R3 = R1 + 1.5 % control biomineral (without encapsulation); R4 = R1 + 0.5 % encapsulated biomineral; R5 = R1 + 1 % encapsulated biomineral; R6 = R1 + 1.5 % encapsulated biomineral; and R7 = R1 + 2 % encapsulated biomineral. This study was done using randomised block design with 4 blocks, and the block was rumen fluid obtained from 4 cattles. Variables measured were ammonia and VFA concentrations; dry matter (DM) and organic matter (OM) degradabilities in fermentability study, and DM and OM digestibilities. Data were analysed using analysis of variance (ANOVA), and differences among treatment means were determined with contrast orthogonal (Steel and Torrie, 1993).

Results and Discussions

Table 1 shows nutrient composition of original and encapsulated biominerals and commercial mineral mix. Both biominerals were less dried than the commercial mineral mix; that could be related to high concentration of Ca source in commercial mineral mix. There were no significant differences in nutrient composition between the two types of biomineral. In comparison to nutrient content of commercial mineral mix, both biominerals contained lesser ash and ether extract contents; greater crude protein, NFE and TDN contents; and similar content of crude fibre except for that of encapsulated biomineral. The higher contents of crude protein, NFE and TDN in biominerals could be due to the addition of carrier substances (wheat flour and agar); on the other hand, greater ash content in commercial mineral mix might be due to the addition of lime stone as Ca source and this was supported by Ca content of commercial mineral mix, *i.e.* 43.37 % vs 0.34 and 0.32 % in original and encapsulated biominerals. In addition, commercial mineral mix did not contain P (0 % vs 0.43 and 0.32 %) and had low S content (0.01 % vs 0.11 and 0.10 %) compared to original and encapsulated biominerals. The nutrient contents of original and encapsulated biominerals and commercial mineral mix did not alter nutrient composition of treatment rations because

the levels of all supplements added were not high. Nutrient composition of both biominerals were comparable to those obtained for control biomineral by Tjakradidjaja *et al.* (2009).

Table 1. Nutrient composition of original and encapsulated biominerals and mineral mix¹

Nutrients	Biomineral		Commercial mineral mix
	Original	Encapsulated	
Moisture content (% fresh matter)	15,52	15,18	0,26
Dry matter (% fresh matter)	84,48	84,82	99,74
Ash (% DM)	5,24	4,47	78,67
Crude protein (% DM)	21,02	20,46	0,84
Ether extract (% DM)	1,25	1,16	4,31
Crude fibre (% DM)	0,36	0,05	0,35
NFE (% DM)	72,12	73,87	16,69
TDN (% DM) ²	74,68	75,54	24,69

¹ Analysed by Feed Technology Laboratory, Faculty of Animal Science, Bogor Agricultural University (2008)

² Calculated TDN

Table 2. *in vitro* fermentability and digestibility of dairy cattle rations supplemented with xylose - encapsulated biomineral

Variables	Control ration +		Control ration + biomineral				
	0 mineral supplement	1.5 % commercial mineral mix	1.5 % original	encapsulated			
				0.5 %	1 %	1.5 %	2 %
Ammonia concentration (mM)	16.71 ± 4.58	15.22 ± 6.67	20.26 ± 9.19	16.82 ± 5.73	15.82 ± 6.70	15.13 ± 6.76	14.43 ± 1.33
VFA concentration (mM)	93.19 ± 58.71	93.11 ± 62.58	106.57 ± 73.78	105.14 ± 55.57	95.44 ± 38.52	98.14 ± 76.10	129.81 ± 27.76
DM degradability (%)	63.57 ± 15.99	60.95 ± 21.06	60.79 ± 25.32	55.32 ± 21.24	58.44 ± 21.04	55.00 ± 20.93	61.30 ± 25.21
OM degradability (%)	59.13 ± 6.69	56.79 ± 13.31	55.72 ± 17.52	53.95 ± 12.54	47.63 ± 12.14	52.84 ± 13.79	59.46 ± 11.02
DM digestibility (%)	72.14 ± 13.75	67.82 ± 21.38	71.61 ± 19.75	66.92 ± 19.63	68.39 ± 20.41	65.12 ± 22.36	72.08 ± 20.80
OM digestibility (%)	67.72 ± 7.49	69.70 ± 6.23	71.63 ± 6.61	69.94 ± 9.11	64.32 ± 12.92	68.09 ± 14.13	71.07 ± 7.25

Results show that treatments did not produced significant effects on all variables measured (Table 2). These results indicate that supplementation with encapsulated biomineral at different levels produced similar effects on fermentability and digestibility of dairy cattle ration to those supplemented with original biomineral at 1.5 % or with commercial mineral mix. No significant effects of encapsulated biomineral could be due to no differences in nutrient composition of control ration supplemented with encapsulated biomineral with that of control ration wether added with commercial mineral mix or with original biomineral as indicated above. In addition, supplementation with encapsulated biomineral should be given in more than 2 % (w/w) to improve fermentability and digestibilit of control ration. Large variations among treatments in all variables could be due to variations in rumen microbes in rumen fluids used; this could be in relation to feeds consumed by beef cattle before slaughtered.

Conclusion

It is concluded that encapsulated biomineral at 2 % (w/w) can be given as supplement in dairy cattle ration containing field grass, KPS concentrate and tofu waste (63.50 %, 11.32 % and 25.18 % on DM basis). To improve fermentability and digestibility of that ration, it is necessary to add encapsulated biomineral greater than 2 % (w/w).

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Effect of Packaging Medium on Survival of Napier Grass Stem Cutting

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Abstract

Napier grass (*Pennisetum purpureum*) is a species of perennial grass that has been used as ruminant feed because of high dry matter yield and most suitable for cut and carry to feed the animals. The napier stem also being traded among farmers and the planting materials has been sending via transportation and post. The problem begin when the purchased Napier grass stem cutting has to be hold for inspection and holding purpose. The plant can be wilt and half dead due to longer time before reach the customer's hand. The present study was conducted to generate new information regards on the best medium to be used for packaging plant stem cutting for postage and transportation purpose. The objective of the study is to identify the survival rate of Napier grass cutting after being pack in 5 different types of medium and keep for 1 month, where 100 mature Napier stem cutting, which consist of 50 samples of upper part and 50 samples of lower part in 5 different medium which are sawdust, paper wrapping, plastic wrapping, vacuum plastic and short immersion into fungicide. The entire packed Napier grass stem cuttings are then being postage and kept in the box for 1 month, and after 1 month of storage, the packed stem cutting was open and observed for the survival rate.

Keywords: *packaging, medium, survival, napier grass, stem cutting*

Introduction

Transporting of living plants materials by mail requires careful preparation and right packaging method of materials. Mailing garden plants across the country is fairly easy to do, but the best way is to choose the fastest method for the plant to travel, because some country have a very strict laws and limitations. Knowing how to ship the packed alive plant and the best way to pack them up for trading experience will enrich the supplier and receiver at the end of the line. Sending living packed plants through postage successfully depends upon careful packaging as well as acclimating the plant and sending it with enough water to survive for several days. Plants that get sent to hot regions or are shipped in winter will benefit from some insulation. So, the best packaging method and medium will determine the best arrival and least breakage along the way. There are four basic guidelines for postage living plant materials. First step is to prepare the plant, pick the best packaging method and medium, packing the plant, labelling and choosing a shipping company and speed are the primary important aspects to shipping the plants. The post office does a good job posting the plants.

The key is to find out and choose the best company that do it fastest and safest. For the postal service, choose priority mail at the very least. Also a good note to remember that many posting services do not deliver on Sunday and possibly not on Saturday; depending on the service that being choose. To make sure that the packaging spends as little time as possible in the box, plan on posting early in the week, such as Monday or Tuesday. This will ensure that packaging does not languish unnecessarily in the box over the weekend.

Other than that, do not forget to check the weather in both location, the supplier's current local weather and the one that packaging are posting to. If the location are about expecting extreme weather, wait to posting the packaging. It would be a shame to lose a plant simply because it got stuck in the broiling posting truck or because it death freezing. Then again the problem was detected when alive Napier grass stem cutting was packed and postage, especially the one that have to stay for quite in the packaging. This might happen when the packaging was postage across the border and country, where the immigration in some areas have a very strict laws and limitations, they will hold any living or alive postage material for further inspection.

Therefore, this study was to generate new information regards on the best medium to be used for packaging of Napier grass stem cutting for postage purpose by using five different selected media.

Methodology

Experiment Location and treatments

The mature Napier grass used in this research study was harvested from Malaysia Agriculture Exposition Park Serdang (MAEPS). The condition of Napier grass was mature enough and it is 8 weeks old. The length of each stem cutting was 1 meter long and then divided into two part which is upper part and lower part. Each Napier grass stem cutting at least consist of 3 nodes. For storage purpose, all the packed sample was stored in normal room condition with standard room temperature for 1 month.

The study consist of five treatments of packaging medium that was used to pack the Napier grass stem cutting. The treatments were (1) packed in vacuum plastic, (2) packed with sawdust, (3) packed in paper wrapping, (4) packed after short immersion of fungicide and (5) packed in plastic wrapping. The harvested mature grass stem cutting was divided into two part which is upper part and lower part and then wrapped and packed with respective treatment and each treatment have 20 replicate, 10 replicate for upper part and another 10 replicate for lower part stem cutting. All the wrapped sample were posted and kept for 1 month time. After that, the packaging was open and stem cutting was counted the survival rate.

Statistical Analysis

All the data was analyzed by using 2-ways ANOVA. The significance difference between the means was analyzed by using Duncan's Multiple Range Test at $p < 0.005$. The analysis was carried out using Statistical Analysis Software (SAS, 2011).

Results and Discussion

The survival rate of napiergrass stem cutting was made by observation once the packaging is opened. The upper and lower part of Napier grass stem cutting was packed using 5 different medium, postage and stored for 1 month in the room temperature. Below showed the result for survival rate of Napier grass stem cutting in different packaging medium.

The effect of different packaging medium (TR1, TR2, TR3, TR4, TR5) on the survival rate of Napier grass stem cutting was no different for the upper part stem cutting, as shown in Figure 1, there are significant different ($p < 0.05$) between the survival rate of upper part and lower part of stem cutting by different packaging medium. The best survival rate for both upper and lower part of Napier grass stem cutting is by using sawdust (TR5) as the packaging medium. This is because all 20 samples for both upper and lower part of Napier grass stem cutting are survived during the 1 month storing period

For plants to develop properly and survive, programmed cell death is an important response strategy to various internal and external cues. Morphologically, a key difference between programmed cell death of plant cells and apoptosis in animals is the absence of engulfment by neighboring cells in plants (Lam, 2004).

Plants emit a diverse array of phytochemical volatile organic compounds (VOCs). The production and emission of VOCs has been an important area of research for decades. However, recent research has revealed the importance of VOC catabolism by plants and VOC degradation in the atmosphere for plant growth and survival (Oikawa & Lerdau, 2013).

Based on the analyzed data result in the previous chapter, there are no significant different ($p < 0.005$) of different packaging medium on the survival rate. From the aspect of different stem part, there are significant different ($p < 0.005$) between different treatment on the survival rate of Napier grass stem cutting, where the lower part of Napier grass stem cutting showed more promising result as compared to upper part stem cutting. This is due to the higher energy content that was stored in lower part of stem cutting, and this energy was then being reserved and stored until the stem cutting was replant back. The upper part stem cutting did not store energy as much as lower part stem cutting as the energy that being supplied was utilized in the growing of new tiller, shoot and leaf. So when the upper part of Napier grass stem cutting was cut and stored, it will slowly wilt and become dead if the storage period is too long, where there are no more energy in the stem to maintain the survival (Figure 1).

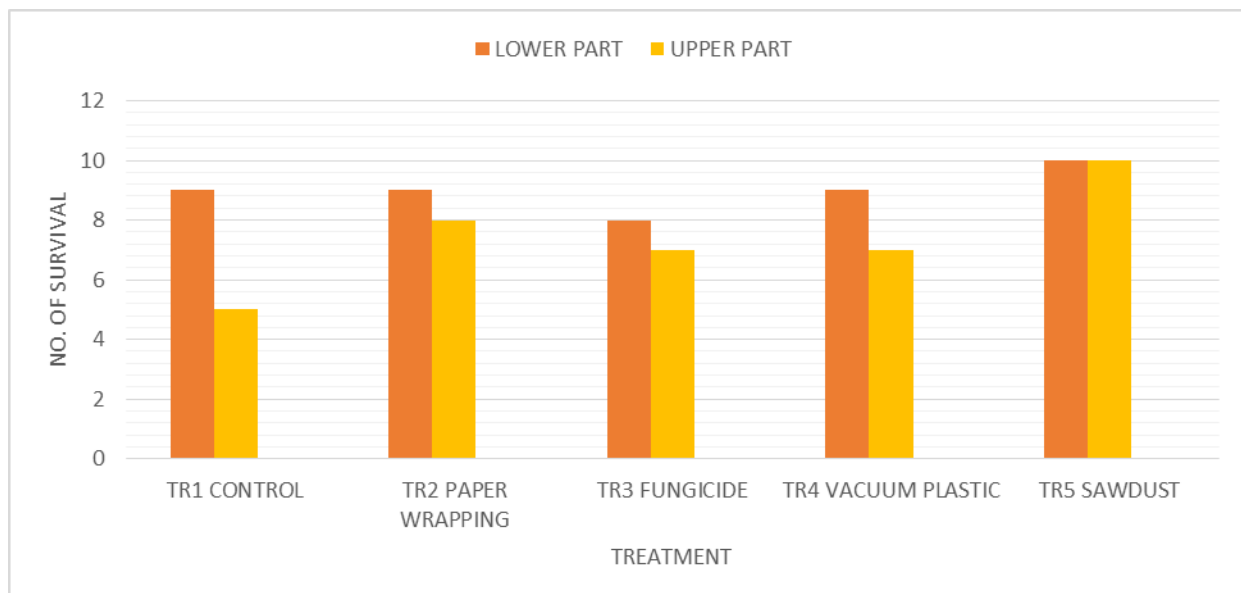


Figure 1: Diagrammatic illustration of the survival rate of Napier grass stem cutting upon different packaging medium.

Conclusion

The research study indicates that different packaging medium used for Napier grass stem cutting give no significant different on the survival and growth performance.

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Effects of Rumen Mechanical Stimulating Brush Administration on Eating Behavior and Dry Matter Digestibility of Brahman Cross Steers Fed with Low Forage Diet

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Abstract

The objective of this research was to investigate the effects of Rumen Mechanical Stimulating brush (RMS) administration on production performance and eating behavior of Brahman Cross (BX) steers. Twenty Brahman cross steers 267.50 ± 3.456 kg live weight were randomly distributed into four pens. There were two control pens without RMS and two RMS pens. A video surveillance unit was set up in each pen to record daily time spent for eating, drinking and ruminating. Eating behavior data were taken for a month (24h/d) started at the second month of the experiment. Animals had access to high concentrate (94.5%) and low fiber diets (5.5%) containing 18.2 % crude fiber and 12.24% crude protein. All steers were fed based on 3% dry matter of average body weight. Allowance of the concentrates was offered to all animals twice a day at 7 a.m. and 12 p.m. Results showed that RMS administration caused a significant increase in rumination time ($P < 0.05$). On the other hand, it significantly decreased eating and drinking time ($P < 0.05$). Dry matter intake (DMI) and dry matter digestibility were not affected by the application of RMS ($P > 0.05$). Thus, dietary factor is a determinant factor of DMD in this study. It can be concluded that synthetic physical dietary fiber supplementation affected eating behavior of the BX steers fed with low forage diet without giving adverse effects to DMI and DMD throughout the fattening period.

Keywords: *rumen mechanical stimulating brushes, bx steers, eating behavior, dry matter intake, dry matter digestibility*

Oral Presentation 2 Focus Session:

Feed and Nutrition 2

Wednesday, 19 October 14:00-15:00

Room: Panderman 2

Effect of *Piper retrofractum* as a Phytogetic Feed Additive for Broiler Performance

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Abstract

This research aimed to measure the effectiveness of the *Piper retrofractum* as phytogetic feed additive that to replace synthetic antibiotics and measure fat loss in broiler chickens. The research was designed in a completely randomized design with 5 treatments and 4 replications. The treatments were: T0: basal diet (negative control); T1: basal diet + synthetic antibiotics (positive control); T2: T0 + 1% *Piper retrofractum*; T3: T0 + 2% *Piper retrofractum*; T4 : T0 + 3% *Piper retrofractum*. Parameters measured were feed intake, water intake, feed conversion ratio, and mortality. The result showed that addition of *piper retrofractum* increased significantly ($P < 0.05$) for FCR and decrease significantly ($P < 0.05$) water intake, but not significant in body weigh, feed intake, water intake, and mortality. Although not significant the addition of piperin still increase final body wiegh. The addition of T2 (1% *Piper retrofractum*) could increase final body weigh (1110 g) and decrease significantly ($P < 0.05$) for FCR (1.6). The lowest mortality is 0.005% in T1 (use syntetic antibiotik). The highest feed intake in T0 (control) is 472 g/head/day and highest water intake in T1 (with syntetic antibiotic). The conclusion showed that the addition of *Piper retrofractum* could increased significantly ($P < 0.05$) for FCR and decrease significantly ($P < 0.05$) water intake, but not significant in body weigh, feed intake, water intake, and mortality.

Keywords: piperin, *piper retrofractum*, broiler chicken, performance

Introduction

The high fat content in broiler chicken carcass lay in the abdomen and viscera which must be separated from the carcass (Zulfanita *et al.*, 2011). A high percentage of fat content in broiler chicken will lower the percentage of protein and other nutrients in broiler chicken. The other problems in the maintenance of broiler chicken was decreased and banning the use of synthetic antibiotics in broiler chicken maintenance period in several countries. This is because residues of synthetic antibiotics that may be toxic for consumers, besides that synthetic antibiotics can cause resistant micro-organisms in the human body or animal (Lee *et al.*, 2004).

So it is necessary to other feed additive can replace synthetic antibiotics. One of the alternatives that can be used to replace for synthetic antibiotics was with the addition of phytogetic feed additive into the feed. Phytogetic feed additive is a feed additives derived from medicinal plants (herbs) and spices as replace of antibiotic growth promoters (Lee *et al.*, 2004) that able to improve FCR, digestibility, performen, added weight on animal, one of

them is *Piper nigrum* and *Piper retrofractum*. *Piper retrofractum* contain piperine, palmitic acid, piperidin, sesamin, 1% essential oils of dry matter, and 6% essential oil of piperine.

Research in several countries stated that the average amount of essential oils in *Piper retrofractum* almost the same with *Piper nigrum*, about 0.6% which comprise 0.19% alkaloid piperin (Cardoso *et al.*, 2012). The addition of piperine as phytogetic feed additive in broiler chicken feed can increase the surface area of the absorption in the duodenum and the ileum significantly, increase weight gain and feed conversion on day 36-42 with a dose of 60 mg/kg feed. While the concentration of 120 mg/kg and 180 mg/kg feed will be toxic to the liver and leukocytes (Cardoso *et al.*, 2012). Behind it, this research is needed to figure out how the effectiveness of use of *Piper retrofractum* as phytogetic feed additive and a decrease in fat on broiler chicken. This study aimed to measure the effectiveness of the *Piper retrofractum* as phytogetic feed additive that to replace synthetic antibiotics and measure fat loss in broiler chickens.

Methodology

The experiment was conducted in Laboratory of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University. Two hundred (200) of *day old chicken (male)* from Japfa Comfeed Indonesia with strain MB 202 PSX (*Loghman*) were maintained in colony cages (10 heads/cages). The experimental design used in this study was completely randomized design with 5 treatments and 4 replications. The treatments were: T0: basal diet (negative control); T1: basal diet + synthetic antibiotics (positive control); T2: T0 + 1% *Piper retrofractum*; T3: T0 + 2% *Piper retrofractum*; T4: T0 + 3% *Piper retrofractum*. Parameters measured were feed intake, water intake, feed conversion ratio, and mortality. The data were analyzed using an ANOVA and the differences among treatments were examined with polynomial test.

Result and Discussion

Table 1. Feed intake, water intake, feed conversion ratio, and mortality on broiler chicken of control and treatment diets

Treatment	Feed Intake (g/head/d)	Water Intake (ml/head/d)	Body Weigh (g)	Feed Conversion Ratio	Mortality (%)
T0	472 ± 151,89 ^a	659,87 ± 32.20 ^c	1063 ± 111 ^a	1,7 ± 0.1 ^b	0.02 ^a
T1	471 ± 174,69 ^a	682,97 ± 32.22 ^c	1035 ± 77 ^a	1,7 ± 0.1 ^b	0.005 ^a
T2	466 ± 234,63 ^a	625,52 ± 68.57 ^{bc}	1110 ± 187 ^a	1,6 ± 0.2 ^b	0.015 ^a
T3	464 ± 234,63 ^a	582,36 ± 30.29 ^{ab}	1001 ± 43 ^a	1,7 ± 0.1 ^b	0.01 ^a
T4	446 ± 268,63 ^a	550,32 ± 48.17 ^a	875 ± 29 ^a	1,9 ± 0.1 ^a	0.005 ^a

Data of performance parameters of broiler chicken with *Piper retrofractum* as a phytogetic feed additive were presented in Table 1. It is shown in Table 1 that that addition of *piper retrofractum* increased significantly ($P < 0.05$) for FCR and decrease significantly ($P < 0.05$) water intake, but not significant in body weigh, feed intake, water intake, and mortality. The highest of feed intake is T0, average of feed intake of T0 is 472 g/head/day and than T1 is 471 g/head/day, T2 466 g/head/day, T3 464 g/head/day, and T4 446 g/head/day. Different with feed intake, body weight is highest in treatment 1% of addition *Piper retrofractum* (T2) with a body weight of 1110 g and the lowest in the treatment with 3% addition of *Piper retrofractum* (T4) is 875 g. Showed that the addition of *Piper retrofractum* as phytogetic feed additive can improve body weight broiler (35 days) compared to controls. The addition of the most optimal in T2 with the addition of 1% of *Piper retrofractum*, while for the use of *Piper retrofractum* 2% and 3% would result in a lower body weight when compared with control. Showed that the use of *Piper retrofractum* as phytogetic feed additive in broiler chickens no more than 1% of total feed.

Similarly with body weight, the lowest FCR was also obtained in the treatment T2 and T4 are highest in each of 1.6 and 1.9. FCR claimed the amount of feed needed to produce one kilogram of meat. The calculation of the FCR obtained by dividing feed consumption by weight on the breeding period. Water consumption used to measure effect addition of *Piper retrofractum* on drinking water. Water consumption are generally not affected by the addition of *Piper retrofractum* on feed, but more influenced by environmental factors such as temperature of the enclosure.

Conclusion

The conclusion showed that the addition of *Piper retrofractum* could increased significantly ($P < 0.05$) for FCR and decrease significantly ($P < 0.05$) water intake, but not significant in body weigh, feed intake, water intake, and mortality.

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Production Performance and Egg Quality of Laying Hens on Silage Juice Addition

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Abstract

The aims of this study were to evaluate the effect of adding juice from corn silage on production performance and egg quality of laying hens. Ninety six laying hens age 17 weeks were divided into 24 groups and assigned to one of the four dietary treatments namely P1: ration with antibiotic + control drinking water; P2: ration with antibiotic + drinking water containing juice; P3: ration without antibiotic + control drinking water; and P4: ration without antibiotic + drinking water containing juice. Feed and water intake, production, feed conversion ratio and egg quality were evaluated weekly. Data from completely randomized design were ANOVA analyzed. The results showed that production performance and egg quality of laying hens received juice in their drinking water was comparable with that of laying hens fed diet containing antibiotic, and tended higher compared with that of laying hens received P3. It is concluded that addition of silage juice in drinking water improve production performance without affecting egg quality of laying hens.

Keywords: silage juice, laying hens, egg quality, performance

Introduction

The use of antibiotic in the poultry industry as growth promoters is still good choice since it give a positive effect in improving the performance of poultry cheaper than those of the other feed additive. However the products of poultries (meat and eggs) fed antibiotic growth promoters has been reported to contain residues (Pettersen and Burkholder 2003). Many countries began to ban the use of antibiotic, and it is believed that the efficacy of antibiotic growth promoters may not significance if the animals are kept in a good hygienic condition. Probiotic, prebiotic, and symbiotic have a good potency to replace antibiotic. Gaggia *et al.* (2010) reported that the use of probiotic could control and reduce *Salmonella* colonization in DOC. Supplying *Lactobacillus* as probiotics increased DOC immunity (Higgins *et al* 2008). Moreover, Lee *et al.* (2009) reported that feed efficiency was improved and better when broiler given combination treatment of probiotics and prebiotics compared with that of probiotic and prebiotic separately.

Nahrowi *et al.* (2010) developed silage technology and he fractionated the products to be silage, lactic acid bacteria and organic acid. The technology is then simplified by pressing the silage to produce a juice containing a mixture of lactic acid bacteria (probiotics), organic acids (prebiotics). Silage juice was reported to be capable of inhibiting *E. coli* and *Salmonella* sp. and antimicrobial activity of silage juice was greater than VITA Tetra Chlor® against *Salmonella* sp. but lower against *E. coli* (Nahrowi 2013). The juice could increase performance of broiler and improve egg follicle development of layer age 1 – 18 weeks.

Moreover the juice may control stress in broiler, layer and calves (Nahrowi 2014). However, study on the effect of addition of silage juice in drinking water on performance and egg quality of laying hens has not been reported yet.

Methodology

Juice was obtained by pressing the corn plant silage and then as much as 0.3% of the fresh juice was added to the drinking water. Ninety six of Isa Brown 17-28 weeks were divided randomly into four groups and assigned to one of the four dietary treatments namely: P1: ration with antibiotic + control drinking water; P2: ration with antibiotic + drinking water containing juice; P3: ration without antibiotic + control drinking water; and P4: ration without antibiotic + drinking water containing juice. The diets were composed of corn-soya based diet and formulated according to NRC (2004). Feed and water were given *ad-libitum*. Feed intake, egg production and feed conversion ratio were evaluated weekly. Analysis of the physical quality of the eggs was done at the age of 23-28 weeks. Data from completely randomized design were analyzed of variance (ANOVA) and followed by DUNCAN test if its were significantly ($p < 0.05$) different (Steel and Torrie, 1980).

Results and Discussions

Performance of layer 17-28 weeks

The diet treatments did not affect water intake, egg production and feed conversion ratio, but affected feed intake where the feed intake of chicken received P3 was lower ($P < 0.01$) compared with that of the others treatments (Table 1). However feed conversion of P3 was 3.0 while the other treatments only 2.5 - 2.8

Table 1 Performance of layer 17-28 weeks

Parameters	P1	P2	P3	P4	Standard
Feed intake (g hen ⁻¹ day ⁻¹)	84.16±2.27b	84.19±1.00b	78.89±2.02a	83.71±3.08b	114.08 ¹
Water intake (ml hen ⁻¹ day ⁻¹)	212.56±21.60	209.59±14.46	202.77±21.24	219.08±18.05	228.17 ²
Feed intake : Water intake	1 : 2.53	1 : 2.49	1 : 2.57	1 : 2.62	1 : 2
Egg productions (%)	69.40±3.96	66.95±6.77	64.68±5.46	68.49±8.22	77.40 ¹
Eggs (unit)	1191	1113	1032	1176	
Egg weight (g)	53.37±1.36	52.82±1.47	52.32±0.87	52.98±1.74	56.84 ¹
Feed conversion ratio (FCR)	2.67±0.62	2.83±0.68	3.05±0.36	2.53±0.45	2.50 ¹
Mortality (hen)	0	1	0	1	
Waters content of feces (%)	78.34±2.74	77.76±2.18	77.71±2.48	78.62±2.48	79.60 ³

P1: ration with antibiotic + control drinking water; P2: ration with antibiotic + drinking water containing juice; P3: ration without antibiotic + control drinking water; and P4: ration without antibiotic + drinking water containing juice. Different superscripts in the same variables showed significant differences at $P < 0.01$ | source : ¹HGC (Hendrix Genetic Company 2015); ²Data HGC (2015) modified Ensminger et al. (1990) which states that water intake twice feed intake; ³ Santoso (2005)

Water content of feces (17 weeks) was not different to standard (Table 1). It shows that addition of silage juice did not cause diarrhea in hen as in research Manin et al. (2012) reported that the addicted probiotics in drinking water did not give a real difference to the water content of the feces but can lower the pH of broiler chicken feces which resulted in a decrease in the number and activity of gram-negative bacteria. The use of silage juice or antibiotic did not affect egg weight and feed conversion ratio. These results were in line with Pambuka (2014) who reported that adding LPMC, antibiotics, or a combination of both with a dose of LPMC 0:15 to 0:45% to the layer did not give any significance effect on egg weight, egg production and feed conversion.

The Physical Quality of Eggs (23-28 Weeks)

Treatments did not affect physical quality of eggs. Index eggs in this study were range of 75.78-80.68%, which means the shaped of egg was oval. Yuwana (2010) reported that eggs index related to egg shape whose value varies between 65-82%, and the ideal value was 80% or oval (Soekarto 2013).

Table 2 The Physical Quality of Eggs (23-28 Weeks)

Parameters	P1	P2	P3	P4
Exterior quality				
Egg Indexs	77.88±0.70	78.51±0.45	77.65±1.47	78.88±0.90
Interior quality				
Haught Unit (HU)	96.19±2.73	95.48±4.48	95.91±0.50	95.69±1.90
Shell thickness (mm)	0.34±0.03	0.34±0.01	0.36±0.01	0.34±0.01
Yolk	8.22±0.92	8.72±0.25	8.56±0.59	8.44±0.54
Physical characteristic				
Albumin weight	67.90±0.54	67.42±0.09	67.28±0.18	67.59±0.20
Yolk weight	21.85±0.37	22.44±0.73	22.61±0.68	22.47±0.51
Shell weight	10.16±0.62	10.15±0.40	10.28±0.24	10.26±0.13

P1: ration with antibiotic + control drinking water; P2: ration with antibiotic + drinking water containing juice; P3: ration without antibiotic + control drinking water; and P4: ration without antibiotic + drinking water containing juice

The average HU value of the eggs of laying hens age 22 weeks was reached 98.87 and then decreased until week 28 with a value of 92.55. Yolk color in this research is dominated by a score of 9. Yolk color is determined by the content of carotenoids (xanthophyll) which can be derived from feed components. Treatments did not influence yolk color. It is indicated that the juice was not capable of improving yolk color. The percentage of yolk increased in line with the increase in egg weight and the age of the hen. According to Amrullah (2004) eggs produced from the early period of egg-laying has a yolk weight range from 22-25% of the total weight of egg.

Conclusion

The addition of silage juice into the drinking water of layer hen could improve egg production and physical quality of eggs without affecting egg quality of laying hens.

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Digestibility Evaluation of Microparticle Protein Derived from Fish Meal and Soybean Meal in Broiler Chicken

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Abstract

Fish meal and soybean meal are the common protein sources for poultry, however, due to their high price in average, an effort to improve nutrient or feed efficiency is needed to reduce production costs. Reducing particle size of both fish meal and soybean meal proteins by ultrasonic bath treatment is one possible method to increase their nutrients utilization. The ultrasonic durations were 30, 60 and 60 min to obtain solid components of protein particle dispersion, and they were then dried prior to measuring particle size using particle size analyzer equipment. Three dried solid components derived from different duration of ultrasonic bath treatment (30, 60, 90 min), and one intact protein were the treatments which was arranged into a completely randomized design with 4 replications for fish meal and soybean meal, respectively. Protein digestibility, N and Ca retentions of fish meal were significantly ($P < 0.05$) increased by 60 and 90 min ultrasonic bath treatment, but those of soybean meal were increased only by 90 min ultrasound duration without any change in Ca retention. Particle size of fish meal as well as soybean meal proteins decreased with the increasing ultrasound duration. Fish meal indicates faster response compared to soybean meal to ultrasonic bath treatment based on protein digestibility and N retention.

Keywords: nutrient digestibility, microparticle protein, fish meal and soybean meal, broiler

Introduction

The increase in price of both fish meal and soybean meal has forced poultry nutritionist to find an alternative way in improving their nutrients utilization efficiency. Reduction of particle size provides some advantages in term of nutrients utilization and efficiency to support productivity of growing poultry. Particle size reduction bring about the increase in both the number of particles and the surface area per unit volume which allowing greater access to digestive enzymes (Huang and Stein, 2016). The interest in dietary protein particle size has increased due to the economical purposes of optimising protein utilization and improving poultry production efficiency.

Producing protein microparticle by transducer ultrasound is the way to fulfill the purpose of improving utilization. In relation to the degree of particle size, the birds may encounter difficulties in consuming very course or very fine particles (Pacheco *et al.*, 2013) but pelleting would be a solution can be applied when feeding microparticle protein. Prevoius studies (Gabriel *et al.*, 2003; Amerah *et al.*, 2007; 2008) indicated that particle size had some effects on poultry production parameters, such as digestive tract development, nutrient utilization and growth performance. However, the present study was only focused on the clarification of nutrients retention of protein microparticle due to various duration of ultrasonic bath treatment, while pelleted particle will be evaluated in the next experiment.

Methodology

Fish meal and soybean meal as common protein sources for poultry were ground and sieved to obtain fine particle. The intact particle was then diluted in distilled water (1 : 4 w/v) with additional virgin coconut oil prior to transducer ultrasound treatment, a simply modified method of Jambak *et al.* (2014). The ultrasonic procedure was run for 30, 60 and 90 min to obtain protein particle dispersion. Solid component of dispersion product was then dried and continued to measuring particle size using particle size analyzer equipment.

Three components of particle size from different duration of ultrasonic bath treatment (30, 60, 90 min), and one intact protein of the ingredient were created as treatments. Either protein particle due to ultrasonic dispersion or its intact source were evaluated for protein digestibility, N and Ca retentions by the method of force feeding in 45 days of broilers. A completely randomized design was assigned with 4 treatments and 4 replication (4 birds each), and was applied separately for fish meal and soybean meal. Data were statistically subjected to analysis of variance and continued to Duncan test at 5% probability level.

Results and Discussion

Particle size of protein of either fish meal or soybean meal decreased with the increasing duration of ultrasonic bath treatment. Protein digestibility, N and Ca retentions were significantly ($P < 0.05$) increased by 60 and 90 min ultrasonic bath treatment for fish meal (Table 1). However, both protein digestibility and N retention of soybean meal were improved due to ultrasound duration of 90 min only. It was found that Ca retention of soybean meal was not changed by ultrasound treatment. All measurements of intact protein of both fish meal and soybean meal indicated similar values compared to those of 30 min ultrasonic bath treatment, but lower than those of 60 and 90 min treatments.

Table 1. Particle size and nutrient digestibilities of ultrasound-treated fish meal and soybean meal in broiler chicken

Parameter	Intact protein	Ultrasonic bath treatment (min)		
		30	60	90
Fish meal				
Particle size (microns)	–	1.662	1.213	1.054
Protein digestibility (%)	84.4 ^c	86.2 ^{bc}		87.9 ^{ab}
Nitrogen retention (%)	64.7 ^b	65.3 ^b		69.1 ^a
Calcium retention (%)	61.8 ^b	62.9 ^b		66.5 ^a
Soybean meal				
Particle size (microns)	–	0.432	89.8 ^a	0.404
Protein digestibility (%)	81.0 ^c	82.8 ^{bc}	69.8 ^a	86.4 ^a
Nitrogen retention (%)	56.4 ^c	57.7 ^{bc}	67.0 ^a	62.4 ^a
Calcium retention (%)	55.1 ^a	54.9 ^a		55.5 ^a
			0.426	
			83.6 ^b	
			59.5 ^b	
			56.2 ^a	

^{a-c}Mean values within row followed by different superscripts are significantly different ($P < 0.05$)

The present study indicated that duration of ultrasound treatment until 90 min in both fish meal and soybean meal resulted protein particle size reduction. The higher protein digestibility and N retention for fish meal was due to both 60 and 90 min of ultrasound duration, but the higher values of both parameters for soybean meal was only found in 90 min treatment. It have been reported elsewhere that the smaller particle size of either feed ingredients in general (Gabriel *et al.*, 2003; Amerah *et al.*, 2007; 2008; Chewning *et al.*, 2012) or protein in particular (Jambak *et al.*, 2014; Huang and Stein, 2016) allowing the greater access to digestive enzymes which then increased nutrients digestibility. The present results

suggest that 60 min ultrasonic bath for fish meal was able to significantly increase protein digestibility and N retention, while the increase in both items could be achieved until 90 min ultrasound treatment for soybean meal. It was seemingly attributable to the presence of phytate compound (Banaszkiewicz, 2012; Tahir *et al.*, 2012), non-protein component such as oligosaccharide (Kocher *et al.*, 2002; Oliveira and Stein, 2016), and trypsin inhibitor (Banaszkiewicz, 2012; Pacheco *et al.*, 2013), longer ultrasound treatment is needed for soybean meal to maximize nutrients utilization. Soluble carbohydrates can interfere with protein utilization, and phytic acids is known to have ability to bind Ca, therefore, both protein digestibility and Ca retention were still low with 60 min ultrasonic bath treatment.

Conclusion

The longer ultrasonic bath treatment, the smaller particle size can be obtained from both fish meal and soybean meal. Protein digestibility, N and Ca retentions of fish meal can be achieved to be the highest with ultrasonic treatment of 60 min, but the highest values of soybean meal are resulted by ultrasound until 90 min with no any change in Ca retention.

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***Piper betle* Leaf Infuse Supplementation as Herbal Antibiotic to Reduce *Salmonella* sp. in Small Intestine of Quail (*Cortunix cortunix japonica*)**

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Abstract

Salmonella in poultry has given a problem in recent times. Betle leaf is known as a tropical medical plant which contain many active compounds that could be used as a herbal antibiotic. This research was aimed to reduce *Salmonella* sp. contamination in quail which has given *piper betle* leaf infuse in drinking water. *Salmonella* sp. contamination was evaluated in small intestine which had given treatment for six weeks. A Completely randomized design of seven treatments and three replication was used in this study. The treatments were control treatment which has been given Vita Stress and betle leaf infuse supplementation of three different concentration (10%, 20%, and 30%) in drinking water which had been given since Day Old Quail (DOQ) or laying period. This research had 7 treatments of: P0 = Vita Stress supplementation since DOQ; P1 = 10% betle leaf infuse supplementation since DOQ; P2 = 20% betle leaf infuse supplementation since DOQ; P3 = 30% betle leaf infuse supplementation since DOQ; P4 = 40% betle leaf infuse supplementation since laying period; P5 = 10% betle leaf infuse supplementation since laying period; P6 = 20% betle leaf infuse supplementation since laying period; P7 = 30% betle leaf infuse supplementation since laying period. Result showed that addition of betle leaf infuse (P1, P2, P3, P4, P5, and P6) compared to control treatment (P0) could decrease colony of *Salmonella* sp. in small intestine of quail significantly ($P < 0.05$). Betle leaf infuse supplementation is better given at laying period rather than DOQ.

Keywords: *herbal antibiotic, infuse, piper betle linn, salmonella typhimurium, quails*

Introduction

Salmonella is a harmful bacteria which could lead Salmonellosis in poultry. Salmonellosis is a zoonotic diseases and cause high mortality rates in poultry. *Salmonella* contamination could come from dirty environment at poultry (Dickson and Anderson 1992). To prevent *Salmonella* contamination in poultry, farmers usually use antibiotic growth promotors (AGP) to kill *Salmonella*. The use of antibiotic growth promotors (AGP) in poultry feed has been banned in many countries. The ban was due to AGP which leave residues in the animals body and cause bacteria in becoming resistant to certain antibiotics. The residue in livestock products are very dangerous for consumers because it can cause allergies and cause bacteria resistant to certain drugs. The use of AGP on animal feed is aimed to kill the bacteria which found in the digestive tract to increase the absorption of nutrients. This shows that farmers still rely on the use of AGP to improve livestock productivity. So it is important to replace the use of these antibiotics.

The use of natural antibiotics is an efforts that can be done to replace the AGP. Natural antibiotics are secondary metabolites that are usually found in plants and can inhibit or kill

bacteria. Betle leaf contains active substances in the form of betlephenol that can inhibit some bacteria (Sastroamidjojo 1997). The content has been demonstrated in several studies that betle leaves have the potential to be used as a natural antibiotic for cattle in Indonesia. The extraction process is also important to ensure effectiveness in inhibiting bacteria betel leaf. The ethanol extract of green betel leaf is more effective than the betel leaves are extracted with water solvent in inhibiting the growth of pathogenic bacteria (Kaveti *et al.*, 2011).

The target of this research is to replace the use of AGP in poultry with betle leaf infuse as a natural antibiotic. Betel leaf extraction methods determine the effectiveness when given directly to livestock. Infuse method is a traditional method which applicable for farmers.

Methodology

The study was conducted in the Laboratory of Bacteriology, Faculty of Veterinary, Bogor Agricultural University, Bogor, Indonesia and the quails were raised at Slamet Quail Farm, Cilangkap Village, Cikembar, Sukabumi, Indonesia. Completely randomized design of seven treatments and three replication was used in this study. The treatments were control treatment which has been given Vita Stress in the drinking water and supplementation of three different concentration between 10%, 20%, and 30% of betle leaf infuse in the drinking water on quails which had been given from Day Old Quail (DOQ) and laying period. The ration which had been given in this study was quails commercial ration from PT. Sinta Feedmill. The treatment details were P0 = Vita Stress supplementation since DOQ; P1 = 10% betle leaf infuse supplementation since DOQ; P2 = 20% betle leaf infuse supplementation since DOQ; P3 = 30% betle leaf infuse supplementation since DOQ; P4 = 40% betle leaf infuse supplementation since laying period; P5 = 10% betle leaf infuse supplementation since laying period; P6 = 20% betle leaf infuse supplementation since laying period; P7 = 30% betle leaf infuse supplementation since laying period. Betle leaf infuse was made by mixing 1:1 (b/v) water and betle leaves, chopping the mixture using blender, and boiling the liquor at $\pm 90\text{ C}^\circ$ in 15 minutes. Bacteria contamination was measured in small intestine digesta of quails. 1 gram digesta was mixed by 9mL NaCl. The mixture was put in enrichment medium (tertrationat), incubated $35\pm 1\text{ C}^\circ$ for 2x24 hours, mixed with *Salmonella Shigela Agar* (SSA), and incubated $35\pm 1\text{ C}^\circ$ for 2x24 hours. Parameters measured were *Salmonella sp.* contamination, feed consumption, water consumption, feed conversion ratio (FCR), total egg production, and total egg mass.

Result and Discussions

Data of parameters including *Salmonella sp.* contamination, feed consumption, water consumption, FCR, total egg production, and total egg mass are shown in Table 1. It is shown that all treatments gave better performance in reducing *Salmonella sp.* contamination, reducing FCR, increasing feed consumption, water consumption, total egg production, and total egg mass. (P6) showed the lowest *Salmonella sp.* contamination (2.63×10^2 CFU/mL), FCR (1.92), highest feed consumption (691,3 g/head), water consumption (1758.33 mL/head), total egg production (306.33 unit), and total egg mass (3595.57 g). While control (P0) showed the highest *Salmonella sp.* contamination (2.33×10^4 CFU/mL), FCR (2.19), lowest feed consumption (675.0 g/head), water consumption (1675.00 mL/head), total egg production (262.00 unit), and total egg mass (3076.71 g).

Table 1. *Salmonella sp.* contamination, feed consumption, drinking water consumption, FCR, total egg production, total egg mass, and treatment diets

Treatment	<i>Salmonella sp.</i> contamination (CFU/mL)	Feed consumption (g/head)	Water consumption (mL/head)	FCR	Total egg production (unit/cage)	Total egg mass (g/cage)
P0	2.33×10^4 ^b	675.0 ^b	1675.00 ^b	2.19 ^d	262.00 ^d	3076.71 ^d

P1	2.47x10 ³ a	682.7ab	1685.00b	2.21d	263.33d	3098.13d
P2	2.33x10 ³ a	686.0ab	1743.33a	2.14cd	272.33c	3203.10c
P3	1.63x10 ³ a	674.0b	1733.33a	2.08bc	272.33c	3239.83c
P4	3.83x10 ³ a	684.8ab	1733.33a	2.00ab	291.33b	3428.33b
P5	2.27x10 ³ a	686.9ab	1746.67a	1.93a	302.00a	3560.00a
P6	2.63x10 ² a	691.3a	1758.33a	1.92a	306.33a	3595.57a
Sign.	***	***	***	***	***	***

FCR: Feed conversion ratio, ***: highly significant different

Betle leaf extract had an antimicrobial, antioxidative, and antihemolytic effect (Chakraborty and Barkha 2011). Betle leaf infuse could inhibit bacteria such as *Salmonella sp.*, *E. coli*, lactat acid bacteria, and increasing egg durability (Haryuni *et al.*, 2015). Adequate energy and protein in ration resulted in decreasing feed consumption of quails (Daulay *et al.* 2007). Water consumption indirectly leads in increasing feed consumption (Leeson and Summers 2005). Egg production is affected by feed consumption and feed nutrient composition (Brand *et al.* 2003).

Conclusion

Supplementation of betle leaf infuse could decrease *Salmonella sp.* contamination in small intestine and give better performance in egg production of quails. Betle leaf infuse supplementation is better given at laying period rather than DOQ.

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The Effect of Addition Mannase Enzyme in Diet on Broiler Production Performances

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Abstract

The research was conducted to identify the effect of addition mannase enzyme in the diet on broiler production performances. The materials used were 100 *Day Old Chick* (DOC) broiler chickens. The treatment was in the form of adding mannase enzyme with 5 treatments and 4 replicated into the basal feed for P0=basal diet, P1=basal diet + 1 g/kg enzyme, P2= basal diet + 2 g/kg enzyme, P3= basal diet + 3 g/kg enzyme, and P4= basal diet + 4 g/kg enzyme. The chick were plotted into 20 plots, each plot contained 5 broilers of 35 days old. The variables observed during this study were the feed consumption, weight gain, feed conversion ratio, and *income over feed cost* (IOFC). The data obtained were analyzed through Analysis of Variance (ANOVA) of Completely Randomized Design (CRD) and the different among the treatments were analyzed Duncans's Multiple Range Test (DMRT). The results showed that the addition of mannase enzyme had high significant effect ($P < 0,01$) on weight gain, IOFC and significant effect ($P < 0,05$) on feed consumption and feed conversion ratio. It can be concluded that the addition of mannase enzyme on the diet were increased production performances of broiler. The best treatment was 2 g/kg mannase enzyme based on feed consumption, feed conversion ratio, weight gain, and IOFC.

Keywords: broiler, diet, mannase enzyme, performances

Introduction

About 80% of poultry feed are made up of ingredients of plant origin such as coconut cake, containing non-starch polysaccharides (NSPs) that form the cell wall in plants, where a large portion of this group is present in the hemicellulose fraction. The NSPs have the characteristic of increasing gastrointestinal viscosity, which results in a reduction in the diffusion rate of digestive enzymes and substrates, preventing their interactions on the surface of the intestinal mucosa, leading to impaired digestion and absorption of nutrients. Endogenous enzymes produced by poultry cannot hydrolyze the NSPs contained in cereals (OPALINSKI *et al.*, 2010).

In poultry, only the amylase enzyme produced by the pancreas can hydrolyze starch into maller units that can be absorbed; therefore, the presence of exogenous enzymes is needed (O'NEILL *et al.*, 2014). The enzyme β -mannasease is responsible for the hydrolysis of β -mannases, thus reducing intestinal viscosity, promoting better nutrient digestibility, and acting on pathogens after hydrolysis. However, since the exact effect of the enzyme interaction is unknown, and there is a difficulty in determining the amount of NSPs present in foods, the results may often be controversial (ALBINO *et al.*, 2006).

Prebiotic is a source of energy and bacterial substrat fermentation on the intestinal mucosa to produce vitamin and antioxidant. Mannase oligosaccharides (MOS) derived from the yeast cell wall have high binding affinity, providing a competitive binding site for oligosaccharide-specific bacteria. The benefits of MOS are based on properties that include changes in the intestinal flora, a reduction in mucosa turnover rate, and the modulation of the immune system in the intestinal lumen (SIMS *et al.*, 2004).

Methodology

The experimental was carried out at the Jiwut Village, Nglegok Sub-district, Blitar Distric and proksimat analyses were carried out at Nutrition Laboratorium in Brawijaya University. The experiments were lasted long continued for 35 days. One hundred (100) broiler chickens Strain *Cobb, CP 707* produced by *Charoend Pokpand Jaya farm* were divided into 5 treatments in which each treatment had 4 replications with 5 broiler chickens per replication. Twenty (20) flocks were used and equipped with feeder and bottle drinker. In this experimental were used 5 treatments, consist of control (basal diet), P1 (basal diet + 1 g/kg of mannase enzyme), P2 (basal diet + 2 g/kg of of mannase enzyme), P3 (basal diet + 3 g/kg of of mannase enzyme), P4 (basal diet + 4 g/kg of of mannase enzyme). All treatments were measured into analysis carcass percentage, fat abdominal percentage, and internal organ percentage of broiler chickens. The data was analyzed by GLM (General Linear Model). Duncan's multiple range test was used to detect the differences ($P < 0.05$) among different group means.

Result and Discussion

The effect of the addition different level of mannase enzyme on performance of broiler chicken, consist of feed intake (FI), body weight (BW), feed conversion ratio (FCR), and *income over feed cost (IOFC)* were shown in Table 1.

Treatment	FI (g/bird)	BW (g/bird)	FCR	IOFC
P0	2,7 ±54,65 ^b	1.422,33±107,51 ^{ab}	1,88±0,11 ^b	11.349,71±1.601,49 ^a
P1	2,5±169,3 ^b	1.530,08±25,56 ^b	1,65±0,08 ^a	13.974,39±762,71 ^b
P2	2,5±153,11 ^b	1.544,83±29,53 ^b	1,62±0,08 ^a	13.998,04±644,48 ^b
P3	2,5±233,7 ^b	1.444,38±28,75 ^b	1,71±0,13 ^a	12.120,22±854,27 ^{ab}
P4	2,2±45,63 ^a	1.293,80±81,40 ^a	1,73±0,13 ^a	10.678,79±1.243,57 ^a

The treatments consisted of a control group and the use of 1 g/kg, 2 g/kg, 3 g/kg, and 4 g/kg of mannase enzyme, respectively.

^{a-c} Means within row with different superscripts were significantly different ($P < 0.05$).

The addition of different level of mannase enzyme has differences ($P < 0,05$) in feed intake. The higher of the addition mannase enzyme were showed the lowest of feed intake compared control group. According Sahara, Raudhaty, and Maharany (2012), feed consumption influenced by energy requirements. Feed intake would be significantly decrease when it has been met the energy requirement.

The effect of different level mannase enzyme has significantly difference ($P < 0,01$) in body weight. The additon of mannase enzyme increased body weight compared control group, however 4 g/kg mannase enzyme decreased body weight. The optimum level of the addition mannase enzyme would be improved body weight.

The addition of different level of mannase enzyme has differences ($P < 0,05$) compared control group in FCR. The effect of mannase enzyme decreased FCR on broiler chickens. The addition of mannase enzyme increased non-patogenic bacteria as a source of prebiotic in intestinal mucose.

Income over feed cost (IOFC) in the experiment of the addition of mannase enzyme has significantly different ($P < 0,01$) compared to the control group. The addition of mannase enzyme with the best proportion were improved IOFC. According to Safingi, Mufti, and Ning (2013) that the factors affecting IOFC consist of feed cost, body weight, and FCR.

Conclusion

According to the experiment, it was concluded that the addition of different levels of mannase enzyme has increased the performance of broiler chickens. The addition of 2 gr/kg of mannase enzyme improved feed consumption, feed conversion ratio (FCR), and *income over feed cost (IOFC)*.

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Broiler Chickens Performance as Affected by Animal Fat and Plant Oil Under Hot Arid Conditions of Sudan

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Abstract

The influence of dietary animal fat and plant oil on broilers performance under Sudan conditions was studied. The experiment lasted seven weeks. One hundred and fiftyone - day old, unsexed Lohmann breed chicks were divided randomly into three dietary treatments (50 birds /treatment) with five replicates of ten birds each. Average minimum and maximum temperatures during the experimental period were 26.1°C and 38.9 °C, respectively. Parameters measured were feed intake, body weight gain, feed conversion ratio, and mortality rate. Three dietary treatments were used in this study. Diet A with no fat added (NF), diet B was supplemented with 5% peanut oil (PO) and in diet C 5% beef tallow (BT) was added . The three diets were made to be isonitrogenous. All nutrients were calculated to meet the USA National Research Council Requirements (NRC, 1984) for broiler chicks. The results indicate that during the experimental period feed consumption was not affected by fat addition, irrespective of its source. There was a trend to increase the total body weight gain but the difference did not reach significant level. It was noticed that the ambient temperature during the experiment was very high which might upset the beneficial effect of dietary fat.

Keywords: peanut oil, beef tallow, broiler, performance, sudan

Introduction

Supplemental fat has been used in poultry feed for energy adjustment (a high-density energy source) and to improve efficiency of feed utilization. Song et al. [1] reported that availability of amino acid in Chinese oil corn than in conventional corn. There are many factors influencing fat utilization, such as level of fat inclusion and basal diet composition, degree of saturation of the total lipid fraction, age and temperature. Environmental temperature is the most important factor affecting bird performance in the tropics. High temperature has adverse effects on the performance of the hen due to inadequate intake of nutrients. In growing chicks and turkeys, growth depression and reduction in feed intake are caused by environmental temperature above 20 °C [2]. Many workers tried to overcome this growth depression. Hurwitz et al. [2] and Charles et al. [3] failed to overcome this depression by increasing both protein and energy. In an attempt to diminish the detrimental effects of a constant high environmental temperature, Payne [4] suggested suitable dietary modifications. Fuller and Rendon [5] explained that the " extra calorific " effect of fat resulted from the low heat increment factor of fats, consequently, supplementation of fat has the effect to minimize some detrimental effects of high ambient temperatures. In Sudan, small-scale broilers production is carried in open poultry houses. Evaporative cooled housing is confined to large poultry projects in Khartoum. Producers avoid rearing broiler during summer months due to hazards of high temperature. Little information is available in Sudan concerning the influence of type of fat on birds' performance during high temperature. This study was therefore

conducted to determine the role of dietary fat in feed utilization efficiency and Broilers utilization efficiency of vegetable oil versus animal fat.

Materials and Methods

This experiment was carried out at Faculty of Animal production, University of Khartoum. Minimum and maximum temperatures outside the poultry unit were 26.4°C and 38.9°C respectively. The experiment lasted for seven weeks.

Birds, House and Management

A total of 150 one-day old, unsexed commercial broiler chicks (Lohman) obtained from commercial hatchery, were used in this experiment. They were vaccinated against Merke's disease. On arrival, all chicks were selected, weighed. The chicks were randomly distributed into 15 pens, and each pen contained 10 birds of approximate equal body weight. The pens were then randomly allocated to the three experimental diets (50 birds / treatment). The house long axes were situated in an East-west direction. The house was constructed of iron posts, wire netting sides, corrugated iron roofing, and concrete floor, the pens inside the house were made from iron posts with wire netting. Dry wood-shaving was used as litter materials at a depth of 5 cm. Each pen was provided with clean disinfected feeder and drinker that were filled with feed and water all the time. Light was provided 24 hours in a form of natural light during the day and artificial light during the night. 60 watt bulb was used for each two pens.

Three experimental diets were studied. Diet A contained no fat (NF) and served as the control. 5% peanut oil (PO) was added in diet B, and 5% beef tallow (BT) was added in diet C. The composition of these rations is listed in table 1. In the ration in which fat was included, sorghum was replaced with 5% either tallow (BT) or peanut oil (PO). The diets were calculated to be isonitrogenous. The main difference between the diets was in their source of energy. The assumed ME values were 7700, 8800 kcal /kg for tallow (BT) and peanut oil (PO), respectively according to NRC[6].

Vitamins and antibiotics were administered in the water for five consecutive days for each treatment during the fifth week. The nutrients of the experimental diets were calculated to meet the National Research Council requirement [6] of broiler chicks. The calculated and determined nutrients of the experimental diets are shown in table 2. The experimental diets were fed for the whole seven weeks period. Feed and water were offered ad libitum (ad-lib). Records of body weight, feed consumption were maintained on a weekly basis per replicates. Mortality rate was recorded throughout the experimental period.

Experimental design and statistical analysis

The experimental design of the trial was a complete randomized design. The data obtained (feed intake, body weight gain, and feed conversion ratio) were tabulated and subjected to analysis of variance (ONE-WAY ANOVA) using the SAS computer program. The least significant difference (LSD) test was used for treatment means separation.

Results & Discussion

Table 3 shows performance during the whole experimental period. There was a trend to increase final body weight by fat supplementation but the differences were not significant. Feed intake was not affected by addition of fat regardless of its source. Inclusion of both sources of fat in broiler diet tended to improve feed conversion but it did not reach level of significance. Total mortality during the 49-day experiment was 48% in group A, 44% in group B and 40% in group C and postmortem examination showed that the cause of death was heat stroke rather than related to ration treatments.

There was no difference in feed intake between the three groups treatment however; there was a numerical increase in feed intake with tallow added diet. This result supported the work of Bartov[7] who found no effects on feed intake resulted from the dietary fat source

(tallow, soybean oil) in broiler during summer. There was a trend to improve total body weight gain with both fat supplemented diets but the differences were not reach significant level. Feed conversion tended to improve with both fat added diets but the difference was not significant. This supported the previous data of Skinner and Waldroup [8]

The expected beneficial effects of supplemental fat were not obtained. This may due to the effect of higher ambient temperature during the experiment which masked the beneficial effect of fat. Also may due to higher mortality which occurred as a result of the heat wave during the experimental period.

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Table 1. Composition of experimental diet

Ingredients %	Treatments		
	Treatment A control(NF)	Treatment B Oil supplement	Treatment C Fat supplemented
Sorghum	58.46	53.46	53.46
Super concentrate	05.00	05.00	05.00
Sesame meal	12.00	12.00	12.00
Groundnut meal	20.30	20.30	20.30
Wheat bran	03.00	03.00	03.00
Oil	-	05.00	-
Animal fat	-	-	05.00
Oyster shell	00.70	00.70	00.70
Salt	00.25	00.25	00.25
Lysine	00.24	00.24	00.24
DL. methionine	00.05	00.05	00.05
Total	100.00	100.00	100.00

Table 2. Determined chemical analysis of experimental diet

Ingredients (%)	Treatments		
	A	B	C
Crude protein	22.75	22.75	21.87
Ether extract	5.10	10.20	9.20
Ash	6.80	7.10	6.80
Moisture	6.20	5.80	5.90
Crude fiber	8.80	8.90	9.10
Nitrogen free extract	50.35	45.25	47.13

Table 3. Effect of dietary fat source on broiler performance

Parameter	Treatment			
	A(control)	B(oil-supplemented)	C(tallow-supplemented)	SEM
Average body weight : initial (1-day).g.	43.16	43.12	43.18	
Final (49-days) .g.	1242.20	1257.80	1398.40	
Average body weight gain .g.	1199.04	1214.68	1355.22	2.321
Feed intake (g/chick/day)	53.58	53.44	55.98	
Total feed intake	2625.00	2618.00	2743.00	5.087
Feed-to-gain ratio (kg feed /kg body wt.)	2.19	2.16	2.02	0.171
Mortality %	48	44	40	0.407

Oral Presentation 2 Focus Session:
Socio-Economics and Agribusiness
Wednesday, 19 October 14:00-15:00
Room: Semeru

Development of Livestock Agroindustry: Increasing Revenue Economic and Employment Opportunities to Local Society

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Abstract

Strategic of Middle Term Development Plan 2015-2019 Indonesia Government can strengthen overall development in various fields by emphasizing the achievement of economic competitiveness on the basis of competitiveness of natural resources and qualified human resources as well as the ability of science and technology that continues to increase with the hopes of improving the living standards of the poor with social protection. Program Pro-Poor and Pro Job is a form appropriate strategies to create equitable welfare of the people in accordance with Pancasila and the 1945 Constitution, known as the State Indonesia is an agricultural country with great potential for economic improvement program and create jobs through the development of the livestock sector in particular Agriculture Agroindustry based on hallmarks that has high competitiveness so it is useful for improving the local economy and the local area because generally the people of Indonesia have small-scale agroindustry is the object of their income. Agro-industry add value is a sub system of a primary commodity livestock, more and more products are created downstream of the commodity, the higher the economic improvement of the local farming communities.

Keywords: *Agroindustry, development of the livestock sector, Program Pro-Poor and Pro Job*

Introduction

In mid-1997, Indonesia has experienced the impact of the economic crisis that affects the national crisis, the weakening of the rupiah causing joints national economy paralyzed, bottlenecks the wheels of business, and loan repayments attempt against national banks unfavorable economic growth in 1997 was recorded only 4.7 percent, far from the average over the last three decades to reach about 7 percent with 11.05 percent inflation. In 1998, economic growth has increased only by 13.2 percent. Inflation is soaring ie 77.63 per cent in 1998. As a result, the unemployment rate is very high and the number of poor people has increased. Overcoming unemployment and poverty were high, various economic policies and structural reforms by the Government after the 1997/1998 crisis was able to increase the strength of the national economy. In the past five years, the economy grew an average of 6 percent per year in 2009 in which the economy grew only 4.6 percent when the Financial Crisis Lehman Brothers and increased by 5.8 percent in 2013. So that the high economic growth in the last five years has been pushing for the expansion of employment opportunities. The open unemployment rate was reduced from 7.4 percent in 2010 to 5.9 percent in 2014 and the number of poor people decreased from 32.5 million in 2009 to 27.7 million in September 2014. The poverty rate fell from 14.1 percent to 10.96 percent over the same period.

In the political field, political life order as long as it generates political stability and security. However, the stability is still an apparent because of the participation and political

culture in the national political system is not working as it should. In sector of law, inadequate legislation on the limitation of organic executive power has given opportunities for corruption at various levels of government from the center to the regions that also involves the judicial power. In addition, there has been a misuse of authority by law enforcement, law enforcement, and the lack of protection and legal certainty for the public. In sector of religion and social culture, national identity that is disciplined, honest, high work ethic and morals can not be realized by either tends to decrease each year. Most people did act improperly in violation of law and religion, which were condemned by the noble character and noble character derived from the norms and religious teachings and cultural values of the nation. In addition, it also happens behavior that does not respect and uphold the law. Inequality, jealousy, tension, and other social ills increasingly implicated in reduced side is also a sense of caring and social solidarity of society.

Methodology

This article is the result of research conducted by literature studies and policy reviews the Law of the Indonesia Republic literature and direct field observation nowadays.

Results and Discussions

The Central Bureau of Statistical that the population below the poverty line in Indonesia in March 2013 stood at 28.07 million (11.37 percent) compared to the month of September 2012 amounted to 28.59 million votes (11.55 percent). Therefore, we need a good effort and sustained by the command to address poverty and unemployment through various programs Pro-Poor and Pro Job. Based on Law No. 25 of 2004 on the national development planning system is an integral part of development planning procedures to produce development plans in the long term, medium term and yearly conducted by an element of the state and society at central and regional level. National economic development based on democracy organized by the principles of solidarity, justice, sustainability and environmental friendliness, as well as autonomy to be a balance between progress and national unity systematically arranged, directed, integrated, comprehensive and responsive to change organized by the General Asa State Implementation.

Furthermore, based on Law No. 32 of 2004 on Regional Government, the local government set up and manage their own affairs in accordance with the principle of autonomy and duty of assistance, directed to accelerate the realization of people's welfare through improvement, service, empowerment and community participation and to increase regional competitiveness by observing the principles of democracy, equity, justice, privileges and specificity of a region within the Unitary State of the Republic of Indonesia by taking into account aspects of the relationship between levels of government and between local government, potential and diversity of the region, the opportunities and challenges of competition globally by giving authority to the widest area with Award rights and obligations held regional autonomy within unitary state system of governance, and it is an institutional objective in every area of Indonesia.

Judging from the policy and strategy of the Directorate General of Livestock and Animal Health which is an integral part of agricultural development and national development as outlined in the 2010-2014 RPJMN particularly in terms of development according to the results of Food Resilience Food Summit of 2009. To that end, the government should ensure the implementation of measures urgent measures at the national, regional, and global commitment to fully realize the Millennium Development Goals (MDGs), namely: pro-poor, pro-growth, pro-jobs, and environmental preservation. But the direction policy is not clearly visible on the vision and mission. Vision Directorate General of Livestock and Animal Health

Long Term is: "Being a professional Directorate General in realizing the livestock and animal health and a sustainable competitive by optimizing the utilization of local resources to realize the supply and safety of livestock products and improving the welfare of farmers".

Conclusion

There are several strategies for the development of local livestock agroindustry Pro-Poor and Pro Job, namely:

1. Business actors Ranch Regional Agro-industry large-scale enterprises, medium and small enterprises in operation based on economic democracy and that a balance between the interests of business operators and the public interest and not to commit fraud in determining production costs and other costs that are part of the component of the price of goods and or services which may result in unfair competition as one of the efforts to improve people's welfare.
2. The Government of guaranteeing the provision of capital or credit and the use of local raw material as the material supply process Sustainable Livestock Agroindustry.
3. The Government continues to build, improve or develop infrastructure and supporting infrastructure activities Agroindustry Ranch activities are inclusive.
4. The Government of empowerment and capacity building of human resources business agent Agroindustry Ranch so that it has a competitive product value through training, coaching and mentoring continuously.
5. Establish a partnership that is integrated between the stakeholders and farmers, as well as employment opportunities for the community of farmers, ranchers and not society or marginalized people.
6. The Government increased the efficiency in deregulation activities in the real sector, such as export-import tariff reduction, simplification of investment, and the reduction of barriers in the country in achieving the MDGs.

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Urban Community Program of Rabbit Raising based on Eco-Friendly

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Abstract

The purpose of the program was the development of potential women groups of primary or literacy school education through individual and group approach so that it could improve the nutrition and well-being of the family. The participant's number of this program was 20 people from the Tasikmadu and Merjosari village. This activity was a participatory method, which meant that each participant played an active role in developing the potential of the community. The results of these activities were capable of developing rabbit cages that had sanitary flow. The cages were suitable to be developed in densely populated areas because of pollution and odor-free. In addition, this activity was capable of expanding video learning for slaughtering and dressing rabbits, as well as recipes and cooking meat rabbits. The conclusion of this activities was raising rabbit in urban areas with narrow land could be developed based on eco-friendly.

Keywords: *rabbit, eco-friendly, raising*

Farmers' Adoption to Pig Intensive Keeping System in Taebenu Sub District, West Timor, Indonesia

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Abstract

Improving livestock productivity in West Timor has been conducted by introducing new innovations. However, the efforts have not resulted in continuous adoption. Currently Many farmers in Taebenu Sub District, West Timor, Indonesia have adopted an intensive pig keeping system with commercially-oriented. This is interesting because it has been independently and continuously adopted. This study was aimed to explore the adoption process by seeing the support from the innovation system that consists of actors and institutions. The information is expected to be useful as a guideline for the introduction of new innovations in the field of animal husbandry in West Timor, thus finally the adoption of new innovations is expected to be faster. Data were collected through observation, individual interviews, Focus Group Discussion, and related documents. The research concluded that the adoption influences by internal and external Actors. External actors are successful intensive pig farms (companies and individuals), Agricultural Polytechnic, Government Pig Breeding unit, and distributor of feed and concentrate. The internal actors are public figures, local intellectuals, village government, and sub-distributors of feed and concentrate. Two most influencing actors are local intellectuals and public figures, which the results and income obtained by them inspire other farmers to adopt the innovation. Institutions that support the adoption consist of formal institution (local government programs to increase income of community and informal.

Keywords: *habit of keeping pig, pork consumption, smoke pork phenomenon, and the social role of pig*

The Empowerment of Rabbit Breeders in Lang-lang Village, Singosari Districts, Malang City, East Java Province, Indonesia

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Abstract

Community empowerment is an attempt to help the community in a sustainable manner without reliance on other parties. This research were conducted to identify the characteristic of rabbit breeder and to determine the empowerment level of rabbit breeders in Lang - lang Village, Singosari District, Malang City, East Java Province, Indonesia. The method used in this study was a case study. The respondents was all of member of Bina Mandiri Group rabbit breeder which was selected by using census method as much as fifteen respondent. Primary data were obtained through a structured questionnaire survey and direct observation. Descriptive analysis was applied for the data analysis. The results revealed that the age of respondents ranging between 28-64 years old, with majority of education background were primary school graduates and junior high school. Only as many as two respondents (13,34%) who have the primary job as rabbit breeders, while around 86,67% of varies job such as entrepreneur, construction workers, and private employees. The average income of rabbit breeding ranging from Rp.500,000 – 2,000,000 (approximately 104-156 USD per month). Furthermore, the level of empowerment in the ability to improve the economy of farming household was good, while the level of empowerment in being able to access welfare benefits, culture and politics abilities showed that they were very capable and independet in decision-making process as much as 3,27%. It can be concluded that culture, politics, economy, and welfare benefits can be indicators that the community was powerless.

Keywords: *empowerment, community, rabbit breeder*

Evaluation of Productivity Indicators to Propose Broiler Performance Index for Assessment of Broiler Operations

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Abstract

Performance assessment of broiler project is solely based on profit margin. Comparison of performance are limited to few individual criteria such as feed conversion ratio or body weight. The significance of composite effect of performance parameters is unclear. A survey was conducted to identify the range of individual performance parameters in three scale of farms (n = 60) and feed conversion ratio, survival rate, age at disposal, average live weight at disposal were established for local conditions. Data were statistically analysed using Minitab 15 software and Excel office. Significance of each parameters were evaluated and assigned a condition factor to denote the significance for performance. A simple formula for calculation of Broiler Performance Index (BPI) was proposed to evaluate overall performance. Farm data were analysed using the formula to test the efficacy and sensitivity of the index for performance evaluation. The four significant parameters have been combined in proposed formula to assess the efficiency of the management and production. The proposed broiler performance index was sensitive to feed conversion ratio and body weight and less sensitive to age at disposal and survival rate of the flock. The index is sensitive and positively correlated to the profit margin of the flock. Higher the index in a batch compared to a lower index in another batch of birds indicates higher performance. The proposed broiler performance index can be used to evaluate and compare performance of broilers in commercial flocks and research.

Keywords: *broiler, performance, feed conversion, survival, index*

Introduction

Poultry production in Sri Lanka has developed rapidly as a result of modern technologies applied in rearing, management, nutrition, housing, and health control. The per capita consumption of chicken meat and egg had changed from 100 g and 38 eggs in 1980 to 4.86 kg in 2010 and current per capita consumption of chicken meat and egg is estimated to be 7.19 kg and 107 eggs respectively according to the recent livestock statistics (Anon, 2014). The poultry production is in private hands with forward contracts for input supplying and marketing. The maximum return on investment per flock of birds vary around 4% to 11% based on input and product prices but the small scale farmers recover relatively low margin (Premasiri and Jayaweera 2014).

The viability and the economic performance of broiler project is assessed based on the net margin or gross margin based on the current price of inputs and products in Sri Lanka. Comparisons of performance between flocks in farm level and research are limited to individual criteria such as feed conversion ratio (FCR), age at marketing or final body weight (Premasiri and Jayaweera 2014). FCR is considered as the most important indicator of performance because that is the single factor that affects cost of production (COP) most. The

feed cost accounts for 60-70% of the COP according to the current prices of feed and other inputs and profit is mostly determined by price of feed, FCR and market price of chicken (Premasiri and Jayaweera 2014). Age at marketing is considered to be the second most important performance parameter and attaining market weight early is often attributed to the chick quality or feed quality. Survival rate of flock is just a parameter recorded in flocks. Production performance analysis in broiler industry has been considered important for several decades. Competitive broiler production cannot be conceived without the thorough knowledge of the affecting determinant factors and the effective applications of these. FCR was the main focus of many researchers to evaluate flock performance and FCR was estimated daily with data on feed intake and daily weight gain of bird (Bird, 1955). However FCR is calculated by local farmers to evaluate performance by taking the average final body weight of bird and average cumulative feed intake per bird into consideration. This may lead to over calculation of feed efficiency. European Efficiency factor (EEF), European Production Index (EPI), production efficiency index (PEI) and Russian Production Index (RPI) have been employed by many scientists to assess the performance of broiler flocks and in experiments. However, these indices are not popular locally and even in feeding trials and other experiments with broiler, performance indexes are seldom used. Thus, relative value of each performance parameter to flock's productivity or profit is not estimated and discussed. The significance of the composite effect of individual performance parameters is unclear to farmers and comparison of flock performance is done solely based on gross margin of the project. This study was conducted to identify the individual performance parameters in broiler operations that may influence the profits and identify the significance of each performance parameter to overall efficiency of production through index calculation.

Methods

The study was conducted in year 2015 by surveying broiler farms to identify performance parameter achieved at farm level which can be employed to formulate performance index. The study sample comprised of three scales of operation: Small to medium scale, large commercial scale and Commercial industry scale broiler farms (n=60) which are under deep litter management system in different agro climatic zones of Sri Lanka. Available farm records for 2014 and 2015 were collected and data on feed intake of bird, feed conversion ratio, survival rate, age at disposal, average live weight at disposal, feed and other input cost prevailed in the year were estimated. Data were statistically analysed using Minitab 15 software and Excel office. The range of individual performance parameters in broilers were summarized and tabulated for each farm and range of each parameter was established for local conditions. Cost of production and gross margin of each project were estimated based on standardized input and output price. Relative significance of each parameter for the performance and gross margin were analysed. A simple formula for evaluation of overall performance was developed based on the range of recorded performance parameters and the performance figures which are higher the better were taken as numerators and figures that are smaller the better were taken as denominator. Factors were employed to keep the index within sizeable values preferably from 1 to 100. Broiler performance index was calculated for each flock using the proposed formula and relationship of performance parameters and economic performance were investigated.

Results and Discussion

The precise data on feed intake of birds, final body weight and age at marketing were available in farms while survival rate often had to be estimated based on available information. FCR and body weight of birds at 42 days of age highly vary between batches within the farm and also from farm to farm. The survival rates of the flocks of the study group

were 86% to 97% (average 94% ±3.4). Deaths were mostly recorded (1-2%) in first five days of brooding and after 32 days of age (2-3%). Death rates were below 5% in all three scales of operation. Average feed intake of birds in 42 day rearing period was 3.06 kg to 3.52kg. FCR recorded in individual farms were 1.56 to 1.98 (average 1.80 ± 0.19). FCR vary between farms based on the system of feeding, watering and other management practices. Age at marketing was 31 to 47 days (average 39.7 ±4.3 days). The body weight of the birds at disposal varied between 1.67 kg to 2.23 kg (average 1.89 ± 0.13 kg). Profits of projects were higher when FCR is below 1.7 and when average body weights were over 1.9 kg in 42 days.

Impact of morality of chicks at early ages and age at dispatch to profits are negligible but deaths after 30 day of age keeps all the cost components high and 1% deaths at last weeks of growing reduce the total profits by 2.7% to 3.4%. Increases of FCR by 0.1 reduces profits by 4.3 to 5.4% and increase of body weight by 0.10kg increases the profit by 2.3 to 2.8%, when calculated using standard input cost and market prices. That proves that profit margin is more sensitive to FCR than to live weight of birds. According to Figure 1, even lower live weights (1.7kg to 1.8kg) are profitable if the FCR is around 1.6 to 1.7 and some times higher live weights (1.9kg to 2.0kg) would not be profitable when the FCR is around 1.8 to 1.9.

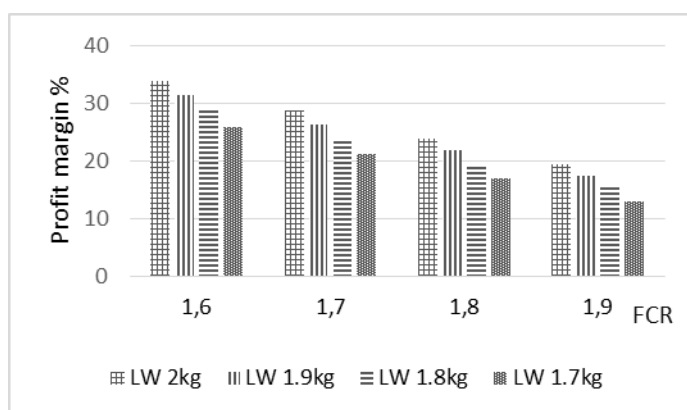


Figure 1: Relationship of average live weight and FCR to the profits margin

Evaluation of individual performance parameters has revealed that FCR had the highest impact on profit margin and final body weight also has high impact while age at disposal and survival rate had comparatively less impact to the rate of return. The all significant phenomena with their relative impact have been put together to develop formula to calculate more effective performance index. The following formula was proposed to calculate Broiler performance index considering the relative significance of the each parameter.

$$BPI = \left[\frac{LW \times SR \times 50}{FCR \times AD} \right] - 100$$

LW: average live weight per bird (kg), SR: survival rate (%), FCR: feed conversion ratio, AD: age at disposal (days)

The performance figures which are higher the better were taken as numerators and figures that are smaller the better were taken as denominator. Factors were employed to give a weight to significant parameters and to keep the index within sizeable values preferably within the range of 0 to 100. When considered individually, FCR and the final body weight had highest impact on profit margin and survival rate and age at disposal had comparatively less impact on the profits. BPI for the entire sample was 24.6 for all the flocks with the recorded performance parameters. The highest and lowest recorded BPI values were 96.41 and -15.09 respectively for some extreme cases. Minimum BPI for a profitable operation of a flock was estimated to be 1.54 and at this level of the four performance parameters were FCR;1.8, survival rate; 94%, final body weight;1.75 kg and age at disposal; 45 days. At the

optimum performance levels of four selected parameters were FCR;1.6, weight; 2kg, age;42 days and survival rate: 95% and BPI at that performance was 41.4. BPI was positively correlated to the gross margin (Table 1).

Table 1: BPI and the return on investment for different levels of performance

Batch No	FCR	Live weight kg	Survival rate%	Days to disposal	BPI	Return on investment %
1	1.51	2.30	98.00	38	96.41	33.00
2	1.55	2.21	99.00	37	88.82	29.00
3	1.60	2.00	95.00	42	41.37	18.47
4	1.70	1.90	95.00	43	23.46	11.85
5	1.80	1.84	94.00	44	9.19	5.40
6	1.80	1.74	91.00	44	- 0.04	0.15
7	1.90	1.65	88.00	45	-15.09	-8.32

When BPI was 41 and 19 the rate of return was 27.0% and 13.6% respectively at the current price of inputs and products. When the BPI is below zero project may not be profitable unless cost of production was low and product prices were high.

Conclusion

FCR, average live weight (kg/bird), survival rate and days to market are the indicators of flock performance of broilers respectively in their order of significance. These four factors can be used in proposed formula to calculate BPI to demonstrate the overall productivity of the boiler flock and to indicate profitability of the project. Higher BPI value was an indication of higher performance always in relation to better FCR, lower age at disposal, higher average live weight at disposal and higher survival rate of birds. Calculated BPI can be used to compare productivity of different broiler flocks and can be modified to assess economic performance.

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Fresh Milk Quality and Information Availability on Local Stage in Malang Area East Java, Indonesia

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Abstract

Milk is commonly well known by people come from product made from factory, while fresh milk from dairy farmer is still not. Cutting market chain is very important in order to get low price of milk for everyone which mean the market of fresh milk need to be built. Even so, the quality of fresh milk need to be controlled. This study aims to know fact happens on fresh milk information availability for common people and its quality. Correspondent used was 280 people which divided into 30 groups which had to buy fresh milk then answer questionnaire. Variables used were milk density, fat content, price, area, and source of information. Data then analyzed descriptively. The result shows that the quality of fresh milk still low in local stage is still unsatisfied with only 20% of fresh milk fulfill density standard and 56.67% meet minimum fat standard in Indonesia. The price of fresh milk in local stage is commonly affordable. For one liter, 66.67% milk has price below 7,000 rupiah, 20% milk has price from 7000 rupiah to 10,000 rupiah, and 13.33% milk has price with more than 10,000 rupiah. Commonly, they buy in Malang City (55.67%), Batu City (36.67%), and other (7.66%). The main information source is come from their friend (43.33%), asking people in the way (33.33%), and find by themselves (23.33%). In conclusion, the fresh milk in local stage is commonly still do not meet the standard, has affordable price, can be easily to find by asking people.

Keywords: *area, density, fat content, fresh milk, price, quality, source of information*

Introduction

Milk is the important food for human needs which content various useful nutrition. Even so, milk is still well known by people from factory product. Milk product from factory is come from long market chain, start from farmer in on farm production, cooperation, milk industry, then product marketing which including grocery, until retailer (Firman, 2010). The longer market chain, the more expensive product even the more value added to the product. Recently there are high concern about sustainable nation development by keeping food price low and reachable for consumer. Kneafsey et. al. (2013) said that there was the development of Short Food Supply which have several characteristics: (1) food is traceable from where being produced; and (2) there should be few or no intermediaries between farmer and consumer. There is some benefit of Short Food Supply Chain including significant profit for farmer and regaining control of production by farmer (Mastronardi, 2015). Moreover, Bakri et. al. (2015) said that Malang is one of milk production center in East Java, but there is still no information whether people know where to buy fresh milk or not. In order to ensure local product, the quality itself need to be checked based on National Milk Standard (BSN, 2011).

Therefore, the purposes of this study is to know fact happens on fresh milk information availability for common people and its quality.

Methodology

The study consisted of two parts: (1) interviewing the correspondents how they got the fresh milk; then (2) testing milk quality. For milk quality test, the study was held in dairy science laboratory, University of Brawijaya. Correspondent used was 280 animal husbandry student divided into 30 groups which had to buy fresh milk then answer questionnaire. Variables used were: (1) milk density; (2) fat content; (3) price, (4) area, and (5) source of information. Data then analyzed descriptively.

Results and Discussion

Based the investigation, there are several result collected. Especially for milk quality, milk density can be seen on Figure 1, while for fat content can be seen in Figure 2.

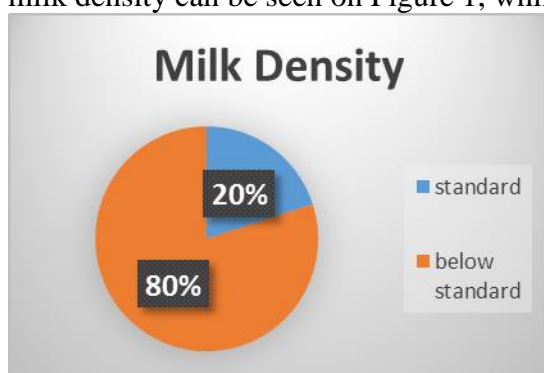


Figure 1. Local Fresh Milk Density Compared with National Milk Standard (1.027)

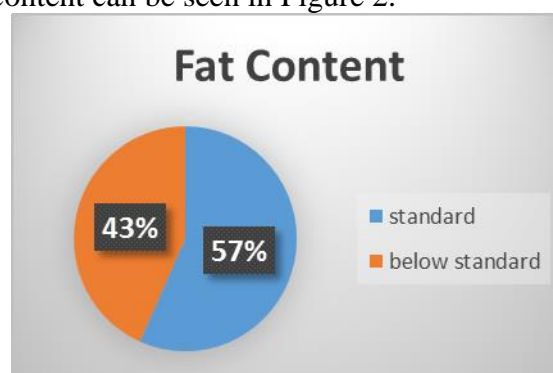


Figure 2. Local Fresh Milk Fat Content Compared with National Milk Standard (minimum 3%)

According to national standard, there are regulation for milk standard which had to be fulfilled, for milk density is 1.027 while fat content minimum 3% (BSN,2011). According to Figure 1, fresh milk density sold by local farmer 80% is still below standard, while fat content many of them fulfill standard (57%). This is accordance with investigation of Saputra (2015) which reported that local fresh milk in Tawang Argo is still lower specifically in milk density 1.027 while the fat is already met 3% fat content.

The price of fresh milk in local stage is commonly affordable based on Figure 3. For one liter, 66.67% milk has price below 7,000 rupiah, 20% milk has price from 7000 rupiah to 10,000 rupiah, and 13.33% milk has price with more than 10,000 rupiah. Prasaja (2016) said that fresh milk price from farmer to factory around Rp 4,200 to Rp 4,500 which equal with spring water product. This mean that by making new direct market, it can improve farmer income in certain strategy.

Based on Figure 4, more than half correspondents know where to buy fresh milk. Commonly, they buy in Malang City (55.67%), Batu City (36.67%), and other (7.66%). High result of correspondent bought in Batu was because the mindset of Batu City famous of fresh milk variety product.



Figure 3. Fresh Milk Price

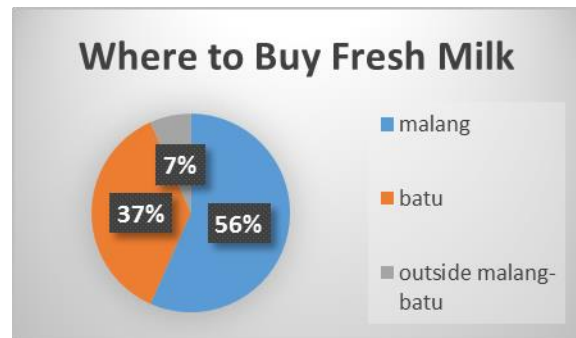


Figure 4. Where correspondent buy fresh milk

It is also explained by Figure 5; which friend have big role as source of information. The main information source is come from their friend (43.33%), asking people in the way (33.33%), and find by themselves (23.33%). Based on this, reputation of dairy farm play as big role.

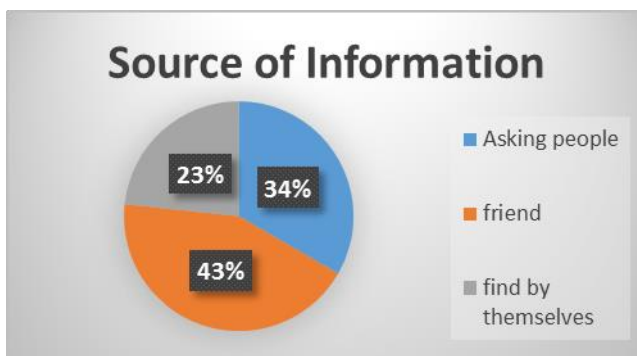


Figure 5. Source of Information

Conclusion

The fresh milk in Malang Area is commonly still do not meet the standard for milk density, but for fresh milk fat content already met. Fresh Milk in Malang Area has affordable price and can improve local farmer income. Fresh milk can be easily to find by asking people or friend.

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Oral Presentation 2 Focus Session:

Reproduction

Wednesday, 19 October 14:00-15:00

Room: Anjasmoro

Sperm Quality of Ongole Crossbred Cattle on Egg Yolk Cauda Epididymal Extender During Cooling Process in Straw

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Abstract

CEP extender has been characterized basically follow the condition of cauda epydidimal plasma in male reproduction tract which is suitable to maintain the life of sperm. The aim of this study was to evaluate the quality of Ongole Crossbred Cattles sperm on CEP extender with and without bovine serum albumin (BSA)+ egg albumin during cooling process in straw. The material used was fresh semen with the motility at least 70%. The treatment used were sperm on CEP-2 and CEP without BSA + egg albumin. During cooling process semen was stored in a straw as much as 0.25 ml with concentration was 25 millions/straw. The results showed that sperm motility decreased to around 40% after 7 day incubation . The average of motility were $40 \pm 12,0$ on T1; $36,5 \pm 10,6$ on T2, while percentage of viability were $79,5 \pm 7,8$ on T1; $81,1 \pm 5,6$ on T2 and the percentage of abnormality were $4,4 \pm 1,8$ on T1; $3,8 \pm 1,3$ on T2. T-test results showed that on seventh day incubation there was significant differences ($P < 0.01$) between CEP-2 and CEP without BSA on motility, viability and abnormality. In conclusions, the quality of sperm on CEP-2 and CEP without BSA + egg albumin were decreased significantly in 7 day incubation.

Keywords: sperm quality, cep-2, egg albumin

Introduction

Chilled semen is more advantageous compared to frozen semen because of its longevity that persist in the female reproductive tract and give a higher rates of fertilization (Bucher et al., 2009). However, even for chilled semen also have the significant decrease in sperm motility for a longer incubation time (Verberckmoes et al. 2005). The conception rates of cows inseminated with bovine semen cooled for 24 h is higher than cryopreserved semen (Crespilho et al. 2012).

CEP-2 is a diluter that have the ionic composition mostly like liquid of bull cauda epididymal (Verberckmoes et al. 2005). It is a diluter with consist of many components including fructose as a energy source, citric acid as the buffer sources, sorbitol to increase the osmolarity and bovine serum albumin (BSA) as macro-molecular. The research was conducted to investigate the quality of bull spermatozoa on CEP-2 diluter during chilled storage (5°C) (Sumadiasa et al. 2015). BSA is one of the component of CEP-2 with high cost. BSA is the protein albumin protein derived from cows with the sources albumin is 100mg/mL (Sasongko et al. 2010). In order to get the lower cost of CEP extender need to

investigates the other sources albumin to replace BSA such as egg albumin, because it contain 54% of total egg protein (Alleoni dan Antunes 2004).

The aim of this study was to evaluate the quality of Ongole Crossbred Cattles sperm on CEP diluter with and without bovine serum albumin (BSA) + egg albumin during cooling process in straw.

Methodology

The bulls used in this study was Ongole Crossbred Cattles which were raised at Beef Cattle Research Station, Pasuruan, Indonesia and housed at individual housing during the experiment. The bulls were feed with additional feed on two weeks before the collected semen. Semen was colected by using Artificial Vagina with the temperature of artificial vagina was around 45-50° C (Susilawati T 2013). After colected, the tube with semen colected was placed on water jacket with the temperature was 33-36° C. Fresh semen with the individual motility at least 70% and mass motility was + 2 can be used for the research material based on standart of SNI. Fresh semen was evaluated both macroscopically and microscopically. The selected semen was diluted with egg yolk caudal epididymal-2 (CEP-2) (T1) and CEP without BSA + egg albumin (T2). The semen were diluted gradually until the temperature reached to 5°C. Semen was placed in a straw with the volume was 0.25 ml and concentration number was 25 millions in each straw, the semen diluted was stored in temperature 5°C during the evaluation. After diluted semen was evaluated with the three variables including individual motility, viability and abnormality of sperm. The evaluation was conducted everyday at the same hours until the individual motility was decreased to 40%. The repetition were conducted as much as 10 repetitions. The obtained data were analyze with T test to compared two methodes including semen with CEP-2 diluter (T1) and CEP without BSA + egg albumin diluter (T2).

Results And Discussion

The average of fresh semen quality used in this research were included on good category based on on Garner and Hafez (2008) with the average volume was 6.29 ml , individual motility was 70% , mass motility was ++, cream colour, the viability was 80.78% and abnormality was 2.98 % . All the parameter showed that fresh semen used in this studies can be processed for chilled semen and frozen semen.

Chilled semen quality were measured in three parameters including individual motility, viability and abnormality. The quality of semen after dilution can be seen on the table 2.

Table 2. The average quality of chilled semen

Parameters	Treatme nt	Day of Incubation (5°C)							Overall mean ±SEM
		D-1	D-2	D-3	D-4	D-5	D-6	D-7	
Sperm Individual Motility (%)	T1	63.5±4.1	57.5± 7.5	55.5± 9.6	53.5± 9.7	49.5± 11.9	45.5± 9.8	40± 12.0	52.1±7.85
	T2	63± 3.5	60.5± 7.2	57.5± 7.2	54.5± 8.3	49± 10.5	42.5± 10.6	36.5± 10.6	51.9±9.74
Sperm Viability (%)	T1	84.2 ± 5	81.9± 4.8	81.8± 2.9	80.8± 5.8	80.8 ± 1.5	80.1 ± 5.8	79.5 ± 7.8	81.3±1.54
	T2	83.9± 3.5	83.6± 4.9	82.2± 2.4	81.0± 4.3	80.9 ± 2.2	80.8± 2.6	81.1 ± 5.6	81.9±1.34
Sperm Abnormality (%)	T1	3.3± 1.5	3.3± 1.0	4.6± 0.2	4.2± 1.4	4.1± 1.8	4.7± 0.9	4.4± 1.8	4.1±0.56
	T2	3.4± 2.2	3.8± 1.3	4.0± 0.3	3.9± 0.9	3.4± 0.2	4.2± 1.1	3.8± 1.3	3.8±0.3

Note: T1 was semen on CEP-2 diluter

T2 was semen on CEP diluter without BSA + egg albumin

The table 2 showed the quality of sperm after diluted and stored at the straw on the temperature 5°C, overall the individual motiliy of sperm on the first day until fifth day was

around 50-65 % between the T1 and T2, however on the sixth and seventh day the individual motility of sperm was decreased under 50%. In general, the individual motility was decreased to 40% after seventh day incubation. Based on T test result on the seventh day incubation there is a significant differences ($P < 0.01$) between the T1 and T2 which the individual motility of T1 was higher than T2. However overall of average of motility showed that the individual motility of sperm both of treatments almost the same which were T1 52.1 ± 7.85 and T2 51.9 ± 9.74 .

The average of viability of sperm on T2 overall higher than T1. T test result on the seventh day showed the significant different ($P < 0.01$) between T1 and T2 which the percentage of viability on T2 were higher than T1. While on abnormality also showed the significant different ($P < 0.01$) on seventh day incubation which the percentage of abnormality in T2 were lower than T1. Overall, based on data of individual motility, viability and abnormality the data showed that egg albumin can be considered to replaced BSA on CEP-2 diluter. Egg albumin was effective to maintain the quality of sperm because it consist of 18 amino acids such as alanin, arginin, aspartic acid, glutamat acid, cystin, glycin, histidin, iso leucin, thereonin, tryptofhan, tyrosin and valin (Soekarto, 2013), while BSA consist of 20 amino acid (Gadea, 2003).

Conclusion

The chilled semen of Ongole Crossbred Cattles still can be used for inseminated until seventh day after dilution both in CEP-2 diluter and CEP without BSA + egg albumin. Based on all parameters resulted of sperm quality, egg albumin can be considered to replaced BSA on CEP-2 diluter.

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Semen Characteristics and Sperm Recovery Rate of Aceh Bull Frozen Semen

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Abstract

This study were aimed to evaluate the semen characteristic of Aceh breed and to study the spermatozoa recovery rate after freezing. Nine Aceh bulls belong to Nasional Lembang AI centre were used for this research, in total 593 ejaculate during 2015. The semen was collected using artificial vagina and subsequently evaluate macro- and microscopically according to AI centre procedure. Semen were diluted with skim milk egg yolk extender, packed into 0.25 ml straws and then equilibrate at cooling cabinet and finally frozen using automatic freezing machine for 10 minutes. The result demonstrated that color and aspect of the ejaculates ranged from milky white to creamy, the average of semen volume was 5.57 ± 1.66 mL, pH was 6.56 ± 0.14 . The average of sperm progressive motility and sperm concentration were $67.21 \pm 0.09\%$ and $975.24 \pm 381.72 \times 10^6$ sperm respectively. The average straw produced per ejaculate was varies from 190.14 ± 66.51 to 380.41 ± 106.82 straws. The recovery rate were 60.44 ± 5.42 to $66.01 \pm 7.41\%$, these results were higher than other local breed such as Bali, Madura or Ongole crossbreed. In conclusion, we found wide variability in the sperm concentration among individual Aceh bull as well as in the number of straw produced by each bull and also the value of recovery rate.

Keywords: aceh cattle, semen characteristic

Introduction

Aceh bull is a breed of cattle indigenous to the Aceh province, have been declared by the government through the Minister of Agriculture No. 2907 / Kpts / OT.140 / 6/2011 as one of Indonesian local cattle. The population of this cattle in Aceh is estimated at around 590 315 head with a population growth of 4.4 % (Diskeswannak Aceh, 2011). The entry of exotic cattle from abroad in addition to improve the quality of local livestock, threatening of local animal genetic resources, if conducted without crossing evaluation, control and without consider conservation of Indonesia native cattle. To improve quality of Aceh cattle, Lembang artificial insemination center produce frozen semen of this breed. This research aimed to evaluate the quality of raw semen quality, expected frozen doses produced from each bull and recovery rate of Aceh bull.

Methodology

Nine Aceh bull, age 5-6 years, body weight 350-450 kg belong to Lembang Artificial Insemination Center were used as a sperm source with a total of 593 ejaculate during 2015. The bull were kept under natural light and maintained under a uniform and constant

nutrition regime. Each bull being fed on a daily diet of 6 kg concentrate, 30 kg king grass, and water ad libitum.

Extender Preparation

Milk extender was prepared by using 10 g of skimmed (Tropica slim) milk powder and 0.9 g of glucose in 100 mL of distilled water, heated to 95 °C for 10 min, and then cooled to room temperature before the addition of 10% egg yolk and 8 % glycerol. Finally the extender were added with 0.5 mg streptomycin and 1000 IU Penicillin. per ml extender (Kulaksiz *et al.*, 2012).

Semen collection, evaluation and Processing

The semen was collected by using artificial vagina, twice a week. Immediately after collection the semen were evaluate macro and microscopically. Macroscopic evaluation including, semen volume, pH, consistency and colour. For frozen semen production only motility and sperm concentration were recorded. Only semen having $>1.000 \times 10^6$ sperm concentration and $> 70\%$ of progressive sperm motility were selected for cryopreservation. The semen were diluted with diluent to a final concentration of 100×10^6 sperm/ml. Diluted semen were loaded into 0.25 ml straws (Minitube Germany) using automatic filling and sealing machine (Combo System, Minitube Germany), equilibrated at 4° C for 4 hours and freeze at automatic freezing machine (Digitcool 5300 ZB 250, IMV Prancis) for 9 minute and the straws were then plunged into the liquid nitrogen; where stored until thawing (Hafez 2000).

Evaluation of post thawing quality and recovery rate

After 24 hours of storage, the semen straws were thawed in a water bath (37° C for 30 second) Sperm motility evaluation was asses immediately after thawing.using a phase contrast microscope (Olympus BX 53) X 200 magnification with a warm stage maintained at 37°C. A wet semen mount was made using 5 µL semen placed directly on a microscope slide and covered by a cover slip. Motility estimations were performed from five different microscopic fields in each sample.

Statistical Analyses

All data of raw semen quality and post thawing motility and recovery rate were recorded, tabulated using Microsoft Excel 2007 and expressed presented as average and standard deviation.

Result and Discussion

The result of aceh bull raw semen demonstrated milky white to creamy in color. Semen volume ranged from 4.25 to 7.12 ml with 6.56 ± 0.14 in pH. Sperm motility ranged from 66.00 to 66.80%, and sperm concentration were varies from 832.06 to 1074.49×10^6 (Table 1).

The production of straw per semen collection is varies for each collection and each bulls. The number of straws produce from single ejaculation can yield ranged from 190.14 ± 66.51 to 380.41 ± 106.82 straws (Table 2). Straw that produce from single ejaculation in this research comparable with Bhakat *et al.* (2015) and Roy (2006) in Karan Fries bulls and Fries Holstein crosses, which was 180 and 220.70 straws. Ghodasara *et al.*, (2016) in buffalo, entire year frozen production can reach 3546.46 ± 540.30 straw.

Table 1. The quality of Aceh bull semen

Number of bull	Volume (ml)	pH	Sperm Motility (%)	Sperm concentration ($\times 10^6$)
21049	5.60	6.51	66.80	869.67
21050	4.25	6.63	67.50	1102.27
21051	6.13	6.63	67.50	1024.24
21052	7.12	6.63	67.80	967.14
210602	6.17	6.54	67.50	1020.00

210804	5.81	6.44	66.80	881.52
211005	5.19	6.52	66.80	1074.49
21254	4.59	6.63	68.50	832.06
21053	5.25	6.55	66.00	1005.71
Average	5.57±1.66	6.56±0.14	67.24±0.09	975.23±381.72

593 ejaculate during 2015

Table 2. Number of straws produce per ejaculate and recovery rate of Aceh bull semen

Number of Bull	Number of Straw	Raw semen Motility (%)	Post thawing Motility (%)	Recovery rate (%)
21049	222.17±86.24	70	42.31±1.51	60.44±5.42
21050	213.78±110.32	70	45.00±1.12	64.29±3.78
21051	380.41±106.82	70	44.00±1.32	62.86±5.22
21052	305.67±112.12	70	46.00±2.10	65.71±2.82
210602	204.65±76.14	70	46.21±2.20	66.01±7.41
210804	190.14±66.51	70	43.00±1.44	61.43±3.1
211005	259.35±67.23	70	43.00±1.50	61.43±4.22
21254	268.28±80.12	70	44.00±1.40	62.86±2.32
21053	300.62±65.23	70	46.00±2.10	66.00±4.21
Average±SD		70±00	44.39±1.44	63.42±2.10

Post thawing motility of frozen thawed Aceh bull was moderate 44.39±1.44% with the recovery rate was 63.42±2.10% (Table 2). This result was in the range of recovery rate of FH bull, reported by Arifiantini *et al.*, (2005) which were 59.40±11.24 to 69.56±11.32%. Present study revealed that semen characters, number of straw produced from single ejaculation and recovery rate of Aceh bull are comparable with Fries Holstein and buffalo bull.

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Post-Thawed Semen Quality of West Java Local Ram at Different Level of Glycerol

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Abstract

The purpose of this study was to determine the level of glycerol that produce the best quality of post-thawed West Java local ram semen. The study was conducted using complete randomized design (CRD). Semen was obtained from local sheep were 3 years old treated with four levels of glycerol (4%, 5%, 6% and 7%) and was repeated for 10 times. The parameters observed were motility, abnormality and intact plasma membrane (IPM) of sperm. The results showed that the level of glycerol 4%, 5%, 6% and 7% resulted motility, respectively for 36.93%, 42.09%, 37.72% and 37.36%; abnormalities at 2.65%, 1.85%, 2.35% and 2.65%; and IPM at 47.71%, 52.30%, 48.50% and 47.50%. Results of variance analysis showed that the level of glycerol significantly ($p < 0.05$) affect on motility, abnormalities and IPM. It was concluded that the level of 5% glycerol produce the best post-thawed semen quality of West Java local ram.

Keywords: *post-thawed semen quality, West Java local ram*

Introduction

Sheep is one commodity in West Java as the main business and sideline. The existence of sheep as the main business is generally intended as one of the suppliers of red meat, while the sheep as a side business is diversification with a core business of agricultural as economic savings to support the household economy (Priyanto 2008). However, both of these efforts contribute to the animal protein needs of society.

According to statistics of the Department of Animal Husbandry in 2007, sheep have second ranks in the fulfillment of red meat after the cattle. The overall condition of livestock in West Java can only provide 17, 27% of all demand for meat and the rest met from imports as much as 44.04% and from other provinces amounted to 38.69%. The data is increasing from year to year so that the sheep livestock subsector should continue to be developed.

Development of sheep population could be done with reproductive biotechnology such as artificial insemination using post thawed frozen semen, so we need to do research about the level of glycerol as cryoprotectants that can produce the best semen quality of Local ram.

The result of this study will provide scientific information that can be used in artificial insemination program, which is expected to accelerate the improvement of sheep population for the benefit of the fulfillment of meat consumption.

Methodology

Materials and Devices Research

The research material like cement produced from a local sheep males weigh 45-50 kg and aged 24 months. Green feed and feed additives (pulp) given every day as much as ± 5 kg/head and ± 0.35 kg/head. Semen collection was conducted using an artificial vagina, then the cement will be evaluated in the laboratory.

Semen Processing Method

Diluent component cement consisting of a buffer solution (buffer), egg yolk and antibiotics. The diluent used is tris yolk. Cement that has been given a diluent and then treated glycerol levels, consisting of 4%, 5%, 6%, and 7%. Freezing semen begins with inhalation of cement that has been diluted into the straw using a suction pump automatically, and then the open end of the straw which emphasized on polyvinylalcohol adhesive powder. Straw used is ministraw (0.25 ml). The next process is inserting a straw that has been glued into the refrigerator temperature of 5 ° C to equilibrated for 2-4 hours. After equilibration process then straw arranged in a rack that is located approximately 10-15 cm above the surface of liquid nitrogen (-130°C) for 15 minutes and then inserted directly into the goblet is dipped into a solution of liquid nitrogen (-196°C temperature) that exist within the container, Thawing be done in water with a temperature between 38 - 40°C

Results and Discussion

Fresh Semen Characteristics of Local Sheep

The average volume of semen obtained Local lamb is 1.20 ml. Fresh cement produced cream-colored, somewhat watery consistency with a characteristic odor and a pH of 7.15. The observation of mass movements are (+++). The concentration of sperm cells Locally produced lamb is 349.60 x 10⁷ sperm cells / ml. Fresh semen motility obtained by 87.62%. Abnormalities of spermatozoa obtained in the study was 0.6%. Local sheep MPU fresh semen is at 92.60. Based on this, the fresh semen characteristics of sheep Locally obtained are of good quality. Based on the observation of fresh semene can be concluded that the cement worthy of further processing in the form of frozen semen.

Effect of Glycerol Level in Tris Diluent Egg yolk on sperm motility Local Sheep

Parameters	Glycerol Level			
	4%	5%	6%	7%
Motility (%)	36,93	42,09	37,72	37,36
Abnormality (%)	2,65	1,85	2,35	2,65
IPM (%)	47,71	52,30	48,50	47,50

Based on Table, the average percentage of sperm motility post-thawing Local lamb produced on the treatment level of glycerol 4%, 5%, 6%, and 7% in tris diluent yolk respectively by 36.93%; 42.09%; 37.72%; and 37.36%. Results of analysis of variance shows that the addition of glycerol level provide a significantly different effect (P <0.05) on sperm motility Local ram post thawing.

Glycerol is able to prevent cold shock and minimize ice crystals formed during the freezing process so that the semen motility can be maintained. According to Hafez (2000) and Siswanto (2006) glycerol used as cryoprotectants can diffuse penetrate and enter the sperm cells, have the binding force of water is strong, so that the effect of protection that is able to help prevent dehydration caused by cold shock by replacing the water that comes out of freezing the cells as they progress. Personality thus affect the vapor pressure so that the freezing point of the medium decreases, resulting in sperm cells will have an opportunity longer to remove the water, in addition to the glycerol used by sperm cells to oxidative metabolism and pushes out electrolytes, lower electrolyte concentration of intracellular and reduces damaging to cells spermatozoa so that cell death can be minimized. According Mumu (2009) and Tambing (1999), during the freezing process, glycerol is able to modify the ice crystals formed and inhibit damage to the cell membrane mechanically at the time of temperature decrease (cooling rate), so that the damage of cell organelles spermatozoa such as lysosomes mitochondria can avoided, so that an unbroken chain oxidation and metabolic

processes that cause the spermatozoa continue to stay alive. Glycerol will provide effective protection against sperm if the concentration in the optimal dilution. Tambing, et al. (2000) states when the glycerol concentration is not optimal will cause interference in the form of decreased quality of sperm.

The results of this study show that the addition of level 5% of glycerol is an optimum level to maintain sperm motility Local sheep post thawing, and when seen from the side of the application in the field, the level of 5% glycerol to produce an average of 42.09% motility eligible for the IB. It is based on the ISO 4869.1 (2008) found a decent standard IB motility in frozen semen thawed back (post thawing) the minimum is 40%.

The membrane can protect the physical parts of spermatozoa, regulate the entry and exit of nutrients, ions required in metabolic processes and maintain electrolyte balance intra and extracellular. According Feradis (2010) MPU spermatozoa characterized by the swelling and the arch at the end of the sperm tails, a short tail and thick or swelling of all or part of which is formed by the tail spermatozoa, while the spermatozoa are damaged are marked with a tail that is straight.

Based on Table the average percentage of IPM post thawed Local lamb produced on the treatment level of glycerol 4%, 5%, 6%, and 7% in tris diluent yolk respectively by 47.71%; 52.30%; 48.50%; and 47.00. Results of analysis of variance shows that the addition of glycerol level provide a significantly different effect ($p < 0,05$) to IPM ofpost thawed Local ram semen.

The addition level of glycerol 5% able to prevent cold shock and minimize the formation of ice crystals that increase the concentration of the electrolyte can be avoided and the osmotic pressure of intra and extracellular remain stable, the cell membranes of spermatozoa remain normal and does not lose the enzyme aminotransferase (Aspat) which is the main enzyme in mitochondria that produce ATP that ATP production continued and motility can be maintained (Arifiantini & Purwantara 2010). According to Parks and Graham (1992); Siswanto (2006); and Tambing, et al. (2000), glycerol has the properties of fat-soluble, so it can directly penetrate the cell's plasma membrane by way of balancing the intra and extracellular concentrations. When presented with glycerol medium will occur osmotic response, and the cells will lose water. Furthermore, glycerol is absorbed into the cell so that the size of the sperm cells back to normal. The entry of glycerol into sperm cells resulting in reduced intracellular water so that the formation of ice crystals is reduced.

The role of glycerol in protecting the plasma membrane phospholipid binding force thus decreasing membrane fluidity and interact with the membrane to bind to proteins and glycoproteins that cause the particles collected intra membrane. Thus, in addition to work to minimize the formation of ice crystals glycerol is also able to maintain the flexibility of cell membranes. If the cell membrane integrity can be maintained during the freezing process, it will provide a good effect on motility (Parks and Graham, 1992). The results of this study show that the addition of the level of glycerol 5% in diluent tris yolk is an optimum level to maintain MPU spermatozoa sheep Locally post thawing, and when seen from the side of the application on the ground, treatment glycerol 5% yield MPU within the normal range and deserves to IB ie amounting to 50.20%. This is based on research Jeyendran and Zanevald (1984) in Solihati, et al. (2005) found that the MPU spermatozoa less than 50% is not recommended for use in the IB program.

Conclusion

Based on the results of this study concluded that the Level 5% glycerol in tris diluent yolk produce post-thawing semen quality is the best in local sheep.

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Effect Equilibration Time in the Process of Freezing the Quality of Semen Wagyu Bull Using Diluent ®Andromed

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Abstract

This studies aimed to know the effect of long equilibration of Wagyu cattle semen on the semen quality and to determine the influence of individuals on the quality of Wagyu cattle semen on different equilibration time. The material used in the form of Wagyu cattle fresh semen is derived from 9 times collecting process from 3 bulls. The collection process conducted one time a week for each bull by using an artificial vagina. All bulls are maintained by good management in PT. Austasia Stock feed breeding unit. Fresh semen that was used had average value of individual motility percentage of 75% and the mass motility 3+. The diluent used was AndroMed®. This research method is experimental laboratory with 3 treatments and 10 repetition. The treatments were three long equilibrations time span with P1 (3 hours 30 minutes), P2 (4 hours), and P3 (4 hours 30 minutes). The observed variables include the percentage of individual motility at the time before freezing and after freezing and total motile spermatozoa (TMS). Data analysis used analysis of variance and design used was a randomized block design nested two stages. The results of this study indicates that the equilibration time difference (P1, P2, and P3) no significant effect ($P > 0.05$) to percentage of individual motility of spermatozoa in Wagyu cattle. Wagyu cattle bull individual differences influence on semen quality before freezing and post thawing. Bull 1 has the best quality of spermatozoa percentage value with the value of the percentage of individual motility spermatozoa before freezing and post thawed with the value $61.67 \pm 2.50\%$ and $35.51 \pm 7.71\%$.

Keywords: semen quality, individual motility, post thawing

Introduction

Efforts to improve the productivity of livestock and to overcome the limitation of the number of superior male can be done by improving the genetic quality of livestock through the AI program. In the Frozen semen production process. here are several things that greatly affect the quality of the semen. including the freezing process. In this process occurs a critical point temperature on spermatozoa to survive due to cold shock. Spermatozoa adapted with glycerol in cold temperatures. This process is also known as equilibration.

Based on the above description need to do research on the effect of long equilibration of the quality of frozen semen ie individual motility after thawing back (post thawing motility) in spermatozoa Wagyu cattle.

Methodology

Research conducted at the Laboratory of Production PT. Austasia Stockfeed breeding unit Dusun Bawang Kijang, village Negara Batin, District Jabung, East Lampung regency.

The material used in this study a superior male fresh semen trained Wagyu beef derived from 9 times the storage of 3 bull. The process of semen collection performed 1 time per week per individual cattle using artificial vagina. Fresh semen were found to have an average percentage of 75% motility individual and mass motility 3+. Dilution semen using commercial diluent is ®Andromed.

This research uses experimental methods. The design used was a randomized block design (RAK) Nested two stages. After collection , fresh semen evaluation macroscopically and microscopically.

Semen that has been qualified directly diluted using diluent ®Andromed. and the equilibration process is then performed in accordance with the treatment. The final stage is in thawing using warm water temperature of 37-38 ° C. Data obtained by the individual motility of semen before freezing and after diluted (post thawing) 3 treatment time equilibration semen, which is 3 hours 30 minutes (P1), 4 hours (P2), and 4 hours 30 minutes (P3) of each of the three superior male semen trained.

Results and Discussion

Fresh Semen Quality

The volume of fresh semen obtained from each individual bull is different The average of the volume of semen per ejaculate were used in this study sequentially that is *bull 1* (8 ± 0 ml), *bull 2* ($10 \pm 1,80$ ml), and *bull 3* ($8,83 \pm 3,88$ ml). Fresh semen Wagyu cattle in this study includes normal for the type of beef cattle.

Individual Motility of Bull1, Bull 2 and Bull 3 is $75,00 \pm 5,00$ % , $73,33 \pm 2,89$ % and $76,67 \pm 2,89$ % , Viability $93,96 \pm 3,82$ %, $90,73 \pm 1,68$ % and $93,46 \pm 0,67$, Abnormality of Bull 1, Bull 2 and Bull 3 is $5,85 \pm 0,80$ % , $7,04 \pm 4,07$ % and $4,46 \pm 1,82$ % , Concentration of Bull 1, Bull 2 and Bull 3 is $1.726,70 \pm 676,56$ (Milion/ml), $1.403,30 \pm 317,70$ (Milion/ ml) and $1.486,67 \pm 234,60$ (milion/ml).

Individual Motility (%) at Before Freezing and Post Thawing on Different bull

Individual motility of spermatozoa in the semen wagyu beef are significant differences ($P < 0.05$) between different individuals of Before Freezing and Post thawing. Individual Motility of *bull 1*, *3* and *2* sequentially is $61,67 \pm 2,50$ %, $58,33 \pm 5,00$ % and $55,00 \pm 0,00$ % on observations before freezing . Post Thawing Motility *bull 1*= is $35,51 \pm 7,71$ %, *bull 2* is $25,05 \pm 4,39$ %, and *bull 3* is $30,09 \pm 4,12$ %

Individual Motility (%) at Before Freezing and Post Thawing on Different Treatment

Individual motility of spermatozoa wagyu cattle at different equilibration time showed that there were no significant differences ($P > 0.05$). between treatments for each individual bull either a different time of observation before freezing and post thawing.

Individual motility Before Freezing of Treatment 1, 2 and 3 on Bull 1 is the same = $61,67 \pm 2,89$ %, Bull 2 in the same = $55,00 \pm 0,00$ and Bull 3 is the same = $58,33 \pm 5,77$ %. Post Thawing Motility of Treatment 1, 2 and 3 on Bull 1 = $30,69 \pm 7,32$ %, $35,69 \pm 10,48$ % and $40,14 \pm 2,77$ %; Bull 2 = $25,56 \pm 6,31$ %, $25,00 \pm 6,01$ % and $24,58 \pm 0,72$ % ; Bull 3 = $29,58 \pm 3,70$ %; $30,97 \pm 0,87$ % and $29,72 \pm 7,18$ %. The data below the post-thawing motility SNI 40% (BSN, 2008) The result of the calculation of chi-square (X^2) indicates that PTM these results were not significantly different ($P > 0.05$) with the expected value of 40%. Based on these descriptions, then frozen semen in this study may still be used for inseminated.

Conclusion

1. Older equilibration time does not cause differences in semen motility before freezing and Post thawing on Wagyu cattle, but the individual differences that affect the quality of semen.

2. Bull 1 has a percentage value of best quality with the percentage of spermatozoa motility before freezing and post thawing was $61.67 \pm 2.50\%$ and $35.51 \pm 7.71\%$. Post thawing Motility shows that frozen semen can still be used for the AI

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The Effect of Mangosteen (*Garcinia mangostana*) Peel Filtrate Supplementation in Skim Milk based Diluent on Limousin Culled Semen Quality during Cooling Process

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Abstract

The objective of this study was to evaluate the effect of Mangosteen (*Garcinia mangostana*) peel filtrate (MPF) in skim milk based diluent on Limousin culled semen quality during cooling. The method used was laboratory experiments. Semen was collected from 5 heads of Limousin bull by artificial vagina method. Fresh semen evaluated for colour, pH, volume, concentration, mass motility, individual motility, viability, and sperm abnormality. Semen was diluted with skim milk based extender supplemented with different levels of MPF(0, 2, 4 and 6 %) v/v with the ratio of 1 semen : 9 diluter. Semen used culled Limousin bulls semen (mass motility of + and motility of 45 - 55%). Immediately after dilution semen was stored for 4-5°C and sperm motility, viability and abnormality percentage were observed at 0, 24 and 48 hours after stored at refrigerator. The obtained data were analyze with Analysis of Variant (ANOVA) and Least Significant Difference was determined. The experiment was designed using randomized block design (4 treatments and 9 replications). The results showed that the level of mangosteen peel filtrate had significant effect ($P < 0.05$) on sperm motility, viability and abnormality percentage in 0, 2 and 4 hours of storage. It concluded that the level of 2 % MPF is best to maintain the quality of Limousin bull culled semen during cooling.

Keywords: limousin, skim milk, mangosteen, semen quality and cooling

Introduction

Artificial Insemination is one of reproductive technology that very efficient and effective in supporting program of genetic improvement of livestock. To support the efficiency of the AI program, sufficient quantity and good quality of semen need to be available when required (Isnaini, 2006).

Skim Milk is the basic medium of simple semen bull diluter. Whereas, peel filtrate of mangosteen (*Garcinia mangostana*) is a material containing high both total phenolic and antioxidant (ie: xanthone, vitamins A and C) activity (Dungir et. al., 2012).

This study aimed to determine the effect of Mangosteen (*Garcinia mangostana*) Peel Filtrate Supplementation in Skim Milk based Diluent on Limousin Culled Semen Quality during Cooling.

Methodology

Preparation of mangosteen (*Garcinia mangostana*) peel filtrate.

Mangosteen peel filtrate (MPF) prepared by blending: 50 gripe Mangosteen peel fruit + 500ml aquadest, mixture was then filtered using filter paper and deposited to form the

supernatant and precipitate. Supernatant (MPF) stored in a freezer temperature of -20°C until used.

Semen Collection and fresh semen evaluation. Semen was collected from 5 bulls of Limmousin. Semen was collected 2 times a week by artificial vagina. Fresh semen used was semen culled with motility 45-70 %) that had been through the examination of motility in the Central Artificial Insemination Singosar.

Semen Dilution, Storage and Evaluation. The selected semen was diluted with skim milk - base diluent containing 0, 2, 4 and 6% of MPF. Semen was diluted in ratio of 1 semen: 9 diluter. Diluted semen stored at refrigerator ($4-5^{\circ}\text{C}$). To determine the effect of MPF level on the motility, viability and abnormality of sperm, semen was evaluated after 0, 24, and 48 h of storage. Data were analyzed with ANOVA and Least Significant Difference.

Results and Discussion

Characteristics of fresh semen

Table 1. shows that the characteristics of Limmousin semen used in this study was low.

Table 1. Characteristics of fresh semen used in the experiment (n=9)

Parameter	Mean \pm SD
pH	6.3 \pm 0.52
Volume (ml/head)	5.5 \pm 1.65
Concentration (10^6 /ml)	2070 \pm 64.62
Mass motility (%)	+
Individual motility (%)	46.67 \pm 15.38
Viability (%)	79.77 \pm 9.31
Abnormal sperm (%)	15.55 \pm 4.27

Semen Quality During Cooling

Table 2. Sperm Individual Motility, Viability and Abnormality of Limmousin following treatment with MPF during cooling (n=9; Mean \pm SD)

Parameter	Storage time (h)	Level of MPF			
		0%	2%	4%	6%
Individual Motility (%)	0	37,00 \pm 5,81 ^a	42,22 \pm 5,83 ^b	38,11 \pm 5,77 ^a	38,33 \pm 5,21 ^a
	24	20,56 \pm 6,67	20,63 \pm 8,60	18,33 \pm 5,61	15,56 \pm 5,50
	48	15,00 \pm 4,36 ^a	19,44 \pm 6,48 ^b	16,11 \pm 2,44 ^a	12,50 \pm 1,50 ^a
Viability (%)	0	58,92 \pm 10,36 ^a	72,24 \pm 10,33 ^b	68,07 \pm 10,22 ^a	64,79 \pm 11,24 ^a
	24	46,08 \pm 23,02	48,62 \pm 18,00	48,38 \pm 23,22	47,25 \pm 21,29
	48	34,61 \pm 25,77	47,95 \pm 13,72	38,62 \pm 17,43	36,60 \pm 17,55
Abnormality (%)	0	17,21 \pm 12,05	12,39 \pm 4,04	12,60 \pm 3,98	16,09 \pm 6,86
	24	18,97 \pm 4,84	15,29 \pm 5,15	16,87 \pm 7,92	16,97 \pm 4,84
	48	21,71 \pm 7,22	16,64 \pm 8,20	17,48 \pm 7,38	17,59 \pm 13,02

^{a,b}Means in rows with different superscripts differ ($P < 0.01$)

Table 2. shows that the level of MPF affected highly significant ($P < 0.01$) of sperm individual motility, viability and abnormality during cooling. In general, it was shown that 2% of MPF in skim milk -based diluent showed an optimal level for maintaining the sperm quality (motility, viability and abnormality) compared to the other level (0, 4 and 6%) in 0, 24, and 48 h during cooling.

MPF of 2% is optimal for sperm quality during cooling. The level of 0% of MPF influenced suboptimal effect on the sperm quality, might be due to the low concentration for maintaining function in the diluter during cooling. A contrast different was observed in samples with addition of 4 and 6% MPF. Level of MPF 4% and 6% skim milk extender was unable to maintain the quality of sperm at the same time, because the concentration was added to the extender is too high, and the extender has higher concentrations or hypertonic. The higher the concentration the higher osmolarity of the extender. Hypertonic extender conditions will cause lethal to sperm. The improper influence of osmolarity as a result of the addition of extender concentrations are not exactly expected to result in the loss of natural antioxidants and other essential components in the seminal plasma needed to maintain membrane integrity and sperm function as membrane components has changed the structure so optimal function is decline.

The quality of sperm decreases during cooling. The decline in sperm quality can be suppressed by adding antioxidants in the diluent, with the appropriate type and level (Isnaini, 2006). This study uses a basic diluent skim milk and MPF are rich in antioxidants which form Xanthones, vitamin A and C (Dungir et al, 2012). Antioxidants can neutralize or prevent cell damage by inhibiting or break the chain of oxidative reactions during the formation of radicals, protecting molecules from oxidation by oxidizing activity of the molecule itself, so it can reduce oxidative stress (Bansal and Bilaspuri, 2011) as a result of metabolism and cooling processes.

Conclusion

It concluded that the level of 2 % MPF is best to maintain the quality of Limousin bull culled semen during cooling.

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The Acceptability of Limmousin Bull Raw Semen for Frozen Semen Production

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Abstract

Bull with high frozen semen production is very important in artificial insemination centre (AIC). This research aims to study the acceptability of Limmousin bull raw semen for frozen semen production in Lembang AIC, Bandung, West Java. Secondary data including raw semen characteristics and frozen semen production of 57 Limousin bulls were obtained in period of January to June 2015. Result demonstrated only 39 from 57 bulls, that had more than 24 times semen collection. From 39 head only 24 bulls which had >75% acceptability to be processed as frozen semen. There were 24 of 61.54% (24/39), Limmousin bulls produced >10 000 straws during 6 months of production, moderate (>5 000 straws) were 20.51% (8/39) and 17.94% (7/39) had a low frozen semen production. Based on these results, there are only 24 bulls eligible to be maintained as bulls for frozen semen production, while 15 bulls are not suitable for frozen semen production.

Keywords: *acceptability, Limmousin, frozen semen, spermatozoa*

Introduction

Limousin cow is one of exotic bred cattle in Indonesia, classified as beef cattle with good quality which is an average cattle weight can reach 1009 kg with range of 978-1053 kg (Sumeidiana *et al.* 2007). Limousin can be crossed with some local cattle, such as the Limousin and Brahman (Limbra), Limousin and Ongole bred (Limpo), Limousin and Madura called Limura (Yulianto and Saporinto 2014). Breeding techniques of Limousine is using artificial insemination (AI). The nasional artificial insemination center (AIC) and regional artificial insemination center (RAIC) produce Limousin frozen semen, including AIC Lembang at Bandung.

As an exotic cattle the problems of Limousin is the quality of fresh semen are not always consistent, and not all ejaculate can be processed into frozen semen (Arifiantini 2016). Assessment the acceptability of fresh semen quality for processing into frozen semen needs to be done. Bull population without being followed by high productivity is high cost. Maintenance of bull feed need financing, management and human resources. Mapping productivity to bull is a continuation of the selection process of the production of frozen semen in BIB need to be done. The purpose of this research is to study the characteristic of Limousin raw semen and to evaluate the acceptability of raw semen to be produce into frozen semen.

Methodology

This study is a non-experimental. The study was designed using the case study method with the object of the study was 39 cows Limousin bull belong to BIB Lembang, Bandung. This study uses secondary data frozen semen production period from January up to June 2015. The data used in this research is secondary data reported monthly by BIB Lembang related to raw semen evaluation with macroscopic and microscopic. All data of raw semen quality and status of the semen to be or not processed into frozen semen are recorded, tabulated using Microsoft Excel 2007 and presented as average and standard deviation.

Results and Discussion

From 57 Limousin bulls, only 39 bulls included in this study, 18 bulls demonstrated less than 24 times of semen collection. Semen characteristics of Limousin bull were 6 -7 ml in volume, 97.44% semen are cream-colored to white milk and 2.56% yellowish. The semen consistency were 17.95% watery and 82.15% moderate. The semen acidity (pH) range from 6.59 ± 0.02 to 6.63 ± 0.05 (Table 1).

Tabel 1. The semen characteristics of cement based on the status of its acceptance for processing into frozen semen in Limousin bulls during January to June 2015

Characteristics	(%)			
	<50	50-74.99	75-99.99	100
Macroscopy				
Colour		Milk creamy		
Volume (ml)	6.43 ± 0.92	6.57 ± 0.90	6.89 ± 1.06	7.55 ± 1.62
Consistency	Watery	moderate	moderate	moderate
Ph	6.63 ± 0.05	6.60 ± 0.02	6.59 ± 0.02	6.59 ± 0.02
Microscopy				
Mass movement	+	++	++	++
Sperm motility (%)	50.04 ± 5.98	63.10 ± 2.28	68.07 ± 2.15	71.38 ± 1.65
Sperm concentration ($\times 10^6$ cells ml^{-1})	863.24 ± 276.55	1114.81 ± 217.12	1155.18 ± 145.00	1315.34 ± 131.30

Mass movement (-) = bad, (+) = moderate, (++) = good (+++)= very good

Consistency : watery, moderate, thick.

The mass movement of semen bull Limousin groups with <50% acceptability the value was +. According to Wiratri *et al.* (2014) good quality of Limousine had mass movement minimum ++. Mass movement influence by the sperm concentration and the percentage of progressively motile spermatozoa, and the speed of forward movement of spermatozoa (Youngquist and Threlfall 2007). In our research sperm motility range from 50 to 71%. To be processed into frozen semen sperm motility should be more than 60% (Sarastina *et al.* 2012). Sperm concentration of limousine bull range from 863.24 ± 276.55 to 1315.34 ± 131.30 x cells ^{-1}ml . Garner and Hafez (2000) states that a minimum standard of cattle semen as the male generally has a concentration of spermatozoa of more than 500×10^6 cells ml^{-1}

The Acceptability of Raw Semen To Be Processed Into Frozen Semen

According to our research there were only two bulls (5.12%) with 100% of raw semen acceptable to be process into frozen semen. A total of 56.41% (22/39) were acceptable between 75 to 99.99% and 20.51% (8/39) acceptable between 50 to 74.99% and there were 7 bulls (17.94%) with the acceptability less than 50% (Table 2). The bull had the acceptability less than 50%, demonstrated a normal in color, volume, and pH, but watery consistency. Mass movement, motility, and sperm concentration were lower than other bull.

Tabel 2. Acceptability status of fresh semen for processing into frozen semen on Limousin bull during January to June 2015 in BIB Lembang

Acceptability (%)	Percentage	Semen collection (n)	Semen status (%)	
			Procces	Not proccesed
<50	17.94 (7/39)	321	23.99	76.01
75.00-99.99	56.41 (22/39)	952	88.45	11.55
50.00-74.99	20.5(8/39)	327	65.44	34.56
100	5.12 (2/39)	73	100	0

Factors that may affect the color, volume, concentration, consistency, mass movement, pH and sperm motility is the condition of each individual bull, quality reproductive organs, age, condition of livestock management and feeding (Gordon 2004). Low quality of semen also can be influence by an aproprate of semen collection. At the time of teasing before collection, sometimes bull master see there is a contact between penis with the back of a teaser. Efforts to clean the penis is sometimes is uncorrect. Flushing the penis and prepuce should be done using warm saline solution or drinking water and dried with sterile towel, to prevent an ejaculate from residual. Field observations demonstrated flushing the preputium using well water and not dried. Rinsing with well water and not drained will caused of low sperm motility of the ejaculate (Arifiantini 2016). Residual water attached to the prepuce can contaminate and degrade the quality of the results of the ejaculate semen.

Frozen Semen Production

Frozen semen production of 39 bulls during January to June 2015 are presented in Table 3. Bull that are able to produce frozen semen over 20 000 straw per year is classified as a bull with a good production. Bull produce between 10-20 000 straw per year are moderate and if produce straw less than 10 000 per year considere as low production. Bulls with a 100% acceptance status and between 75-99.99% of frozen semen produced for 6 months as many as 26 839 and 270 108 straw. Bull that have 100% acceptance status and between 75-99.99% are 2 and 22 bulls respectively. The average of each bull produces frozen semen is 12 to 13 000 during the six months production. Based on these assumptions within one year (12 months) these bull capable to produce > 20 000 straws and catagorize as bull with good production.

Tabel 3 Number of frozen semen production (*straw*), during January to June 2015 at Lembang Artificial Insemination Center.

Month	Acceptability to be procces as frozen semen (%)			
	<50	50-74.99	75-99.99	100
January	5 775	9 948	50 533	4 296
February	431	8 057	32 281	3 511
March	6 013	16 017	56 221	6 047
April	4 342	10 832	46 458	4 703
Mey	1 701	7 501	39 615	3 996
June	2 246	9 642	45 000	4 286
Total	20 508	62 297	270 08	26 839
Average	2929.71±1943.19	7787.13±1893.15	12277±3541.04	13419±5000.20

Based on these results, only 24 bull Limousin eligible to be maintained as a bull production, while 15 other cows is not fit for use as a bull production so it needs to be selected. Bulls population which is high cost without being followed by high productivity, could incur loses to AI centre. Limousin bull in BIB Lembang that has the acceptability of fresh semen for processing into frozen semen of > 75% were 24 bulls.

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Oral Presentation 2 Focus Session:
Product Processing and Food Safety
Wednesday, 19 October 14:00-15:00
Room: Welirang

Meta-Analysis of Nutritional Quality Comparison Between Organic and Conventional Dairy Products

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Abstract

The objective of this study is to compare nutritional quality between conventional and organic dairy products by using a meta-analysis technique. A total of 29 studies from 13 articles were used as the database. Parameters recorded included fresh forage in diet, milk yield, fat content, protein content, vitamins (α -tocopherol and β -carotene), and fatty acid profiles. Effect size as the "Hedges' d" was applied to quantify the parameters difference between conventional and organic product. Precision of the effect size is described by using 95% of confidence interval. The calculated effect size is statistically significant if the confidence interval does not reach the null effect size. Results revealed that organic dairy products contain significantly higher protein ($d_{++95\%CI}$: 0.56 ± 0.24), α -linolenic acid (ALA) (1.74 ± 0.16), omega-3 fatty acid (0.84 ± 0.14), *cis*-9, *trans*-11 conjugated linoleic acid (0.68 ± 0.13), *trans*-11 vaccenic acid (0.51 ± 0.16), EPA (0.42 ± 0.23), and DPA (0.71 ± 0.3) than those of the conventional. It is concluded that organic dairy products provide better nutritional quality than the conventional products, especially on higher proportions of beneficial fatty acid profiles.

Keywords: *nutritional quality, organic, conventional, dairy products, meta-analysis*

Introduction

Organic food market, including organic dairy food products, is growing and expanding all over the world and it has been the fastest growing market in the food sector over the last decade. To date, consumers become more concern on health aspect, and it had been demonstrated that health is the second strongest consideration (after hedonic) for consumers to choose organic dairy products, followed by animal welfare and environmental issue (Grunert et al., 2000). However, scientific evidences regarding such better nutritional quality of organic dairy products than those of conventional are still limited and, if any, the results are often inconsistent. The main objective of this study is therefore to compare the nutritional quality between conventional and organic dairy products by using a meta-analysis technique.

Methodology

Literatures obtained from ISI Web of Knowledge and Science Direct related to the topic were integrated into a database. Inclusion criteria used were that (1) articles were published in English, (2) peer-reviewed published journals, (3) direct comparison between

organic and conventional, (4) dairy products, including raw milk and milk based product as well as milk from animals other than bovine, and (5) comparing the nutritional quality aspect. A total of 29 studies from 13 articles were yielded and used for subsequent statistical data analysis. Parameters recorded included fresh forage in diet, milk yield, fat content, protein content, vitamins (α -tocopherol and β -carotene), total saturated fatty acid (SFA), total monounsaturated fatty acid (MUFA), total polyunsaturated fatty acid (PUFA), stearic acid (C18:0), oleic acid (C18:1 n-9), linoleic acid (C18:2 n-6), α -linolenic acid (ALA, C18:3 n-3), omega 3 fatty acid (n-3), omega-6 fatty acid (n-6), conjugated linoleic acid 9 (CLA9, *cis*-9 *trans*-11 C18:2), vaccenic acid (VA, *trans*-11 C18:1), eicosapentanoic acid C20:5 n-3 (EPA), and docosapentanoic acid C22:5 n-3 (DPA), ratio of omega-3 to omega-6 fatty acid (n-3/n-6) and Δ -9 desaturase index, i.e. CLA9/(CLA9+VA).

Effect size as the "Hedges' d" was applied to quantify the parameters distance between conventional and organic product. The conventional group was pooled into a control group (C) and the organic group was pooled into an experimental group (E). The precision of the effect size is described by using 95% of confidence interval. The calculated effect size is statistically significant if the confidence interval does not reach the null effect size. Cohen's benchmarks are used as the standard judgement borders to indicate how large the effect size is. Those benchmarks are 0.2 for small effect size, 0.5 for medium effect size, and 0.8 for large effect size. Least sample size from individual studies was applied as the weighting factor.

Results and Discussion

The forest plot of cumulative effect size and 95%CI of all parameters (Figure 1) illustrates the comparison of nutritional quality between conventional and organic dairy products. According to the cumulative effect size ($d_{++}\pm 95\%CI$), it is clear that organic dairy product contains significantly higher ALA (1.74 ± 0.16) and omega-3 fatty acid (0.84 ± 0.14) with large effect size, higher protein (0.56 ± 0.24), CLA9 (0.68 ± 0.13), VA (0.51 ± 0.16), and DPA (0.71 ± 0.3) with medium effect size, and higher fat (0.21 ± 0.18), SFA (0.31 ± 0.15), PUFA (0.18 ± 0.15), and EPA (0.42 ± 0.23) with small effect size, compared to the conventional one. The result also indicated that the organic dairy farming feeds the cattle with significantly higher fresh forage than that the conventional one does with large effect size i.e. 0.92 ± 0.41 .

Negative effect sizes were found in some parameters which indicated that organic product contains smaller amount of the observed parameters. Those parameters are MUFA (-0.35 ± 0.15), stearic acid (-0.38 ± 0.23), oleic acid (-1.44 ± 0.32), linoleic acid (-0.71 ± 0.2) and omega-6 fatty acid (-0.53 ± 0.14). All except oleic acid (large effect size) are categorised as medium and small effect size. The cumulative effect size of milk yield shows negative and significant value, i.e. -0.9 ± 0.26 .

It appears that the most plausible reason from these evidences is the difference in feeding regime between organic and conventional dairy production systems. Higher fresh forage intake, as observed in organic dairy production, is associated with higher intake of PUFA including ALA. This is due to the high amount of unsaturated fatty acids, especially ALA and other omega-3 fatty acids in fresh forage, and it is more prominent in the early stage of maturity (Dewhurst et al., 2006). Further, PUFA including omega-3 fatty acids may undergo transformation processes in the rumen of ruminants through the action of microbes. The transformation processes are through lipolysis and biohydrogenation of fatty acids to result various isomers of PUFA and MUFA and saturated fatty acids (Jenkins et al., 2008). Inhibition of the biohydrogenation process, at least partially, may occur as indicated by higher CLA9 and VA, and lower C18:0 in the organic dairy product in relation to the higher fresh forage intake. Phenolic compounds present in forages may contribute to this inhibition as the

compounds have been reported to reduce PUFA biohydrogenation, accumulate VA and/or decrease concentration of C18:0 (Jayanegara et al., 2011).

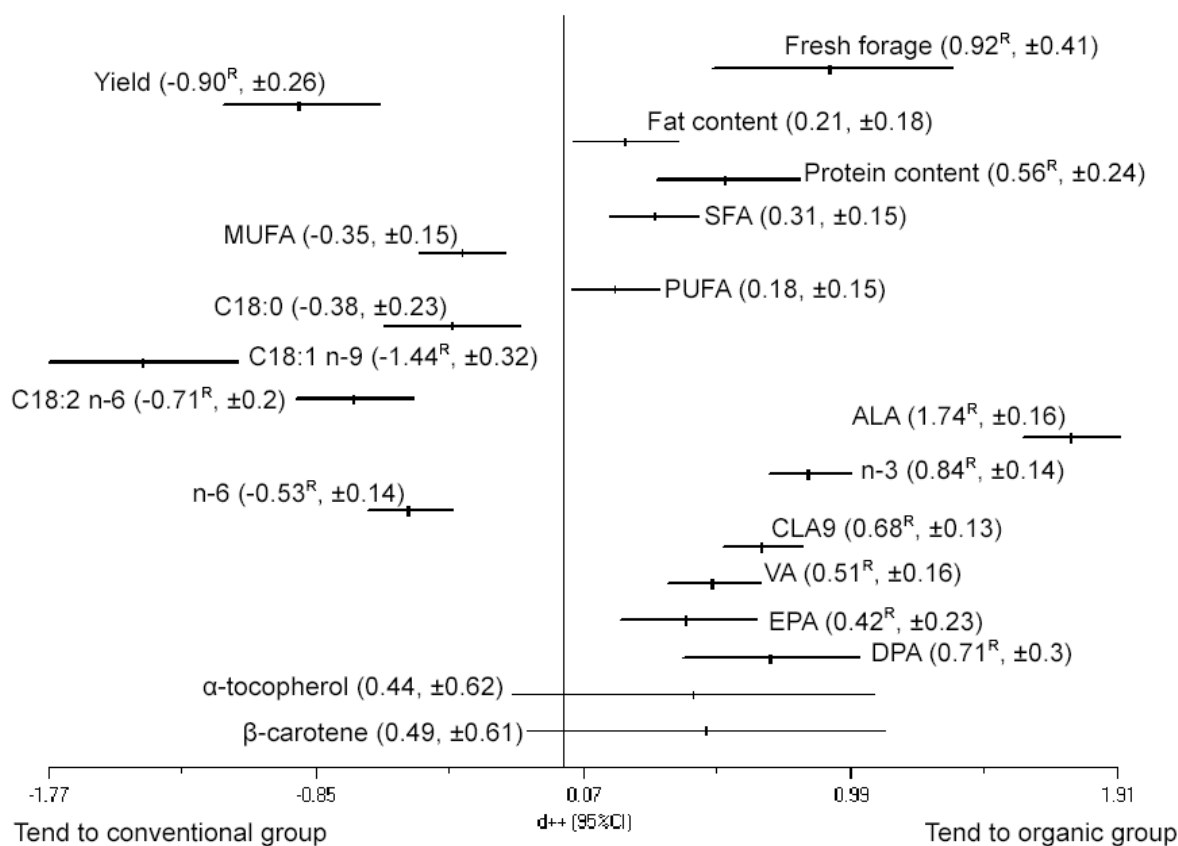


Figure 1. Forest plot of cumulative effect size (d_{++}) and 95% confidence interval (CI) of some nutritional parameters comparing conventional and organic dairy products.

Conclusion

Current meta-analysis presents scientific evidence that the current regulation on dairy farming indeed enables to drive the organic farming to produce organic dairy product with better nutritional quality than the conventional one. The difference in feeding regime between conventional and organic dairy production is suspected as the reason standing behind this evidence.

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Physical Characteristics and Mineral Composition of Bone Meals Produced from Different Body Parts of Cattle Bones by Open-Air Burning and Limed-Water Soaking

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Abstract

The study was aimed to measure physical characteristics and mineral composition of bone meal produced by simple processing methods from different body parts of inedible cow bones. Samples of inedible bones which were grouped into three body parts: head, arms, and rib were collected at three different meat processing companies: slaughter house, local meat shops and beef offal processor. The bones were then processed into bone ash and bone meal by open-air burning and limed-water soaking prior to grinding. Parameters measured included: percent of meal yield; content of crude ash, Ca and P; physical properties and particle size distribution. Results showed that meal yield of bone ash processed by open-air burning (67.3%) was found significantly lower ($P < 0.01$) than bone meal produced by limed-water soaking (91.4%). However, mineral Ca (33.9%) and P (7.9%) content of bone ash were significantly higher ($P < 0.05$) than that of bone meal (Ca: 26.7% and P: 1.8%). Particle size and distribution of particle size of bone ash and bone meal were found not significantly different. There was also no significant effect of different body parts of bones on meal yields, mineral composition and particle sizes. It was concluded that production of bone meal by open-air burning gave lower meal yield, but higher Ca and P concentrations than that of produced by limed-water soaking.

Keywords: *inedible bones, bone ash, bone meal*

Introduction

Calcium (Ca) and phosphorus (P) are two macro minerals that are normally taken into account in formulation of diet for livestock animals due to their various important functions in the body and metabolism. The province of West Sumatra abounds with Ca sources such as limestones and oyster shells (Khalil, 2003; Khalil and Anwar, 2007), but the use of these local minerals in the diets of chicken gave no significant positive effects on egg production, egg quality, growth rate and feed utilization efficiency presumably due to limited P concentration (Khalil, 2004; 2006; 2007; 2010; Khalil and Anwar, 2008). Proper utilization of Ca is affected not only by their sources and amount, but also by their ratio to P. The optimum Ca:P ratio is about 1.5-2:1 (Weaver and Heaney, 1999).

Bone meal is a potential source of P. Bone meal could locally produced from cattle bone as byproduct of slaughter houses that are available throughout the province areas. Bone meal contains Ca and P of about 31-39 and 14-19%, respectively (Kling and Woehlbier, 1983). The objectives of the present research were to measure physical characteristics and mineral composition of bone meal produced from different body parts of inedible cow bones by open-air burning and limed-water soaking processes.

Methodology

The study was initiated by taking samples of inedible bones at three different meat processing companies: slaughter house, local meat shops and beef offal processor in Payakumbuh city of West Sumatra. They were grouped into three body parts: head, arms and rib. Samples of fresh bones in each body part were divided into two groups and each group was subdivided into 3 sub-groups of about 2 kg each. Bones were then washed and boiled in a pressure cooker for about 4 h to free of fat, meat and other soft parts. The clean bones were then dried in the sun. The sun-dried samples were then crushed into chips with uniformly to the lengths of 2-3 cm. The first groups were intended to open-air burning. They were burned on a metal plate, cooled and then ground into meal form.

The second part of samples were soaked in 10% lime water for 5 days, and then dried in oven at 60°C for 48 h. The dried bones were then ground into meal form. The meals were chemically analyzed for crude ash, DM, Ca, and P content (AAS, 1980). Physical properties measured included bulk density, angle of responses and particle sizes. Data were statistically analyzed in completely factorial design of 2x3x3. There were 2 processing methods, 3 different body parts and 3 replications (Steel *et al.*, 1997).

Results and Discussion

Data on meal yield rate, mineral composition and physical properties of bone meal produced from different body parts of inedible bones by open-air burning and lime-water soaking are presented in Table 1. Rate of meal yield ranged from 64.5 to 91.9%. The average meal yield of bone ash produced by open-air burning (67.3%) was found significantly lower ($P < 0.01$) than bone meal produced by limed-water soaking (91.4%). There was no significant effect of different body parts of bones on the rate of meal yields.

Table 1. Rate of meal yields, mineral composition and physical properties of bone ash and bone meal produced from different body parts of inedible bones

Parameter	Bone ash				Bone meal			
	Head	Arms	Rib	Mean	Head	Arms	Rib	Mean
Rate of meal yield, %	71.72 ^b (0.61)	64.55 ^b (0.73)	65.51 ^b (0.76)	67.26^B (0.65)	91.88 ^a (0.79)	92.14 ^a (1.52)	90.31 ^a (1.33)	91.44^A (1.18)
Crude ash and mineral composition, % DM:								
- Crude ash	87.05 ^a (0.65)	85.76 ^a (1.36)	84.72 ^a (0.95)	85.85^A (0.47)	72.69 ^b (1.09)	64.37 ^b (0.96)	62.07 ^b (2.96)	66.38^B (1.01)
- Ca	32.43 ^a (2.47)	34.71 ^a (0.34)	34.43 ^a (0.09)	33.86^A (0.77)	29.27 ^b (0.49)	27.95 ^b (1.33)	27.95 ^b (1.33)	26.68 (1.37)
- P	7.75 ^a (0.52)	8.06 ^a (0.17)	7.86 ^a (0.09)	7.89^A (0.23)	0.43 ^c (0.12)	4.52 ^b (0.43)	0.36 ^c (0.13)	1.77^B (0.19)
Physical properties:								
- Bulk density, g/ml	0.94 (0.01)	0.85 (0.02)	0.88 (0.01)	0.89 (0.01)	0.99 (0.00)	0.75 (0.01)	0.84 (0.01)	0.86 (0.00)
- Angle of response, °	49.94 ^a (0.41)	50.48 ^a (0.35)	51.14 ^a (0.22)	50.52^A (0.23)	43.46 ^b (0.79)	44.83 ^b (0.17)	45.31 ^b (0.66)	44.53^B (0.12)

¹⁾ (SEM): standard error of the mean;

²⁾ abc Means within same row with different superscripts are significantly different ($P < 0.05$)

Bone ash processed by open-air burning showed significantly higher content of crude ash (85.8%), Ca (33.9%) and P (7.9%) than bone meal by limed-water soaking (ash:66.4%; Ca: 26.7%; P:1.8%). The average P content of bone meal from (1.8%) was much lower than bone ash produced by open-air burning (7.9%). The P content of bone meal produced from arm bones (4.5%) was significantly higher than that of other body parts (0.36 and 0.43%). The average P content of bone ash (7.9%) and bone meal (1.8%) in the present study was much lower in compare to that reported by Kling and Woehlbier (1983) of 14 and 19%, respectively.

Bulk density of bone meals ranged from 0.75-0.99 g/ml and there was no statistically different in bulk density. Bone meal produced by limed-water soaking showed significantly ($P < 0.05$) lower angle of response (44.5°) in compare to meal produced by open-air burning (50.5°). Bone meal produced by lime-water soaking tended to have higher particle size, so that the particles in this product were more mobile than the bone meal produced by open-air burning.

Conclusion

It was concluded that production of bone meal by open-air burning gave lower meal yield, but higher Ca and P concentrations than that of produced by limed-water soaking prior to grinding. Bone ash was better source of P in compare to bone meal.

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Effect of Storage Time and Citric Acid Addition on Functional Properties of Arabian Chicken Egg White

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Abstract

The purposes of this research were to determination the storage time and addition of citric acid on functional properties of Arabian chicken egg white in foaming properties and coagulation time. Foaming ability, foaming stability, and overrun in foaming properties were observed. The material for these studies were 192 Arabian chicken eggs. Egg white pH was increased during storage period and significant effect for reduced the quality. Thus, citric acid was added at the rate of 0%, 0.8%, 1.6% and 2.4% on egg white. The fresh egg white with the addition of citric acid 0.8% gave the highest foaming ability and overrun, but the highest foaming stability obtained from fresh egg white with 1.6% citric acid. The shortest time of coagulation occurred on egg white that stored 14 days with 0.8% citric acid. Based on the results of this study, it can be concluded that the addition of citric acid could be improved the functional properties of Arabian chicken egg white after 21 days of storage.

Keywords: *coagulation time, egg white ph, foaming ability, foaming stability, overrun*

Introduction

The high nutrient content of egg including Arabian chicken egg makes it an excellent potential basic ingredient for food industry applications. The protein content of Arabian chicken egg was higher and the lipid content was lower than hen's egg [1]. The application of egg was more variation using functional properties for any product especially egg white such as foaming ability, foaming stability, emulsion, gelling, and coagulation [2]. According to [3], the egg white was responsible as a foaming agent and the other functional properties cause it was containing with different proteins (globulins, ovalbumin, ovotransferrin, lysozyme, ovomucoid, and ovomucin).

The storage of egg without treatment decreased of egg quality were physic, chemistry, and microbial contaminant through a pore of the egg shell. Decreasing quality of egg white indicated with a change of pH [4]. The longer storage of egg could be more increasing egg white pH. The storage temperature was not suitable with egg's condition during storage period on 2 weeks that was reducing egg quality. For egg was stored at 26°C and humidity on ±70-80% just would be last about 8 days. [5] reported that evaporation of CO₂ and H₂O while storage period could occasion unbalanced between bicarbonate ion concentration and buffer system of the egg. Evaporation of CO₂ and H₂O also caused the fibers ovomucin of eggs was broken and reduced the viscosity. In addition, the evaporation from inside egg occurred by the decomposition reaction of NaHCO₃ into NaOH and would decompose again into ions Na⁺ dan OH⁻, thus increasing egg pH [6].

Functional properties including foaming properties of egg white influenced by different factors such as the first condition of egg, storage time, pasteurization, temperature, pH, stabilizers (acid addition), water, sugar, and metallic cations [7]. The addition of citric acid decreased egg white pH that stored and it can be related to improving egg's functional properties.

Citric acid (*2-hydroxypropane-1,2,3-tricarboxylic acid*/ $C_6H_8O_7$) was organic acid weak, the crystal formed, unsmelt, and has wide applications in food, beverage, preservation and other industries [8]. Citric acid as the pH stabilizer and improved upon buffer system of the egg. However, the presence of acid has an essential effect that improved the foaming stability and makes possible a successful angel food cake [9]. Besides that, protein coagulation especially the coagulation of egg protein was also influenced by the addition of acid although any other factors such as temperature, pH, ionic strength, and protein content [10].

Information about influenced storage time and the addition of citric acid in functional properties of Arabian chicken egg spread all over especially of egg white unrevealed. Thus, this study needed to evaluate of functional properties Arabian chicken egg white particularly on foaming properties (foaming ability, foaming stability, overrun) and coagulation time influenced by storage time and addition of citric acid.

Materials and Methods

The materials were 192 Arabian chicken eggs. The specification of egg used was collected from Arabian chicken various *Silver* attain the age of 10 months, white egg shell, and chosen that have good physical quality such as clear shell, uncracked and including the fresh egg that the weight about 35 to 40 g.

Sample Preparation

The Arabian chicken eggs white were sampled, they were weighed after collection. Initially, freshly-laid eggs were analyzed for egg quality. For testing functional properties (foaming properties and coagulation time) Arabian chicken egg was stored at 0, 7, 14, and 21 days in room temperature (27-28°C). And each storage period was evaluated functional properties of egg white by the addition of citric acid at the rate of 0%, 0.8%, 1.6% and 2.4% before testing. Egg white was separated from yolk than used as the material of these study. Citric acid ($C_6H_8O_7$) was added before egg white separating have concentration 70% that sold commercially for food additive and used aqua dest also.

Functional Properties

The functional properties of Arabian chicken egg white including foaming ability, foaming stability, overrun, and coagulation time were analyzed in this study according to the methods described below.

Determination of Egg White pH

As indicator also carried out of pH determination before and after the addition of citric acid on egg white according to the method of [11]. The pH meter calibrated with buffer of 7 and 4 before analyzed the egg white pH.

Determination of Foaming Properties

Foaming properties were evaluated by foaming ability, foaming stability and overrun. Foaming ability and stability was evaluated according to [6] method and calculated as follows:

$$\text{Foaming ability (\%)} = \frac{FV}{AV} \times 100\% \quad (1)$$

$$\text{Drainage (\%)} = \frac{DV}{AV} \times 100\% \quad (2)$$

$$\text{Foaming stability (\%)} = 100\% - \text{drainage (\%)} \quad (3)$$

where:

FV: volume of foaming (mL)
 AV: volume of albumen (mL)
 DV: volume of drainage at 1 hour (mL)

The calculation of foaming stability as the time to drainage for 60 second (1 hour). The drainage was expressed as % of the initial foam mass drained and its time starts immediately after whipping [7]. Then, foaming properties measured by foam overrun that was expressing from foaming capacity and percentage of foam volume increasing, reported by [10], and calculated by formulae below:

$$\text{Overrun (\%)} = \frac{(FV-AV)}{AV} \times 100\% \quad (4)$$

Determination of Coagulation Time

Coagulation time of eggs white were evaluated using water bath 70°C and the velocity of forming gell was measuring by stopwatch [12]. The heat treatment using water bath should be have constant temperature. Coagulation time was determinated with monitoring the tube put into waterbath at the firts time until gel formed.

Statistical Analysis

The method of these study used was laboratory experiment with Randomized Block Design using 2 factors. The first factor was egg storage time and the second factor was the addition of citric acid. Each treatment was replicated three times. The observation variables were foaming ability, foaming stability, overrun, and coagulation time. The data was analyzed by using Analysis of Variance (ANOVA) and continued by Duncan's test.

Results And Discussion

Based on the statistic analysis was conducted, the result showed that the storage time was high significant effect ($P < 0.01$) on pH, foaming ability, foaming stability, overrun, and coagulation time of egg white. The addition of citric acid was high significant effect ($P < 0.01$) on pH, foaming ability, foaming stability, overrun, and coagulation time of egg white. The storage time and addition of citric acid were significant interaction ($P < 0.01$) on pH, foaming ability, and overrun, but didn't significantly interaction ($P > 0.01$) on foaming stability and coagulation time.

Egg White pH

pH as the indicator of egg white quality that was increased during the storage period. But, the addition of citric acid till 2,4% could decrease egg white pH and correlated with improving the functional properties. The egg white pH data from this experiment showed on Tab. 1.

Tab. 1. Mean value of egg white pH of Arabian chicken egg with different on storage time and the addition of citric acid

Storage time (days)	Citric acid (%)				Average
	0	0.8	1.6	2.4	
(%).....				
0	8.237 st	7.783 ^r	6.858 ^q	5.882 ^p	7.190±1.04 ^a
7	9.248 ^{vw}	8.610 ^{tu}	8.048 ^{rs}	7.220 ^q	8.282±0.86 ^b
14	9.987 ^{yz}	9.208 ^{vw}	8.995 ^{uv}	8.217 st	9.102±0.73 ^c
21	10.257 ^z	9.798 ^{xy}	9.440 ^{wx}	8.877 ^{uv}	9.718±0.40 ^d
Average	9.432±0.90 ^a	8.850±0.86 ^b	8.335±1.14 ^c	7.549±1,30 ^d	8.542

*Mean value followed by different lower-case letters in columns represent high significantly different at $P < 0.01$

Tab. 1 represented that the mean value of Arabian chicken egg white pH on fresh condition was 8.237, but the longer storage occasion the egg white pH was more increased.

The most significant increasing of egg white pH occurred on 21 days of storage period. According to [5], egg white pH increases with the loss of CO₂ and water from the egg through evaporation that was influenced by long-term storage condition. An increase in pH has been reported by extending the storage time from 2 to 30 days [13].

Although, the addition of citric acid could decrease the pH and approach to the isoelectric pH. [14] point out that the citric acid was added all to the good as the stabilizer of pH that could be extending the storage period of food product including the egg. The addition of citric acid at the rate of 2.4% gave the most significant different on Arabian chicken egg white pH up to 21 days storage.

The treatment of the egg storage time on 21 days without the addition of citric acid represented that the pH was 10.257 not differently effect on 14 days was 9.987. The result was higher than [15]'s study on the fresh egg white of hen's egg was 8.64 and increases 8.98 to 9.07 after stored at 25°C while 7, 14, 21, and 28 days.

Foaming Properties

The result of this study based on statistic variance analysis about foaming ability, foaming stability, and overrun have been represented at Tab. 2, 3, and 4. The storage time and the addition of citric acid influenced to foaming properties Arabian chicken egg white.

Tab. 2. Mean value of foaming ability of Arabian chicken egg white with different on storage time and the addition of citric acid

Storage time (days)	Citric acid (%)				Average
	0	0.8	1.6	2.4	
(%).....				
0	434.692 ^{qr}	630.866 ^t	626.963 ^t	610.070 ^t	575.648±94.4 ^c
7	362.477 ^{pq}	493.058 ^{rs}	478.320 ^{rs}	546.505 st	470.090±77.5 ^b
14	359.474 ^{pq}	409.904 ^{pqr}	403.664 ^{pqr}	446.803 ^{qr}	404.961±35.8 ^a
21	365.386 ^{pq}	376.671 ^{pq}	330.408 ^p	377.818 ^{pq}	362.571±22.2 ^a
Average	380.507±36.2 ^a	477.625±113.3 ^b	459.839±126.7 ^b	495.299±103.2 ^b	453.317

*Mean value followed by different lower-case letters in columns represent high significantly different at P<0.01

Tab. 3. Mean value of foaming stability of Arabian chicken egg white with different on storage time and the addition of citric acid

Storage time (days)	Citric acid (%)				Average
	0	0.8	1.6	2.4	
(%).....				
0	91.840	96.366	96.411	95.765	95.095±2.19 ^b
7	91.048	93.561	92.912	95.691	93.303±1.92 ^b
14	91.023	91.081	91.820	94.132	92.014±1.46 ^{ab}
21	89.933	91.403	87.469	90.458	89.892±1.54 ^a
Average	90.961±0.78 ^p	93.103±2.44 ^{pq}	92.229±3.56 ^{pq}	94.011±2.49 ^q	92.576

*Mean value followed by different lower-case letters in columns represent high significantly different at P<0.01

Tab. 4. Mean value of foam overrun of Arabian chicken egg white with different on storage time and the addition of citric acid

Storage time (days)	Citric acid (%)				Average
	0	0.8	1.6	2.4	
(%).....				
0	334.692 ^{qr}	530.866 ^t	526.963 ^t	510.070 ^t	475.648±94.4 ^c
7	262.477 ^{pq}	393.058 ^{rs}	378.320 ^{rs}	446.505 st	370.090±77.5 ^b
14	259.474 ^{pq}	309.904 ^{pqr}	303.664 ^{pqr}	346.803 ^{qr}	304.961±35.8 ^a
21	265.386 ^{pq}	276.671 ^{pq}	230.408 ^p	277.818 ^{pq}	262.571±22.2 ^a

Average	280.507±36.2 ^a	377.625±113.3 ^b	359.839±126.7 ^b	395.299±103.2 ^b	353.317
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*Mean value followed by different lower-case letters in columns represent high significantly different at P<0.01

Foaming Ability

Both of these factors showed significant interaction to Arabian chicken egg white foaming ability. Mean value all of it was range from a certain amount 330.408% to 630.866%, whereas for the egg white foaming ability without treatment was 434.692%. These results were disagreement with those of [16], index of whipping (foaming ability) of hen's egg white without anything addition was about 600% to 700%.

The addition of citric acid head for improving the foaming ability was decreased the egg white pH during storage. Thus, the risk of protein denaturation its influential on foaming ability could decrease also. In addition, [4] reported that increasing the egg white pH would decrease the egg quality that occasion to breakage protein and used it not still optimal. The breakage protein could not form the foaming capacity as well as.

The optimal foaming ability acquired from the fresh egg (0-day storage) and the lowest percentage of 21 days of storage time. The highest pH (10.257) occurred on the condition. An increase in foaming ability was found in addition of citric acid at 0.8% to 2.4% for storage period. As mention above in Table 2, several trends were occurred. And the highest foaming ability 630.866% was obtained from the fresh egg white with addition of citric acid to 0.8%. The freshly-laid of Arabian chicken eggs at pH 8.237 have optimal foaming ability cause of the condition was supported process of foaming formed while the egg white protein such as ovalbumin and ovomucin haven't transformation. Therefore, the thick layers of egg white have good and could whipping perfectly.

Foaming Stability

The result of the effect of storage time and the addition of citric acid was presented in Table 3. A significant different of the foaming stability of Arabian chicken egg white was found between the storage time and the addition of citric acid.

The statistical analysis showed that the lowest mean value of foaming stability 87.469% obtained the egg with 21 days of storage, while the highest level 96.411% on the fresh egg with the addition of citric acid at the rate of 1.6%. The conditions proved that the egg storage time becomes a very important factor related to the stability of the foam, its occasion by the evaporation of CO₂ and H₂O that increasing pH and causes the condition becomes liquid egg whites for protein fibers have been damaged. The egg whites are increasingly diluted, the result of foam was also more easily leak and stability level were lower. According to [2], fresh eggs have the egg white component was still thick. Therefore, leakage of foam produced was low, whereas the opposite result in eggs that have been stored.

The average foaming stability of Arabian chicken egg white overall decreased with increasing storage time, ie 95.095% for fresh eggs and decreased to 89.892% on the egg stored 21 days. The addition of citric acid was proven to increase the foaming stability of Arabian chicken egg white. The addition of citric acid of 2.4% giving highest impact on improving the foaming stability of Arabian chicken egg white was through 21 days of storage time. However, the citric acid could decrease the egg pH that stored, therefore, the pH approach isoelectric condition and achieved optimally of foaming stability. According to [16], reported that the highest foaming stability occurred on the egg white pH at 8.6 and would be decreased when changes in the pH.

Overrun

The foaming capacity expressed as overrun that was the percentage of volume increase [10]. Table 4 showed that the storage time and the addition of citric acid gave the significant interaction (P<0.05) on foam overrun of Arabian chicken egg. The most significant influence was shown in a fresh egg with the addition of citric acid of 0.8% which produces the highest

overrun value (530.866%), in addition to the 1.6% citric acid with a value overrun on 526.963% and 510.070% at 2.4% also showed a significant effect, while the value of low overrun (230.408%) was obtained from the eggs stored 21 days that the addition of citric acid 1.6%.

The foam overrun of Arabian chicken egg would decrease during longer the storage period exactly in the room temperature. This result was agreement with those [17] that the overrun of egg white would decrease significantly along with the longer egg storage. In addition, [6] explained that the longer egg storage occasion increasingly dilute causes the presence of ovomucin-lysozyme.

The addition of citric acid at the rate of 0.8%, 1.6%, and 2.4% in this study was proven to improve the foam overrun of Arabian chicken egg white after the storage process at 0, 7, 14, 21 days. The foam overrun of the fresh Arabian chicken egg white without the addition of citric acid was 334.692%, while the storage up to 21 days and the addition of citric acid with the highest level of 2.4% that was equal to 277.818%. This proves that both treatment factors gave a significant influence on the value of the overrun. The highest value of 530.866% overrun was obtained from the fresh eggs with the addition of citric acid of 0.8%. These results were consistent with previous studies, including by [10] which states that the foam overrun chicken eggs ranged from 477% to 502%, while according to [16], the value of the egg white foam overrun was up to 550.352% 474.015%.

Coagulation Time

The storage time and the addition of citric acid describing the high significantly effect ($P < 0.01$) on coagulation time of Arabian chicken egg white. Both these factors were gives a significant influence on coagulation time although do not showed the significant interaction effect (Tab. 5).

Tab. 5. Mean value of coagulation time of Arabian chicken egg white with different on storage time and the addition of citric acid

Storage time (days)	Citric acid (%)				Average
	0	0.8	1.6	2.4	
(second).....				
0	196.8	91.5	130.5	103.7	130.5±47.15 ^c
7	167.3	83.2	119.5	111.5	120.5±35.20 ^c
14	152.5	58.5	84.3	78.3	93.4±40.91 ^b
21	115.3	63.7	69.5	58.7	76.7±26.19 ^a
Average	158.1±33.94 ^c	74.2±15.68 ^a	100.9±28.77 ^b	87.8±24.26 ^{ab}	105.3

*Mean value followed by different lower-case letters in columns represent high significantly different at P<0.01

The results showed that the longest of mean value coagulation time occurred on the fresh egg without the addition of citric acid. The widest ovomucin activity occurred on the condition (the fresh egg) which have the protein content of ovomucin in the egg white was not changed, therefore, the coagulation process running optimally. This was consistent with [12] who reported that ovomucin was a component of the egg white protein in great quantities and a role in the coagulation process. The egg white would form the coagulate at 60°C within ± 30 minutes. Another statement reported by Alamprese et al. (2012) that the egg white coagulated at about 81°C of temperature.

The most rapid coagulation time occurs in the egg stored at 14 days and the addition of citric acid 0.8% for 58.5 seconds (less than 1 minute), while the longest time of coagulation occurs in fresh eggs without the addition of citric acid for 196.833 seconds (3 minutes 16.83 seconds). It was influenced by several factors such as the heating temperature, pH, and age of the eggs. In addition, [18] found that the hardest gel of egg white occurred at the increasing of the pH 9.0 to 9.45 and pH 7.7 to 8.1.

[19] explained that the coagulation time can be affected by pH, salt, other materials, and heating time. Another material in mean is such as the addition of acid or acid salt. coagulation by acid and alkaline neutralization process associated with protein molecules that the attractiveness of an increased protein molecule and its solubility decreases. The pH conditions at the time of deposition of a protein called the isoelectric point. Coagulation by acids and bases could also occurred by protein denaturation due to a decrease in pH.

The addition of citric acid affected the coagulation time, that could accelerate the process of forming a gel. The most optimal coagulation time (91.5 seconds) occurs in the fresh eggs and addition of citric acid 0.8%, in this case, coagulation occurs more rapidly in conditions not much-denatured protein as an egg in a state still fresh, so ovomucin forms the best gel. According to [12], a decreasing in egg white coagulation obtained to increasing of protein denaturation and takes a long time to form a gel in the egg white. The coagulation time rapidly found in this study certain occasioned of the addition of citric acid at several rate could improved the gelling ability of Arabian chicken egg white.

Conclusion

The egg white pH was increased during storage period and significant effect for reduced the quality. Result of this study clearly showed that the addition of citric acid could decrease the pH and approach to the isoelectric pH. The condition continued relation to improving the functional properties of the Arabian chicken egg white including foaming properties such as foaming ability, foaming stability, overrun, and coagulation time. The highest value of foaming properties obtained from the fresh egg white with addition of citric acid in optimal level. The fresh egg have good protein condition such as ovalbumin and

ovomucin therefore, could whipping perfectly. The addition of citric acid could also accelerate the process of forming a gel and than the coagulation occurred more rapidly.

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The Physical Quality and Organoleptic Properties of Beef Meatballs in Malang, East Java, Indonesia

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Abstract

This research aimed to determine the physical quality and organoleptic properties of beef meatballs distributed within Malang Regency. The materials were collected from producers of the beef meatballs in Malang. The experiment method was Randomized Complete Design. The grouping was based on sampling at five districts, each of which consisted of three random samples. Three physical quality variables were measured: pH, WHC, and tenderness, while the organoleptic properties variables measured were color, flavor, texture, and aroma. The results showed that the beef meatballs in five districts of Malang do not give an effect ($P>0.05$) on their physical quality and organoleptic properties. The physical quality variables: pH, WHC, and tenderness measured were 6.09-6.29, 65.53%-71.56%, 20.11-20.43 N/m², respectively. In detail, the average pH values of the beef meatballs in the five districts (*Klojen, Sukun, Blimbing, Lowokwaru, and Kedungkandang*) were 6.29, 6.09, 6.26, 6.29 and 6.12; the percentages for the WHC of those were 65.53%, 70.63%, 70.56%, 71.18%, and 71.56%; and the elasticity average values were 20.43, 20.11, 20.14, 20.14, and 20.23 N/m², respectively. Meanwhile, the organoleptic properties average score measured was 3-4. It could be concluded that the beef meatballs from the five districts of Malang do not give an effect on their physical and organoleptic properties. The average values of pH, WHC, and tenderness were 6.09-6.29, 65.53-71.56, and 20.11-20.43 N/m², respectively. *Kedungkandang* district was the best group to produce good quality of beef meatballs with the average value of pH 6.12, WHC 71.56%, and tenderness 20.23 N/m². The average value of organoleptic properties 3-4 represents good color, flavor, texture, and aroma.

Keywords: *physical quality, organoleptic properties, beef meatballs*

Introduction

Beef meatball is a widely-known Indonesian traditional food which is rich in nutrients and becomes a favorite among the locals. The Indonesian beef meatballs are commonly classified based on their origins, some of which are *Solo, Bandung, Jakarta, and Malang* beef meatballs. The latter is considered a popular one, particularly within East Java region.

The basic ingredient of beef meatballs is meat/beef. Meat is an animal product containing high animal protein and composed of water, protein, fat, and nutrient non protein soluble, each of which takes 75%, 18%, 3.5% and 3.5%, respectively. It is important to observe the physical quality and organoleptic properties of the beef meatballs distributed in Malang to raise consumers' awareness of the quality of the beef meatballs consumed. The observed physical quality consists of pH, *Water Holding Capacity* (WHC), and tenderness of the beef meatballs whilst the organoleptic properties include aroma, color, flavor, texture, and aroma.

The result of this research could be used as information in the production of beef meatballs considering their quality and safety.

Methodology

The material of this research was beef meatballs made from ground beef, tapioca flour, and spices like garlic, pepper, and salt. The sample of the research was beef meatballs made by producers at five districts of Malang (*Klojen, Sukun, Blimbing, Lowokwaru, and Kedungkandang*), each of which consisted of three random samples. The pH value was measured with a pH meter (Scot gerate CG 804), the WHC percentage with material glasses and Whatman paper number 42, and the tenderness was tested with *universal instron testing mechanic model Llyod*. The organoleptic test used was a hedonic test. The experiment method was Randomized Complete Design. The grouping was based on sampling at five districts with three random samples taken at each district. The physical quality variables were pH, WHC, and tenderness. The organoleptic properties variables measured were color, flavor, texture, and aroma.

Variables measured were pH (Apriyanto *et al.*, 2002), WHC (Hamm *in* Soeparno, 2005), and tenderness (Carballo, Fernandez, and Baretto, 1996 *in* Anonymous, 2006). The data collected were analyzed by using analysis of variance. The experiment method was Randomized Complete Design with five groups and three times replication. When there was a significant effect of the treatment on the variables measured, the analysis was continued with Duncan Multiple Range Test (DMRT).

Result and Discussion

Table 1. Average values of physical quality of beef meatball

District	pH	WHC (%)	Tenderness (N/m ²)
Klojen	6.29±0.02	65.53±1.74	20.43±0.34
Sukun	6.09±0.13	70.63±6.48	20.11±0.04
Blimbing	6.26±0.17	79.56±3.34	20.14±0.04
Lowokwaru	6.29±0.11	71.18±0.90	20.14±0.06
Kedungkandang	6.12±0.12	71.56±0.97	20.23±0.16

Table 2. Average values of organoleptic properties of beef meatballs.

District	Color	Flavor	Texture	Aroma
Klojen	3.76±0.69	3.67±0.86	3.31±0.78	3.12±1.42
Sukun	3.13±0.18	3.38±0.92	4.27±0.72	3.63±0.71
Blimbing	2.94±0.86	3.88±1.06	2.77±1.35	4.00±0.71
Lowokwaru	2.91±1.57	4.08±0.48	3.78±0.24	3.86±0.11
Kedungkandang	3.92±0.77	3.77±0.80	3.39±0.53	3.30±0.11

Table 1 shows that the average value for the pH of the beef meatballs from the five districts of Malang is 6.21. The highest pH values were found in *Klojen* and *Lowokwaru* districts with 6.29 each whilst the lowest pH value was in *Sukun* district with 6.09. Thus, the total pH value from the five districts in Malang sufficiently meets the standard. According to Soeparno (2005), pH value highly influences the preservation of processed meat products, since the highest pH value of meat is within the range of ≤6.2-7.2. Meanwhile, the pH value range of good meatballs is between 5.9 - which is the lowest meat acidity level - and 6.2 - the minimum pH level for microbial growth. Thus, the pH average value of the beef meatballs in Malang is still at an acceptable quality level. The different pH values of the beef meatballs are due to the changes on the pH of the *post-mortem* which is influenced by the amount of glycogen in the meat and the handling methods prior to slaughter (pre-slaughter animal handling). Linawati (2006) argued that the length of post-mortem interval (PMI) significantly affects the pH of the meatballs, so the longer the PMI is, the lower the pH of the meatballs

will be, since the pH of the meat decreases gradually after slaughter. Table 1 also reveals that the WHC average value of the beef meatballs distributed in the five districts in Malang is 69.90%. The highest and lowest WHC values of the meatballs were in *Kedungkandang* and *Klojen* with 71.56% and 65.53%, respectively. Hence, the total average value of WHC from the five districts has also met the requirement.

The data regarding the tenderness of the meatballs as seen in Table 1 shows that the elasticity average value of the beef meatballs in the five districts is 20 N/m². Since the elasticity value in each of the districts is approximately 20 N/m², the overall tenderness value of the meatballs is considerably good or “chewy,” and meets the locals’ taste. This is in line with Nila’s (2011) findings that 43% of the consumers in Malang preferred chewy meatballs. Tenderness or “chewiness” of a meatball is an important factor that may affect the physical quality of the meatball. Prior to meatball processing, the meat/carcass is usually separated from its fat tissues and thin layer to ease the mincing process, which eventually influences the meat texture and tenderness. The chewed substance added to the meatball dough also leads to a decreased amount of fat it produces. Non-chewed-substance meatballs tend to have a higher amount of fat than the chewed ones, as Tiven’s (2007) research reported. His research on lamb meatballs showed a great amount of fat, but not until the chewed substance was added and boiling process was performed did the amount of the fat reduce. This reduction might be due to the extraction of the fat acid during boiling.

Table 2 reveals the score average of the organoleptic properties covering taste, color, aroma, and texture, that is between 3-4, indicating that the organoleptic quality of the meatballs is suitable with the organoleptic score scale of 5 to 1 from the most delicious to the least. The organoleptik test involved 30 untrained students as the panel. Referring to SNI 01-3818-1995 (Indonesian National Standard for meatball quality standard), a good meatball should have normal meat color, aroma of meat, savory taste, and good or “chewy” texture.

Conclusion

It could be concluded that the beef meatballs from the five districts in Malang do not give an effect on the physical quality and organoleptic properties. The average values of the pH, WHC, and tenderness are 6.09-6.29, 65.53-71.56 and 20.11-20.43 N/m², respectively. *Kedungkandang* district is the best group to produce good quality of meatballs with pH 6.12, WHC 71.56%, tenderness 20.23 N/m², and organoleptic properties average value of 3-4 reflecting good color, flavor, texture, and aroma.

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Application of Porang Flour for Fat Replacer in Reduced Fat Mayonnaise

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Abstract

Mayonnaise is a kind oil-in-water emulsions, containing 70-80 % of oil, egg yolk as an emulsifier and many optional ingredient in commercial mayonnaise. One of the major trends is to reduce the fat content of mayonnaise. It is necessary to use hydrocolloid with different functional roles to replace the quality attributes lost when fat is removed on reduced fat product. Porang flour as a fat replacer can create mayonnaise that has lower in fat. The objective of this research was to observe the quality of reduced fat mayonnaise using porang flour for fat replacer. Mayonnaise samples were prepared using soy bean oil as dipherse phase, egg yolk, porang flour 0.1, 0.2, 0.3 % (w/w) respectively, and controls were made for without porang. The research methods was using experimental design. The result showed that reduced fat mayonnaise with the 0.3% porang flour addition could be applied as an fat replacer to stabilize reduced fat mayonnaise.

Keywords: *Reduced fat mayonnaise, porang flour, fat replacer*

Effect of Canna Starch (*Canna edulis*. Ker) During Refrigerator Storage on Syneresis, Viscosity, and Total Plate Count of Yogurt Drink

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Abstract

The purpose of this research was to determine the effect of cannastarchonsyneresis, viscosity, and total plate count yogurt during refrigerator storage. The canna starch concentration was added 0%; 0.5%; 1%; 1.5% and 2% into the milk before fermentation. Yogurt was stored at refrigerator for 0 day; 7 day and 14 days with 3 replication. The data were analyzed with Duncan's Multiple Range Test (DMRT). The research results showed highly significant difference ($P < 0.01$) between the percentage of addition canna starch on syneresis and viscosity, and showed significant difference ($P < 0.05$) on total plate count (TPC). However, there was no difference ($P > 0.05$) syneresis, viscosity, and total plate count during storage. The canna starch showed the water holding capacity in yogurt system with reducing syneresis (62.06 ± 1.97 %), increasing viscosity (28.44 ± 2.01 Cp), but lower TPC (11.639 ± 0.44 (\log^{10} CFU/ml)) during the storage. Further research was needed more than 14 days and organoleptic tests to determine the consumer acceptance.

Keywords: *stabilizer, syneresis, viscosity, total plate count*

Oral Presentation 3 Focus Session:

Feed and Nutrition 1

Friday, 21 October 08:00-09:20

Room: Panderman 1

Biological Status and Conservation of Anoa (*Bubalus depressicornis*) in Tropical Forest of North Sulawesi

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Abstract

Anoa is classified as Endangered (EN C1 + 2a) on the IUCN Red List 2008 and listed as Endangered on the US Endangered Species Act and is fully protected under Indonesian law. Anoa is one of the endemic biodiversity of Sulawesi which is currently being very worrying population. The present study was designed to reveal habitat conditions, biology, feed resources, and nutrition. Study was conducted in the tropical rainforest of North Sulawesi, where lowland anoa (*Bubalus depressicornis* H. Smith) and may be mountain anoa (*Bubalus quarlesi* H. MacKinnon) are still extant in tropical rain forest of northern part of Bogani Nani Wartabone National Park, at Bolaang Mongondow, North Sulawesi. Lowland anoa inhabits areas of dense forest with diverse rattan. In general, species composition and community structure observed in the location illustrated that there was no particular plant species which is more dominant than others at each plant level. It can be concluded that reproduction rate of anoa (*Bubalus depressicornis* H. Smith) is very low with a litter size of just one calf. Habitat of lowland anoa being a primary forest with no dominant particular species at the plant's level. Forest environment as a habitat of anoa in Bogani Nani Wartabone National Park is suitable for the development of each plant species to ensure the availability of anoa feed.

Keywords: *Lowland anoa (Bubalus depressicornis H. Smith), social behavior, feed*

Introduction

MacKinnon (1979) categorized anoa in two species: mountain anoa (*Bubalus quarlesi* H. MacKinnon) and lowland anoa (*Bubalus depressicornis* H. Smith). Anoa is one of the endemic biodiversity of Sulawesi which is currently being very worrying population. Today, the animal is in the category of endangered species and is feared to become extinct due to habitat destruction, poaching, predators, and diseases (Mustaki, 1996). These animals are considered Vulnerable (VU A2cd) in the IUCN Red Data Book (IUCN, 2008). Although anoa can be domesticated, but it is still not known whether this animal can be developed and handled in a large group. A constraint that must be addressed is the lack of scientific information on the net of anoa life (biological). Scientific information for these constraints will be helpful in supporting conservation of anoa in the native habitat.

The present study was designed to unveil anoa habitat conditions, morphology, and anatomy, as well as complementary biological apparatus, feed resources and nutrition, feeding behavior including reproduction and breeding that support anoa adaptive life as one trophic level in the food chain. Thus, this research can be used as the data base for wildlife conservation programs of anoa, in relation to the welfare and safety of animals (animal welfare), either through forests and wildlife management in their natural habitat (*in situ*), or in particular habitat (artificial) for the nature conservation purposes.

Methodology

The present research was conducted in the tropical rainforest of North Sulawesi, where mountain anoa (*Bubalus quarlesi* H. MacKinnon) and lowland anoa (*Bubalus depressicornis* H. Smith) still extant. The variables of observation were: general condition of babirusa habitat, identifying the source and type of feed and nutrient substances, morphology, and physical character of anoa. The diversity of vegetation and the data of fauna were collected. Primary and secondary data were taken from authorized and competence sources (private, public, NGO, government, as well as poachers and/or ex poachers). Some other data and information were found by direct observation and screening in the forest accompanied by experienced poachers and guides. Data were compiled, analyzed, and discussed descriptively.

Results and Discussion

Topography of the Park is hilly and mountainous with an elevation of 35-95%. Much of the forest is at comparatively low attitudes and correspondingly rich in fruit bearing plants and trees. Bogani Nani Wartabone National Park is an area of ecological uniqueness.

Temperature and relative humidity around the research location were 18.5 – 29.5°C (65°F to 85°F) and relative humidity level was about 85-95%, respectively. The highest elevation of observed location was around 750 – 1.000 m above sea level. Water source found along the research location of Bogani Nani Wartabone National Park as was observed being the biggest source of water (and maybe mineral sources).

Feed potential of vegetation composition was found in the original of anoa habitat, as indicated by relative density, relative frequency, relative dominance, and of importance value index (IVI) data (Soerianegara and Indrawan, 1988). The types of plant communities in the flora constituent around observed area were approximately 22 species, which were strongly considered as feed sources of anoa, namely ferns, herbs, shrubs, and trees (leaves and fruits). Among plant types identified are as follow: rattan shoots (*Calamus sp.*), pandan hutan (*Pandanus tectoriu* Boechni.), forest banana leaves (*Musa paradisiaea* Forsk.), UK-wood (*Eucaliptus deqlupta*), pangalo grass (*E. indica*), woka young leaves (*Livistonia rotundifolia*), pinang hutan (*Areca vestaria*), buah piong (*Eugenia deqlupta* Miq.), banga fruits (*Areaceae* Sp.)

In general, species composition and structure community illustrated that there was no particular plant species which dominant at the level of plants. It can be said that the condition of the forest environment as a habitat of anoa in Bogani Nani Wartabone National Park is suitable for the development of each plant species.

It was observed that anoa licking on stones (rocks) or compacted ground (soil) around sleeping or resting area where available. It is thought that licking on stones as a mean of fulfilling minerals requirements, as also practiced by another exotic wild babirusa (*Babyrousa babyrussa celebensis*). Anoa requires minerals such as sodium and chloride (NaCl) as pointed out by Tikupadang and Misto (1994). When available, anoa searches for rotten and wet wood (log) in order to find minerals. By doing this, anoas do not have to visit beaches to find saline water because it is too dangerous for them to take a risk on predator, especially poachers and hunters. Whitten (1987) reported that anoa often coming down the hilly area in the night time just to find saline water on the beach.

Lowland anoa (*Bubalus depressicornis* H. Smith) spend most of their time alone (unlike most wild cattle) but are sometimes found in pairs or very small groups of a pair and one calf. They are most active during the early morning and early evening, where the ambient temperature is low. Anoa does not like hot environmental temperature. They are excellent swimmers and often wallow in mud or water where available, using shaded and swampy areas to keep cool during hot days.

The elusive anoa appears to be a solitary animal, although suggestions that monogamous pairs remain together have been made, and there is evidence that females form herds when giving birth. Breeding is continuous throughout the year, with one calf born from each pregnancy lasting 270 to 320 days. Weaning has been assumed to take place at six to nine months, a similar length of time as for the lowland anoa and mountain anoa. Lowland anoa (*Bubalus depressicornis* H. Smith) is ready to mate at 2-3 years of age. There is not known (lack of information) on their breeding season, but females are in heat for 24 hours in every 22-23 days. Gestation is about 10 months and usually results in (litter size) one calf, although twins have been born in zoos (Dolan (1965)). It is therefore important to control the population in the habitat by propagating females' anoa and considering female: male ratio.

Lowland anoa help control forest undergrowth by feeding on grasses and plants. They use their sharp horns for protection, but can also hold them against their backs when crashing through forest undergrowth to avoid becoming entangled. Although they look like goats, they are a small species of buffalo.

Roaming area of anoa in Bogani Nani Wartabone National Park is about as big as the area of this National Park, about 193,600 ha ($2,871.15 \text{ km}^2 = 1,108.56 \text{ mi}^2$). Factors such as: feed and water requirement, predator pressures, and uncontrolled hunting were all contributed to why roaming area is getting bigger and bigger.

Conclusion

Reproduction rate of anoa (*Bubalus depressicornis* H. Smith) is very low with a litter size of just one calf. Habitat of lowland anoa being a primary forest with no particular plant species which is dominant at the plant's level. Forest environment as a habitat of anoa in Bogani Nani Wartabone National Park is suitable for the development of each plant species.

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The Nutritional Value Evaluation of Ammoniated Rice Straw and Fermented Sago Dregs in Complete Feed on Performances of Ongole Cross Breed Cattle

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Abstract

This study aimed to obtain the best performances (i.e. nutrients digestibility, body weight gain (BWG), and feed conversion) of ongole cross breed cattle (PO) that fed a complete feed using a combination of ammoniated rice straw (ARS) and fermented sago dregs (FSD). In the early stages, studies were performed to obtain the best nutrient value of the two sources of feed materials, both of rice straw which ammoniated by urea based on levels usage and incubation time, as well as of sago dregs which fermented by fungus *Pleurotus ostreatus* based on duration of incubation. The results obtained, the best rice straw was of which ammoniated by urea 6% with 21 days incubation period, while, the best of sago dregs was of which fermented during the 30-days of incubation period, in which both of the process feed materials were then used in the formulation of complete diet for PO cattle. The complete diet was formulated refers to isoprotein of $\pm 12\%$ (all-in-one ration) by adding 50% concentrate (C), hence the treatment diets were as follows: R1 = 50% ARS + 0% FSD + 50% C; R2 = 37.5% ARS + 12.5% FSD + 50% C; R3 = 25% ARS + 25% FSD + 50% C; R4 = 12.5% ARS + 37.5 FSD + 50% C; and R5 = 0% ARS + 50% FSD + 50% C. This study was conducted at the Faculty of Animal Husbandry UNSRAT laboratory fro three months. Twenty five male PO cattles, approximately 1.5 years of age were used in this experiment. The animals were grouped in 5 groups and confined in separate semi-permanent individual pens, with four animals in each group. The experiment was arranged using a randomized block design, consisting of 5 treatment diets and 5 cattle groups. The treatment diets were fed ad libitum, where the diet offered and diet leftovers were weighed every days. The fresh water was available all times during the whole experiment. The variables measured were dry matter digestibility (DMD), organic matter digestibility (OMD). Body weight gain per day (BWG) and feed conversion. The results shows that treatment diets were affected significantly ($P < 0.01$) on nutrient digestibility, body weight gain (BWG), feed conversion. The R3 treatment diet (*the combination of 25% rice straw which ammoniated by 6% urea and 21 days incubation period and 25% sago dregs fermented by Pleurotus ostreatus during 30 days in complete diet*) gives the highest result on dry matter digestibility (DMD), organic matter digestibility (OMD), body weight gain (BWG), and efficiently feed conversion of PO cattle.

Keywords: *Ammoniated rice straw, fermented sago dregs, PO cattle.*

Potential Source of Feedstuffs from Oil Palm Plantation Areas for Development of Cattle Production in Indonesia

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Abstract

There are around 12 million ha of palm plantations in Indonesia and that always progressively increase every year. Vegetation forage among the oil palm trees are weeds and they must be weeded regularly used cattle as biological cultivator ('bio lawnmowers'). This integration gives mutual effect (complementary) which is converted by livestock forage into meat and oil palm plantation growers can save 25-50 % of weeding costs and increase the production of fresh fruit yield 16.7%. The combination of oil palm plantations with cattle business in Indonesia has been introduced in 2011 through a program of "Sistem Integrasi Sapi - Kelapa Sawit" (SISKA) or "System Integration Cattle – Oil Palm Plantations". Cattle and/or buffalo can be used as a labor of transporting TBS, organic fertilizer, and weed eater. They can also take advantage of plantation waste and palm oil industries as animal feed to produce meat. Therefore, cattle fattening business in the areas of oil palm plantation can suppress the development of weeds up to 77% so as to save the cost of weed control in oil palm plantations. In addition to producing CPO as the mainstay, the palm oil industry also produces several types of by-products potential to be used as animal feed, namely palm press fiber (PPF), mud palm sludge (PS), oil palm frond (OPF) and palm oil trunk (POS) obtained from palm oil plantations.

Keywords: *feedstuffs, oil palm plantation areas, cattle production, Indonesia*

Introduction

Vegetation forage among the oil palm trees are weeds and they must be weeded regularly used cattle as biological cultivator. This integration gives mutual effect (complementary) which is converted by livestock forage into meat and oil palm plantation growers can save 25-50 % of weeding costs and increase the production of fresh fruit yield 16.7%. The combination of oil palm plantations with cattle business in Indonesia has been introduced in 2011 through a program of "Sistem Integrasi Sapi-Kelapa Sawit" (SISKA) or "System Integration Cattle–Oil Palm Plantations". Cattle and/or buffalo can be used as a labor of transporting TBS (Photo1), organic fertilizer, and weed eater. They can also take advantage of plantation waste and palm oil industries as animal feed to produce meat (Setiadi, 2011). Without doubt, fattening cattle on grass grown under oil palm plantations was one of the world's most efficient beef production systems, because the presence of cattle which have been able to introduce an effective biological control, called the cattle 'bio lawnmowers'. The system has lead to 68% reduction in weed control costs in oil palm plantations, because the cattle like to eat fronds so they can be processed them into rations. Over 300 days of feeding, growth rate of cattle goes as high as two kilograms a day

(Goodwin, 2016). This paper reviews literature which identifies potential source of feedstuffs from oil palm plantation areas for development of cattle production in Indonesia.



Photo 1. The introduction of SISKKA Program in Indonesia (Setiadi, 2011).

Development of Cattle Production Under Oil Palm Plantation Areas in Indonesia

Cattle development in Indonesia is constrained by the supply of quality feed for increasingly limited land for grazing and planting forage as a source of feed for cattle. Therefore, the Government through SISKKA Program encourages the breeding business people can be integrated with plantation agriculture or food agriculture/horticulture. This strategy is important because agriculture non farm produce waste or biomass potential as raising cattle palm oil – cattle manure as fertilizer for crops – cattle as a labor of transporting results waste garden or the processing plant as feed for cattle feed source for livestock, one of them derived from oil palm plantations (Matondang and Talib, 2015). In general, cattle farm in an oil palm plantation started in the form of grazing free to take advantage of the availability of forage in the form of weeds at the bottom of the oil palm plantations. Therefore, cattle fattening business can suppress the development of weeds up to 77 % so as to save the cost of weed control in oil palm plantations (Purwantari *et al.*, 2015; Table 2).

Table 2. Weed species in several oil palm plantations in Indonesia

Lokasi	Keterangan	Jenis gulma
Jambi	TBM	<i>Fimbristylis acuminata</i> , <i>Nephrolepis biserrata</i> , <i>Elaeis guineensis</i> , <i>Cyperus compressus</i> , <i>Murdannia nudiflora</i>
	TM	<i>F. acuminata</i> , <i>Digitaria ciliaris</i> , <i>Nephrolepis biserrata</i> , <i>Davallia denticulate</i> , <i>Camponotus compressus</i>
Sumatera	Tanaman berdaun lebar	20 famili, 47 genus dan 56 spesies
	Tanaman berdaun sempit	<i>Asystasia intrusa</i> , <i>Crassocephalum crepidioides</i> , <i>Stachytarpetta indica</i> , <i>Mimosa invisa</i> , <i>Euphorbia heterophylla</i> , <i>Ipomoea spp</i>
Kalteng	Tanaman berdaun sempit	<i>Saccharum spontaneum</i> , <i>Ottochloa nodosa</i> , <i>Setaria barbata</i> , <i>Paspalum spp</i> , <i>Chrysopogon aciculatus</i> , <i>Cyperus rotundus</i> , <i>Panicum repens</i>
	TM	<i>Axonopus compressus</i> , <i>Paspalum conjugatum</i> dan lain-lain (rumput-rumputan), <i>Ageratum conyzoides</i> , <i>Nephrolepis biserrata</i> , <i>Clidemia hirsute</i> , <i>Melastoma spp</i> , <i>Mikania micrantha</i> , <i>Borreria alata</i> (tumbuhan berdaun lebar) dan tanaman pakis

TBM: Tanaman belum menghasilkan; TM: Tanaman menghasilkan

In other words, ruminant-oil palm plantation integration is one of agricultural practices, which commonly applied in Indonesia since the introduction of a “Sistem Integrasi Sapi - Kelapa Sawit” (SISKKA) or "System Integration Cattle –Oil Palm Plantations" in 2011. Up to now, there are around 12 million ha of palm plantations in Indonesia and that always progressively increase every year (Martaguri *et al.*, 2016). System integration of ruminant-oil palm plantation is one form of implementation of crop livestock integration system. In this system, oil palm waste is used as cattle feed. While cattle manure, solid or liquid, used as fertilizer for palm trees. The implementation of this system in addition to increasing the cattle population, and also can improve soil fertility are planted with oil palm trees (Figure 1).

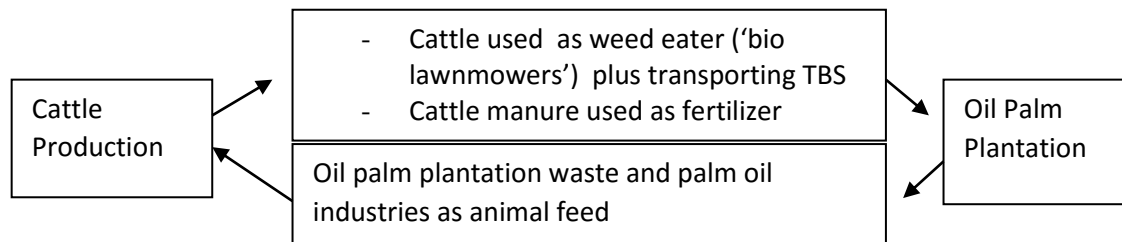


Figure 1. Sustainable cattle-oil palm plantation integration in Indonesia.

In addition to producing CPO as the mainstay, the palm oil industry also produces several types of byproducts potential to be used as animal feed, namely palm press fiber (PPF), mud palm sludge (PS), oil palm frond (OPF) and palm oil trunk (POS) obtained from palm oil plantations (Elisabeth dan Ginting, 2004).

Conclusions

Ruminant-oil palm plantation integration is one of agricultural practices, which commonly applied in Indonesia since the introduction of a “Sistem Integrasi Sapi - Kelapa Sawit” (SISKA) or "System Integration Cattle –Oil Palm Plantations" in 2011. In this production system, grasses species in oil palm plantation are potential forage source for development of cattle production in Indonesia. Up to now, there are around 12 million ha of palm plantations in Indonesia and that always progressively increase every year. System integration of ruminant-oil palm plantation is one form of implementation of crop livestock integration system. In this system, oil palm waste is used as cattle feed. While cattle manure, solid or liquid, used as fertilizer for palm trees. The implementation of this system in addition to increasing the cattle population, and also can improve soil fertility are planted with oil palm trees.

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Methane Reduction Strategy With Fat Supplementation for Development of Sustainable Ruminant Livestock Production

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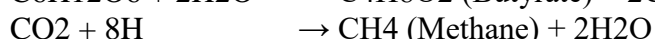
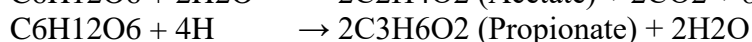
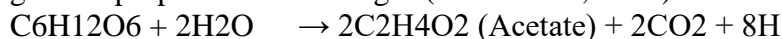
Abstract

Methane emissions from ruminant livestock is one of the contributor greenhouse effect which affects global warming. It is not only related with environmental problems, but also reflects the loss of some energy from livestock being used for the production process. Many strategies from feed nutrition sector is developing to reduce methane emissions. There are increasing feed concentrate, supplementation of ionophor, probiotics, secondary metabolites (tannin and saponin), and fat. Supplementation of fat is very high potential to reduce methane emissions in commercial farm because fat is a natural materials source that's better than chemical source. Fat supplementation, especially saturated fat, can take hydrogen gas in rumen, which is the substance is needed by methanogane bacteria to produce methane. Nevertheless, the fat supplementation in diet can decreased feed intake and fiber digestibility, that's affect ruminant livestock performance. Based on that case, this paper aim to review how potential fat supplementation can reduce ruminant methane emissions to development of sustainable ruminant livestock production.

Keywords: *fat, methane, ruminant*

Introduction

Methane emissions (CH₄) is produced by microbial fermentation of feed components in anaerobic condition. Methane is produced in the rumen (87%) and the large intestine (13%). Methane in the rumen released through eructation process (Boadi et al., 2004). Feed material was conversion to CH₄ by methanogenic bacteria in rumen fermentation. Besides methane, others generate products from the conversion of feed material is volatile fatty acids (VFA), CO₂, H₂, N₂, and H₂S gases. Acetate, propionate and butyrate are the main products of the VFA, which can be absorbed and used by ruminant. Acetate and butyrate produced H₂ gas and propionate used H₂ gas (Boadi et al., 2004).



Hydrogen (H₂) gas products didn't accumulated in the rumen. This gas is used by bacteria (especially methanogenic bacteria) to produce methane gas (Boadi et al., 2004). There were various kinds of methanogenic bacteria such as *Methanobrevibacter ruminantium*, *Methanosarcina barkeri*, *Methanosarcina mazei*, *Methanobacterium formicicum* and *Methanomicrobium mobile*. The amount of methane production can describe the loss of part ruminant energy that can't used for the production (Jayanegara et al., 2008). That's negative effect for ruminant livestock productivity. In that case, reduction of hydrogen

gas production in the rumen can indirectly reduce methane emissions. Biohydrogenation process is one of natural strategy to elimination hydrogen gas. Existence of biohydrogenation activity is due to fat contained in the ration, especially unsaturated fatty acid. Mechanism of fat supplementation to decrease Methane Emissions

Biohydrogenation process in rumen. Fat supplementation on diet is a good choice to reduce methane emissions. Fat can replace some of the energy sources derived from carbohydrates (maximum 10% fat in rations) and has positive effect to reduce methane emissions. Methane production reduce because there are biohydrogenation process in rumen. Biohydrogenation due to when ruminant livestock consume diet with unsaturated fatty acids, then the unsaturated fatty acids took hydrogen gas to convert to be saturated fatty acids. This process is a microbial detoxification mechanisms that aim to avoid the bacteriostatic effects of unsaturated fatty acids that may compromise the integrity of cells and inhibit microbial growth (Maia et al. 2010). The biohydrogenation process effected hydrogen gas decrease for methanogenic bacteria so that the methane production decreased (Lovetta et al, 2003).

Strategy to reduce methane emissions can due to decreased organic materials fermentation in rumen (a low concentration, low consumption of organic matter), lowered fiber fermentation (as well to reduced digestibility), decreased activity of methanogenic bacteria and protozoa number hydrogenated unsaturated fatty acids to saturated fatty acids (Machmuller et al, 2000). Saturated fatty acids (medium chains, C10-C14) can reduce methane emission in rumen. Increased saturated fatty acids (long or medium –chain) can decreased solubility that affect to inhibited productivity of methanogenic bacteria and efficiency methane production.

Generally, fat supplementation should has no more than 5% of feed (dry matter basis) because it may lead to suppression of consumption dry matter (Bhatt et al., 2011). Boadi et al. (2004) reported that the supplementation of fat on diet can reduce methane production more than 33% and it was very easy to implementation, but can increased costs feed.

Some sources of lipids to reduce methane emissions:

a. Supplementation of fumaric acid, essential oil, and canola oil

Table 1 and Table 2 reported Beauchemin and McGinn (2006) research: this study compared 3 kinds of fat (fumaric acid, essential oil, and canola oil) can reduced methane emissions on beef cattle. Fumaric acid is a metabolic precursor to produce propionate and alternatives to accommodate hydrogen gas in rumen. The addition of canola oil (4.6%) in high forage rations reduced methane emissions until 32% per day and 21% of gross consumption energy (GE).

Table 1. Ad libitum DMI and ruminal fermentation variables for cattle housed individually and fed a high-forage diet with various supplemental additives

Item	Treatment ¹				SEM	Treatment P-value
	Control	Fumaric acid	Essential oil	Canola oil		
No. of observations	16	16	16	16		
Ad libitum DMI, kg/d	7.46 ^a	7.16 ^a	7.28 ^a	6.72 ^b	0.335	0.002
GE intake, Mcal/d	31.98	31.18	30.37	30.42	1.494	0.20
ADC, kg/d	0.73	0.65	0.68	0.74	0.119	0.26
Ruminal pH	7.07	6.97	7.11	7.09	0.075	0.47
Total VFA, mM	85.4 ^a	94.0 ^b	82.4 ^a	78.4 ^a	3.25	0.002
VFA, %						
Acetate	65.7 ^a	63.7 ^a	65.3 ^{ab}	58.2 ^b	0.76	<0.001
Propionate	19.2 ^a	21.5 ^b	20.0 ^{ab}	27.5 ^c	0.88	<0.001
Butyrate	10.20	9.98	9.98	9.29	0.514	0.53
Iso-butyrate	0.99 ^{ab}	0.98 ^a	1.04 ^{bc}	1.08 ^c	0.025	0.005
Iso-valerate	1.69	1.82	1.58	2.01	0.086	0.002
Valerate	1.39	1.45	1.44	1.40	0.054	0.55
Acetate:propionate	3.49 ^a	3.02 ^b	3.32 ^a	2.18 ^b	0.143	<0.001
NH ₃ -N, mM	4.45 ^a	5.45 ^b	5.39 ^b	2.92 ^c	0.755	0.01

¹ Within a row, means without a common superscript letter differ, $P < 0.05$.

Treatments were: control (no additive), fumaric acid (175 g/d) with sodium bicarbonate (75 g/d), essential oil and spice extract (1 g/d), or canola oil (4.6% of DMI).

Sumber: Beauchemin dan McGinn (2006)

Table 2. Daily methane emissions from cattle housed in chambers and fed a high-forage diet with various supplemental additives¹

Item	Treatment ²				SEM	Treatment P-value
	Control	Fumaric acid	Essential oil	Canola oil		
No. of observations	6	7	6	8		
DMI	6.38 ^a	6.09 ^a	6.20 ^a	5.07 ^b	0.231	<0.001
Methane						
g/header	159.3 ^a	170.6 ^a	163.1 ^a	108.0 ^b	13.79	0.006
g/kg of DMI	25.5	28.1	27.5	21.7	2.32	0.11
% of GE intake ³	7.93 ^{ab}	8.85 ^b	8.53 ^b	6.30 ^a	0.730	0.04
% of DE intake	12.76	14.31	15.41	11.97	1.030	0.12

¹ Within a row, means without a common superscript letter differ, $P < 0.05$.

² Oil different from control, $P = 0.09$.

³ Methane emissions and corresponding DMI determined for 3 d during which the animals were in the chambers. Chamber (data for 2 animals) was the experimental unit.

² Treatments were control (no additive), fumaric acid (175 g/d) with sodium bicarbonate (75 g/d), essential oil and spice extract (1 g/d), or canola oil (4.6% of DMI).

Sumber: Beauchemin dan McGinn (2006)

Beauchemin and McGinn (2006) reported that decreased feed consumption, low dry matter and fiber digestibility can reduced methane emissions. Dohme et al. (2000) reported that the addition of canola oil at 5.3% DM on in vitro reduced 20% methane emissions. Canola oil consist of 54% oleic acid, 22% linoleic acid and 11% linolenic acid. Biohydrogenation of mono- and polyunsaturated fatty acid that took H₂ gas and lowering CO₂ in rumen reduced

methane production. However, the addition of fats decreased feed intake and digestibility in rumen. Consumption of fat can directly made a rumen full, decreased the digestibility of fiber and acetate: propionate ratio. Beauchemin and McGinn (2006) showed that addition of fumaric acid (175 g/day or 50 mM) increased propionate concentration but didn't reduced methane production of beef cattle on in vivo. Carro and Ranilla (2003) stated that addition of fumaric acid at 0-10 mM on in vitro reduced 5% methane production, increased VFA concentration, decreased acetate: propionate ratio. The same result was reported Bayaru et al. (2004) that the addition of fumaric acid (18 mM) reduced 23% methane production.

b. Supplementation of coconut oil

Coconut oil is one of the oil that be categorized in saturated fatty acid. Coconut oil supplementation reduced 26% methane emissions (Machmuller et al., 2000) compared with control diet (without oil). The addition of coconut oil reduced VFA concentration and small acetate:propionate ratio. This indicated that coconut oil addition disturb fiber degradation in rumen. Lovetta et al. (2003) reported that the addition of coconut oil (350 g/day) reduced 33, 8% methane emissions in all of ratios but not affected on average daily gain in finishing cattle Charolais cross heifers. Methane emissions per unit of livestock products was significantly reduced by the low of forage: concentrate ratio. The addition of coconut oil not only reduced methane emissions but also improved feed conversion efficiency (FCE). Limit maximum of addition coconut oil at 5% in the concentrate ration (Bhatt et al., 2011).

Conclusion

Reduction of methane emissions to improve feed efficiency for development of sustainable ruminant livestock production can use unsaturated fatty acids (sunflower oil, canola oil, essential oils and fumarate acid) and saturated fatty acids (tallow and coconut oil). Maximum addition of oil is preferably 5% on concentrate ration. The addition of fat can improve the feed efficiency, daily gain and positive impact on environment, but also increase cost of feed on commercial farms.

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Study of The Effect of Fortification of Herbals to Multinutrient Feed Block on Rumen Fermentation and Total Gas Production In Vitro

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Abstract

One of the operational policies adopted in order to accelerate the PSDS 2014 was the development of beef cattle feed which is directed at the use of local materials derived from agricultural and industrial waste. The results of previous studies (Khasrad and Ningrat, 2010) showed that some animal feed ingredients could potentially have other benefits are not just limited to the content of nutritional substances, but also as a compound to manipulate rumen microbes, stimulating growth and at the same time used for maintenance of health. Based on the above, it is necessary to do the exploration of the potential of bioactive compounds from Sumbar plant crops namely herbal plant (*Curcuma* (*Curcuma xanthorrhiza* Roxb), Turmeric (*Curcuma domestic* Val), Bitter (*Andrographis paniculata*), and Brotowali (*Tinospora crispa*), which has not once used as a feed supplement ruminants. The results showed that the content of phytobiotic or bioactive compounds from herbs affect rumen microbes and provide a positive effect on the fermentation rumen (the concentration of NH₃ and VFA) and gas production in vitro. Fortification 3% Turmeric could potentially provide the best results of all the measured parameters. The next stage will be testing the supplement on the productivity of livestock on farm.

Keywords: *phytobiotic, local feedstuffs, herbal plants, ruminant feed*

Evaluation of Edamame Husk Silage Using In Vitro Gas Production Method

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Abstract

Edamame husk (*Glycine max* (L.) Merrill) is one of alternative feed due to its abundant availability and its potential CP content around 8%. However, it has high water content that leads to easily rotten. One of the preservation technologies that can be done to preserve it in fresh is namely silage. The objective of this study is to determine the potential of nutrition of Edamame husk silage, in terms of laboratory parameters using *in vitro* gas production method. The research was carried out using Randomized Block Design within 3 treatments of silage and 3 groups: T1 = 60% Edamame Husk + 40% Concentrate; T2 = 30% Edamame Husk + 30% Corn Hull + 40% Concentrate; T3 = 70% Edamame Husk + 15% Corn Husk + 15% Concentrate. Variables measured were gas production, Ruminal Dry Matter Digestibility (RDMD), Ruminal Organic Matter Digestibility (ROMD), b and c value, and ammonia production. The result showed that silage treatment on Edamame husk has significant effect ($P < 0.05$) on RDMD and ROMD but it has no significant effect ($P > 0.05$) on gas production, NH₃ production as well as b and c value. It is concluded that the T1 treatment was the best treatment in term of RDMD, ROMD gas production, NH₃ production as well as b and c value.

Keywords: *Edamame husk, silage, in vitro gas production, NH₃, RDMD, ROMD*

Development of Beef Cattle by Using Agricultural By-Product in West Java

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Abstract

The development of beef cattle in Indonesia was an attempt to meet the need of meat. Such efforts need to be supported by the potential of the feed. West Java province is one of the provinces that have the potential for beef cattle and agricultural by-product. The aim of research was to assess the potential of agricultural by-product and characteristics of farmers in West Java for the development of beef cattle. The research was conducted in four regencies such as Kuningan, Cirebon, Tasikmalaya and Ciamis in West Java. The study used two types of data, primary data and secondary data. Primary data was obtained from interviews respondents with the structured questionnaires and data from laboratory analysis, while secondary data from government database. Interviews and sampling of agricultural by-product carried out in three districts of each regency within 10 respondents each sub district. The results showed that agricultural by-product in West Java were rice straw, corn straw, banana peels, straw sweet potato and peanut hay. The highest potential of agricultural by-product is rice straw and farmers in West Java perform maintenance using traditional system. Conclusion of this research was agricultural by-product in West Java has potential to support the development of beef cattle and farmers need to be educated adapted technology to improve feed resources.

Keywords: *agricultural by-product, beef cattle, west java*

Introduction

The development of beef cattle production must be followed by an increase of forage quantity, quality and sustainability. Range of forage feeding is 40-70% of feeding, but the forage provision is hardly increase due to land limitation for forage fodder cultivation. The land availability is more important for producing human food than producing forage crops. In addition, uncertainty types of forage in small-scale farm usually feed beef cattle. Farmer gives available forage depends on the season. Based on that case, alternative forage is needed to fulfil beef cattle necessary for growing and producing meat. One of the alternative forage can be obtained from agricultural by-product in massive quantity in Indonesia. Constraint of agricultural by-product usage as beef cattle feed is the lack of quality and information. The quality of agricultural by-product is usually nutrient deficiency and the information of agricultural by-product potency is limited. Information on types of agricultural by-product, nutrient content and production quantity are considered less. In the future, the missing information will impact to difficult utilization of agricultural by-product as feed.

West Java province is one of the provinces which is having potential on livestock and local feed. There are four regencies that have potency to develop livestock; Cirebon,

Kuningan, Tasikmalaya and Ciamis. Statistics Indonesia (2014) stated that those regencies have highest potency in both livestock and agricultural by-product. However, the usage of agricultural by-product as feed is still limited due to lack of information and the characteristics of farmer who carry out farming activities. The objectives of this research were to assess the characteristics of beef cattle farmers in four regencies in West Java, to analysis the potential agricultural by-product as feed and to estimate the ability of addition number of ruminant population.

Methodology

The experiment was conducted in four regencies such as Cirebon, Kuningan, Tasikmalaya and Ciamis. Analysis nutrient content of agricultural by-product was in Laboratory of Feed Science and Technology, Faculty of Animal Science, Bogor Agricultural University. Samples were obtained from twelve observation district with three repetition of each commodity retrieval from three types of agricultural by-product which is widely used as feed. The study used two types of data, primary data and secondary data. Interviews and sampling of agricultural by-product carried out in three districts in each regency within 10 respondents each sub district. Interviews were conducted with 30 farmers which consisted of 10 farmers in each district in each regency (Sugiyono, 2011). Criteria for selection of respondents were the farmers rearing beef cattle at least three and who use agricultural by-product as feed. Interviews were using structural questionnaire. Questionnaire were used as data characteristics of farmers, how maintenance beef and way of feeding. Secondary data was obtained from Statistics Indonesia of four regencies. Data were analyzed using descriptive analysis method (Mattjik and Sumertajaya, 2000).

Results and Discussions

Total production of agricultural by-product must be noticed to ensure the availability of agricultural by-product can fulfil the requirement of beef cattle. The production can be classified according to the fresh condition, dry matter (DM), crude protein (CP) and total digestible nutrient (TDN). The result could be seen on the Table 1.

Table 1. Production and by-product commodity based on dry matter, crude protein and total digestible nutrient

Regency	Commodity	Production (ton/year)			By Product	Potency (%)		
		DM	CP	TDN		DM	CP	TDN
Cirebon	Paddy	595907.33	29735.78	285975.93	Rice straw	97.09	96.56	96.89
	Corn	8444.25	487.23	4286.30	Corn leaves	2.50	2.83	2.63
	Cassava	29.50	1.20	24.00	Cassava	0.01	0.00	0.01
	Banana	2202.87	165.66	1254.09	Banana peel	0.40	0.60	0.48
Kuningan	Paddy	531805.56	26111.65	260850.63	Rice straw	97.03	93.80	96.30
	Sweet potato	7553.83	1108.90	3749.72	Sweet potato straw	1.58	3.93	1.60
	Peanut	1420.62	181.13	861.04	Peanut leaves	0.28	0.70	0.34
	Cassava	5057.97	371.76	4216.32	Cassava	1.10	1.57	1.76
Tasikmalaya	Paddy	1153829.40	48922.37	552453.52	Rice straw	98.06	95.80	98.19
	Sweet potato	1389.02	190.30	768.96	Sweet potato straw	0.12	0.38	0.14
	Peanut	2084.66	308.32	1134.06	Peanut leaves	0.19	0.63	0.22
	Banana	20753.85	1847.09	8830.76	Banana weevil	1.62	3.19	1.45
Ciamis	Paddy	1036715.08	51317.40	523230.10	Rice straw	83.05	83.87	82.48
	Banana	374428.12	16325.07	188112.69	Banana stem	15.55	14.05	15.40
	Cassava	0.00	0.00	0.00	Cassava	1.40	2.09	2.11

DM = Dry matter, CP = Crude protein, TDN = Total digestible nutrient

Based on the Table 1, the highest production by-product used is rice straw. It is because paddy is the common agricultural commodity and production of rice in Southeast Asia is high (approximately 80%) (Sarnklong *et al.*, 2010). DM production of agricultural by-product showed the highest value and CP had the lowest value. In feedlot business, beef cattle that

received rations in the form of agriculture by-product is an average shortage of CP around 18.49% and TDN around 18.47 from the standard requirement (Syukur and Afandi, 2009). Agriculture by-product in four regencies is source of fiber based on nutrient content. Energy requirement of ruminant is 70-80% derived from fiber. Rice straw as feed is limited usage about 2% of body weight based on dry matter because hard fermentable carbohydrate and lignin and silica in straw which poorly digested by ruminant (Setiyadi *et al.*, 2013).

Table 2. Estimation capacity of increasing ruminant population based on agricultural by-product

Regency	Description	Production of by-product (ton/year)			
		Fresh	DM	CP	TDN
Kuningan	Total potency	1545209.63	545837.98	27773.45	269677.71
	Actual requirement		59186.08	8704.91	41159.56
	KPPTR (AU)		374520.47	90073.41	289850.51
Cirebon	Total potency	3600989.86	3916447.39	3288475.55	928514.15
	Actual requirement		94912.24	13594.22	76651.15
	KPPTR (AU)		1035396.39	140388.62	611220.52
Tasikmalaya	Total potency	4807958.84	1425169.19	68673.37	722170.85
	Actual requirement		117761.05	17975.23	88350.88
	KPPTR (AU)		1006162.95	239481.09	803931.98
Ciamis	Total potency	3294429.95	1178056.93	51268.08	563187.30
	Actual requirement		124140.04	18709.53	90255.86
	KPPTR (AU)		811079.65	153795.68	599862.30

DM = Dry matter, CP = Crude protein, TDN = total digestible nutrient, AU = Animal Unit

Production of agricultural by-product based on DM, CP and TDN can be used to estimate the capacity ruminant population. Table 2 showed the estimation capacity of ruminant population based on agricultural by-product. Capacity of increasing ruminant population (KPPTR) for the highest value of beef cattle is using rice straw based on CP. KPPTR illustrates the total potential of agricultural by-product which can reach an actual requirement of the lowest value for beef cattle. The effective KPPTR is the lowest value. Kuningan, Tasikmalaya and Ciamis have the lowest KPPTR value. It means the capacity of ruminant population could not be developed while Cirebon has potential to develop beef cattle population.

Conclusion

Agricultural by-products of paddy, corn, cassava, banana, sweet potato and peanut have potency as forage source for beef cattle, especially as source of fiber and energy in four regencies. Cirebon Regency in West Java is most potential to develop beef cattle population. Farmers need to be educated with adapted technology to optimize agricultural by-product as feed.

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Nutritional Responses on The Hypothalamic-Pituitary-Ovarian Axis on Female Goats

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Abstract

Livestock production efficiency depends greatly on nutritional management for reproductive efficiency ('focus feeding'), as embodied in the concept of 'clean, green and ethical management'. As reported in sheep studies, changes in the levels of nutrition primarily affect a range of blood-borne metabolic factors that appear to exert direct and indirect effects on reproductive performance through actions on the hypothalamic-pituitary-ovarian axis. The similarities between sheep and goats in their basic reproductive biology suggest that the same responses would be seen in female goats. However, there has been little experimentation in goats compared to sheep, so we know almost nothing for goats about the effects of nutritional supplements on the feed-forward-feedback loops in either the reproductive axis or the metabolic homeostatic systems. Thus, it is important to understand the fundamental of reproductive physiology that could alter the reproductive performances in goats.

Keywords: *goat, nutrition, reproduction*

Introduction

Several environmental factor such as photoperiod, stress and dietary intakes, could alters the reproductive system of female goats. These factors are primarily affect follicular development, ovulation rate and successful of pregnancy. In small ruminants, the potential to improve reproductive performance through nutritional supplementation is well known on sheep but sparse in goats (Scaramuzzi et al., 2011; Shikh Maidin, 2011). Focus feeding known as "flushing" is short-term high nutrient intake that is focused to increase prolificacy of sheep and this refined system embodiment with concept of 'clean, green and ethical' management (Martin *et al.*, 2004).

In small ruminants, nutrition appears to reproductive performance via metabolic hormones and hypothalamic-pituitary-ovarian axis. For example, in sheep overfed ewe could have negative embryo-maternal communication, thus predominantly affect the establishment of pregnancy but this was not seen in goats (Parr, 1992; Shikh Maidin, et al. 2014). There are several factors linked with sustainability of pregnancy, including, energy balance from feed intake and reproductive hormones. Thus it is important to understand physiological mechanisms underlying those responses so that it could improve reproductive performances of goat industry, particularly in Malaysia.

Endocrine regulation on ovarian activity

Female reproductive activity in goats, as in other animals, is regulated primarily by complex hormonal interactions among the hypothalamus, pituitary gland and ovary. The primary driver of the process is the hormones in the hypothalamic-pituitary system:

gonadotrophin-releasing hormone (GnRH), follicle-stimulating hormone (FSH) and luteinizing hormone (LH). The primary contributions from the ovary are progesterone, inhibin and oestradiol. These hormones are linked by feed-forward processes (hypothalamus to pituitary gland to ovary) and feedback processes (ovary to hypothalamus and pituitary gland), as demonstrated in Figure 1.

During follicular phase, recruitment of growth and development of follicles is initiated by frequency of LH and FSH concentrations. These gonadotrophin hormones are linked closely with intensity of oestradiol. Ultimately, the Graafian follicles that appear during the follicular phase determines ovulation rate (Scaramuzzi *et al.*, 2011). Luteal phase begins from the time of ovulation. In sheep, the intensity of GnRH pulses could affect the number of corpus luteum. Progesterone reflects the secretory activity of the corpus luteum.

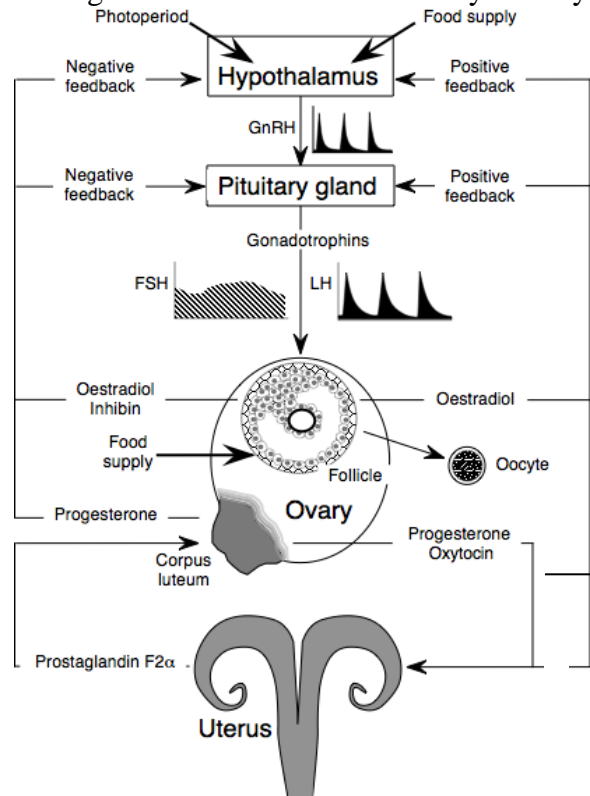


Figure 1: The oestrous cycle is regulated by the inter-relationships between hypothalamic (GnRH), pituitary (LH and FSH), follicular (oestradiol and inhibin), luteal (progesterone and oxytocin) and uterine (prostaglandin F2 α) hormones. Nutritional inputs, the focus of this thesis, are thought to affect these systems by acting on sites in the central nervous system and the ovary. These endocrine relationships are thought to be similar in goats and sheep, although very little is known about inhibin in goats. Redrawn after Scaramuzzi *et al.* (1993).

Feed intake and reproductive performance in female goats

The responses of supplementation vary on reproductive performance, mainly in ovulation rate, pregnancy, embryo survival and kidding rate. Decades have been reported in sheep; high protein and energy supplementation increase number of follicles to ovulate but continued feeding increase embryo mortality. Changes in ovarian activity in response to changes in nutrition and this response could be explained by the actions metabolic hormones and clearance of progesterone concentrations. Insulin directly stimulate folliculogenesis and increase ovulation rate and this seem apply to goats (Haruna *et al.* 2009; Meza-Harrera *et al.*, 2008; Vinales *et al.*, 2005). In addition, metabolic factors are also initiated by changes in expression of secretion at brain and pituitary.

As mentioned earlier, in sheep, embryo mortality increased in overfed ewes, which is led to the reduction of progesterone concentrations during luteal phase (Parr *et al.*, 1982;

1993). There are many possible reasons to progesterone clearance during early pregnancy; 1) feed-forward-feedback loop between ovarian secretion and pituitary stimulation, 2) metabolic factors and 3) stress. Supplements and restricted feeding are able to suppress GnRH secretions and responsiveness of luteal cells.

It is important to understand the differences between species in their reproductive responses to nutrition because the outcomes strongly influence the rate of production of offspring and may help avoid reproductive failure. This is particularly important in countries such as Malaysia where the goat industries contribute heavily to the domestic economy.

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Oral Presentation 3 Focus Session:

Feed and Nutrition 2

Friday, 21 October 08:00-09:20

Room: Panderman 2

Performance and Egg Quality of Quail Fed Marigold Flower Extract

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Abstract

Marigold flower extract (MFE), a natural source of carotenoid at different concentrations (0, 50, 100, and 150 ppm MFE) to determine the effects of MFE on quail performance, egg quality and carotenoid content of the egg yolk of quails housed in enriched cages. This experiment was arranged in a completely randomized design (CRD) with four dietary treatments and five replications (10 quails per treatment). 200 laying quails *Coturnix coturnix* Japonica (7 week of age) for 2 months fed MFE in the diet. Variable measured were quail production performances and egg quality. Results of the experiment indicated that quail production performances and egg quality were affected ($p < 0.01$) by feeding MFE in the diet. Feed intake, hen day production, egg mass, egg yolk colour, egg lutein in D treatment (used 150 ppm MFE) was the highest treatment, but the lowest on egg cholesterol and feed conversion. The conclusion of this experiment that up to 150 ppm MFE improved quail production performance, reduced egg cholesterol 33.28%, increased egg yolk colour 33,12%.

Keywords: *marigold flower extract, quail production performance, egg quality*

Introduction

Marigold flower (*Tagetes erecta* L.) represents a rich source of carotenoid pigment. Carotenoid pigment such as carotene (alpha-carotene, beta-carotene) and xanthophyl (lutein, zeaxantin). Carotenoids from Marigold flowers are anti-oxidants to prevent free radical known as *chemopreventive* agent, improved immune function (Zhang *et al.*, 1991) decreased egg cholesterol and increased egg yolk color (Nuraini *et al.*, 2016).

Egg cholesterol content of poultry feared especially for patients with *hypercholesterolemia*, even though an egg is a complete source of animal protein nutritional and cheap price. According to Sies and Stahl (1995) β -carotene pigment is *hypocholesterolemia* agent. Efforts to decrease egg cholesterol have been done with feeding high carotenoids (β -carotene and xanthophyl). Nuraini *et al* (2009) reported that the utilization 30% tapioca and tofu waste fermented with *Neurospora crassa* in the diet of laying hens with β -carotene content of 80.20 mg/kg diet decreased egg cholesterol 43.15% and increased egg yolk color 20.50%. Application extract carotenoid from Marigold (MFE) to study the effect of MFE on the performance of laying quail and egg quail quality was unknown.

Methodology

The study was conducted on 200 quail (*Coturnix coturnix* Japonica) age 5 weeks. The experimental design used was Completely Randomized Design (CRD) with 4 treatments were: 0, 50, 100, and 150 ppm MFE and 5 replications. The quails were given a diet with iso crude protein 20% and iso energy 2800 ME kcal/kg feed. The variable observed on each type

of quail are feed intake (g/bird/day), quail day egg production (%), egg weight (g/egg), egg mass production (g/bird/day), feed conversion ratio, egg cholesterol (mg/100g), egg yolk colour. Data obtained was subjected to analysis of variance. Where significant differences occurred, the means will be separated using Duncan Multiple Range Test (DMRT).

Results and Discussion

Feed consumption, quail day production, egg weight, egg mass and feed conversion: The effect of feeding MFE on laying quail performance are presented in Table 1.

Table 1. Laying quail performance feeding MFE^{ns}

Parameter	Treatment (ppm MFE)			
	0 ppm (A)	50 ppm (B)	100 ppm (C)	150 ppm (D)
Feed Consumption (g/bird/day)	24.63	24.34	25.32	25.51
Quail day Production (%)	77.33	78.67	79.67	80.68
Egg Weight (g/egg)	9.59	9.66	9.69	9.75
Egg Mass Production (g/bird/day)	7.42	7.61	7.82	7.94
Feed Conversion	3.32	3.28	3.24	3.23

Note: ns = non significant

Table 2. Egg quality of quail feeding MFE

Parameter	Treatment (ppm MFE)			
	0 ppm (A)	50 ppm (B)	100 ppm (C)	150 ppm (D)
Egg Cholesterol (mg/100g)	746.38 ^a	654.79 ^b	563.22 ^c	498.00 ^d
Egg Yolk Colour	7.10 ^e	7.93 ^d	8.87 ^c	9.45 ^b

Note: Means in the same row with different superscript differ high significantly (P<0.01)

Feed consumption dan hen day production not different in treatment A to D, indicated that MFE until level 150 ppm in the diet could maintained hen day production, eventhough decreased utilization of corn. The same weight of quails eggs in treatment D than another is caused by protein consumption is also same in these treatments. It mean the amount of protein contained in the ration required for the formation of eggs was also not different. According Gunawardana *et al* (2008), protein had a significant effect on egg weight. Egg mass is not influenced by MFE in the diet. This is caused by egg weight and egg production are also similar in treatment D, because egg mass are the product of egg production with egg weight. Feed conversion ratio at treatment D than another treatment not different too, caused by feed intake and egg mass also not differ.

The lowest cholesterol of egg quails in treatment D compared to other treatments, associated with the utilization of MFE high of carotenoid. Increasing MFE in the diet caused the higher content of carotenoids (B carotene and xanthophyl) than control. B carotene is *hyphocholesterolemia* agent. According to Sies and Stahl (1995) B carotene can inhibit the

action of the enzyme-CoA reductase Hydroksimetyl Glutaryl (HMG Co-A reductase) that play a role in the formation of mevalonat in the synthesis of cholesterol, so that cholesterol is not formed. The results of this study showed that MFE until level 150 ppm decreased egg cholesterol 41.54%.

The higher egg yolk color (redness) in treatment D compared to treatment A, caused carotenoid was higher in treatment D due to increasing MFE. Gunawardana *et al* (2008) reported that the color of yolk depends on the carotenoids in dietary.

Conclusion

Utilization marigold flower extract until 150 ppm maintained the performance and increased egg quality of quails.

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Performance of Broiler Fed Diets Containing Lipid from Mealworm (*Tenebrio Molitor* L.)

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Abstract

This study was to determine the effect of feeding lipid from mealworm on performance of female broiler birds. Two hundred day-old female broiler chicks (Lohmann) were randomly assigned to four treatments with five replications of 10 chicks based on a completely randomized design. Dietary treatments were: R1= diet containing 1% mealworm lipid; R2= diet containing 2% mealworm lipid; R3= diet containing 3% mealworm lipid; and R4= diet containing 4% mealworm lipid. The results show that use of mealworm lipid in the diet of broiler chicken significantly affected feed consumption, body weight gain, final body weight and feed conversion. Mealworm lipid addition at level 1% (R1) into diet significantly ($P<0.05$) resulted in the highest final body weight (1495.18 gram bird⁻¹), followed by that of those fed R4 (1489.44 gram bird⁻¹), R2 1459.74 gram bird⁻¹) and R3 (1405.75 gram bird⁻¹). Broiler in R4 group, fed diet containing mealworm lipid at level of 4%, resulted in the lowest ($P<0.05$) feed conversion ration among other group. The conclusion of this study was that the addition of mealworm lipid of 4% in broiler diet could produce better performance, resulting in the highest final body weight and lowest feed conversion

Keywords: broiler, lipid, mealworm, performance

Introduction

The effort to meet the requirements of poultry's feed-protein source is still a major problem. Animal protein sources commonly used in rations of poultry is especially meat bone meal (MBM) and fish meal that is currently derived from imports. One of the solutions that can be done by making use of local natural resources that can be used as a feed alternative. mealworm (*Tenebrio molitor* L.) is one promising alternative feed in the future, because its availability pretty much and easily retrieved as well as having a good nutrition content. Mealworm, categorized as an unconventional feedstuff for poultry, has been reported to have numerous advantages for animal due to its rich content of certain nutrients. Some studies had reported that mealworm have a good nutritional value such as 45.87% crude protein, 8.24% of crude fiber and 14% ether extract. In addition to having a good nutrition content, another advantages of the use of insects as a source of feedstuff that is easy on the production because it requires a simple feed, have a relatively short life cycle then don't give negative effects on the environment (Oonincx *et al.* 2010). Ramos-Elorduy *et al.* (2002) reported that the use of dried mealworm up to 10% doesn't give a negative effect to the chicken.

Most of the attention on insects as a food or feed source focuses on protein content. However, lipids are also a main component of insects and are produced during protein isolation (Yi *et al.* 2013). Lipids are a source of energy and essential fatty acid, therefore they could be used to combat malnutrition problems in developing country (Smit *et al.* 2004).

Generally, the lipid content of insects ranges from less than 10% up to 30% on a fresh weight basis and are relatively high in the unsaturated C18 fatty acid, including oleic, linoleic, and linolenic acid (DeFoliart 1991). Seeing the potential of mealworm lipids results from protein isolation as a feedstuff, mealworm lipids expected to be used in broiler ration to increase performance.

The aim of the study was to determine the effect of mealworm lipid levels on production performance of female broiler birds.

Methodology

The research material consisted of a 4 month old mealworm derived from mealworm breeder in Gadog, Bogor. Mealworm extraction based on dry rendering methods. The experiment was assigned in a completely randomized design (CRD) with four treatments and five replications with ten broiler chicken for each replication, and the birds were placed in cage of 1.0 x 1.0 m in size. The experimental animals were 200 day-old Lohman chicks. Dietary treatments were: R1= diet containing 1% mealworm lipid; R2= diet containing 2% mealworm lipid; R3= diet containing 3% mealworm lipid; R4= diet containing 4% mealworm lipid. The diets were formulated isocaloric and isoprotein according to the recommendation of Leeson and Summers (2005). Variables measured were feed consumption, body weight gain, feed conversion, early body weight, final body weight and mortality.

Data were subjected to analysis of variance (ANOVA) by using SPSS V21 IBM program, and the differences among treatment means were distinguished by Duncan's Multiple Range Test (Steel and Torrie 1995).

Result and Discussions

Growth performances of broilers fed the experimental diets are presented in Table 1. The use of mealworm lipid in the diet of broiler chicken significantly ($P < 0.05$) affected feed consumption, body weight gain, final body weight and feed conversion. Broilers fed R1 had the highest feed intake ($P < 0.05$) among the treatments, while those fed R2, R3, and R4 had similar feed intake (Table 1.). In accordance with the results of the present study, Crespo and Esteve-Garcia (2001) also reported that feed intake decreased ($P < 0.001$) with an increase in dietary fat and concluded that feed intake and feed efficiency were affected by different types of fats. By increasing fat sources to broiler diet, the amount of feed intake decreased and feed efficiency was improved (Jeffri *et al.* 2010).

Table 2. Growth performances of broiler as affected by mealworm (*Tenebrio molitor* L.) lipid addition into diet

Variabels	Treatments			
	R1	R2	R3	R4
Feed consumption (gram bird ⁻¹)	2909.33±90.50A	2708.72±99.50B	2700.42±72.39B	2742.65±103.33B
Final body weight (gram bird ⁻¹)	1495.18±47.40A	1459.74±63.89AB	1405.75±63.37B	1489.44±55.84A
Body weight gain (gram bird ⁻¹)	1449.32±46.90A	1413.00±62.76AB	1359.09±63.44B	1443.32±56.18A
FCR	1.78±0.03B	1.75±0.07B	1.87±0.09A	1.72±0.02B
Mortality (bird)	2	3	1	2

Note : R1= diet containing 1% mealworm lipid; R2= diet containing 2% mealworm lipid; R3= diet containing 3% mealworm lipid; R4= diet containing 4% mealworm lipid.

Mealworm lipid addition into diet significantly ($P < 0.05$) affected final body weight and body weight gain of broiler. Final body weight is an accumulation of body weight gain, therefore data of final body weight and that of body weight gain had similar pattern (Table 1). Mealworm lipid addition at level 1% (R1) into diet significantly ($P < 0.05$) resulted in the highest final body weight (1495.18 gram bird⁻¹), followed by that of those fed R4 (1489.44 gram bird⁻¹), R2 (1459.74 gram bird⁻¹) and R3 (1405.75 gram bird⁻¹). In this experiment, broiler fed R1 having the highest body weight gain (1449.32 gram bird⁻¹) had also the highest final body weight, which is directly affected by their highest feed intake.

Feed conversion ratio (FCR) is affected by many factors, such as environmental temperature, genetics, nutrient content of feed, and disease. Broiler in R4 group, fed diet containing mealworm lipid at level of 4%, resulted in the lowest ($P < 0.05$) feed conversion ration among other group. The lowest feed conversion value of R4 group may indicated that the diet they fed could be digested, absorbed, and utilized by the body better than other diets, i.e., R1, R2, and R3.

Conclusion

The addition of mealworm lipid in broiler diet could produce better performance, resulting in the highest final body weight and lowest feed conversion.

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Propionic Acid and Enzymes for Rabbit Feed

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Abstract

Experiment was conducted using weaned rabbit with basal diet containing 40% of rice bran. Commercial enzyme was added in the levels of 0, 300 and 400 ppm, and propionic acid in the levels of 0, 400 and 800 ppm. Feeding trial used weaned rabbit with 5 replicates and 3 rabbits each replicate for 12 weeks. Feed consumption and body weight were observed. Digestibility measurement with total collection of feed refusal and faecal was done in the last week of the trial. Proximate analysis (feed, feed refusal and faecal samples), and internal organ was observed in the end of feeding. Proximate analysis of feed used for feeding trials as followed: Crude protein content between 19.44 and 20.61%, energy between 4054 and 4365 kcal/kg and fiber were 9.44 and 16%. Crude protein content of the rice bran 9.9%. Daily gain ration 14.42 ± 4.515 g/head/day for diet containing 800 ppm propionic. Feed consumption between 101-123 g/ head/day, feed conversion ratio ranged from 5.45 and 8.23. Lowest percentage of carcasses were shown by ration containing 800 ppm propionic and 400 ppm enzyme (45.26%) and highest of carcasses percentage was in diet containing 400 ppm propionic and 400 ppm enzyme (62.99 %). Dry matter digestibility 73.09%, crude fiber 37.83%, NDF 50.28% , ADF 49.84% and protein digestibility 82.77% .

Keywords: *Propionic, enzyme, rabbit*

Introduction

Performance improvement (increased body weight and decreased mortality) of weaned rabbit can be done through nutrition, reproduction and interactions with the disease, which include improving nutritional feeds, the use of probiotics, prebiotics, organic acids, antibiotics and herbal feed additives. On an industrial scale, rabbit feed is pelleted and composed of grains and alfalfa (Lebas et al 1997) but these are expensive. Local feedstuffs can be used as an alternate cheap feed to reduce production cost. For example Clover hay is the most common source of fiber used for rabbit diets in Egypt and used as much as 30 to 40% in the rations (Hassan *et al*, 2012). In Indonesia among these is the agricultural waste / by product feed and vegetables, such as rice bran, coconut meal, palm meal and others. Rice bran is available in considerable numbers and easy to obtain (Abbas, *et al* 2012) and has been widely used to feed rabbits. Rice bran commonly used in large quantities to feed the rabbit but containing high amount of crude protein and fiber and effected the nutrient digestibility. The addition of enzymes and organic acids in feed rabbits was predicted to increase the nutritional value and might improve rabbit performance. In this experiment levels of 0, 400 and 800 ppm of propionic acid and 0, 300 and 400 ppm enzyme were added for rabbit fed with 40% rice bran.

Methodology

Experiment was conducted using weaned rabbit with basal diet containing 40% of rice bran. Commercial enzyme was added in the levels of 300 and 400 ppm, and propionic acid in the levels of 400 and 800 ppm. Design experiment: factorial 3x3 (3 levels of enzymes and propionic). Treatments diagram as follow: Control (RT1), + 300 ppm enzyme (RT2), + 400 ppm enzyme (RT3), + 400 ppm propionate (RT4), + 400 ppm propionate and 300 ppm enzyme (RT5), + 400 ppm propionate dan 400 ppm enzyme (RT6), + 800 ppm propionate (RT7), + 800 ppm propionate and 300 ppm enzyme (RT8), + 800 ppm propionate and 400 ppm enzyme (RT9). Feeding trial used weaned rabbit with 5 replicates and 3 rabbits each replicate for 12 weeks. Feed consumption and body weight were observed. The last week of feeding trial, all rabbit was moved to metabolic cages for digestibility experiment with total collection of feed refusal and faecal. Proximate analysis was conducted to feed refusal and faecal samples. Internal organ was observed in the end of feeding trial by put a sleep of a rabbit in each replicates.

Results and Discussions

Nutrient content of the feed. Proximate analysis of feed used for feeding trials had been conducted. Crude protein content between 19.44 and 20.61%, energy between 4054 and 4365 kcal / kg and fiber were 9.44 and 16 %. Crude protein content of the rice bran is only 9.9%.

Feeding Trial. In the adaptation period body decreased was found in 67 rabbits which is equivalent to 1,426 kg of meat. While the average feed consumption was just 60 g / head / day.

Mortality at this time was 0 %. Mortality of rabbits during the experiment is 17.78 %. Highest mortality (33 %, from 15 rabbits treated) occurred at RT8 , then on RT1 and RT7 (26.67 %) . Rabbit body weight gain during the experiment was not much different between treatments rations. Similarly, the effect of adding enzyme and propionate statistically not significantly difference. The highest average daily gain ration was treatment 7 which was 14.42 ± 4.52 g / h / d (Figure 1).

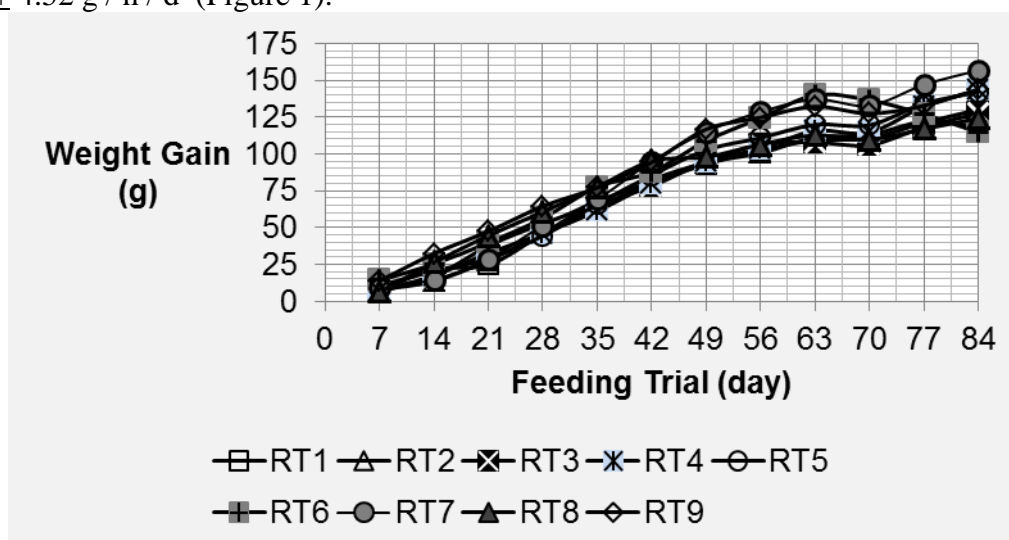


Figure 1. Daily gain (g/h) during feeding trial experiment

Feed consumption between 101-123 g / h / day , feed conversion ratio ranged from 5.45 (RT8) and 8.23 (RT3). Lowest percentage of carcasses were shown by ration containing 800 ppm propionic + 400 ppm enzyme (45.26 %) and highest of carcasses percentage 62.99 %.was in RT6.

Rice bran as a milling by-product contain moderate level of crude protein, and moderate high crude fibre and high metabolizable energy (Ambasankar and Chandrasekan, 2002). Crude fiber consists of cellulose, hemicelluloses and lignin (Yakubu et al., 2007) which are difficult to be digested by monogastric animals and lignin, which envelopes some nutrients, is highly resistant to chemical and enzymatic degradation and is poorly degraded by monogastric and also rumen microbes (Belewu and Babalola, 2009). These issue describing the result of the digestibility of feed nutrient in this experiment. The lowest value of dry matter, crude fiber and the NDF digestibility was found in the control diet, 65 % , 6 % and 32 , 17 % respectively. The highest value of dry matter digestibility, 73.09 % was found in treatment RT4 , and for crude fiber (37.83 %) was in the treatment RT9, the neutral detergent fiber (50.28 %) was the RT3, ADF digestibility (49.84 %) was in the treatment of RT4. While the highest protein digestibility (82.77 %) in RT4 and the lowest (67.73 %) is in control (Table 1).

Tabel 1. Dry matter, Protein, Fat, Energy, Crude Fiber, NDF and ADF digestibility

Treat-ments	DM			Protein			Fat			Energy			Crude Fiber			NDF			ADF		
RT1	64.92	+	2.96	67.73	+	2.72	84.96	+	1.27	99.67	+	0.03	6.34	+	7.89	12.36	+	6.33	12.36	+	7.39
RT2	69.11	+	3.11	81.17	+	1.90	84.98	+	1.51	99.71	+	0.03	33.26	+	6.73	43.94	+	5.65	28.93	+	7.16
RT3	69.23	+	4.30	81.79	+	2.54	82.72	+	2.41	99.69	+	0.04	21.87	+	10.91	50.28	+	6.94	33.56	+	9.28
RT4	73.09	+	4.09	82.77	+	2.62	87.83	+	1.85	99.75	+	0.04	37.74	+	9.46	49.60	+	7.66	49.84	+	7.63
RT5	69.87	+	4.30	80.37	+	2.80	87.23	+	1.82	99.71	+	0.04	32.89	+	9.59	39.43	+	8.65	23.19	+	10.97
RT6	71.10	+	3.88	80.55	+	2.61	86.61	+	1.80	99.72	+	0.04	35.03	+	8.72	44.74	+	7.42	28.95	+	9.54
RT7	68.07	+	5.93	79.23	+	3.86	87.22	+	2.37	99.71	+	0.05	34.30	+	12.20	32.72	+	12.50	20.51	+	14.76
RT8	67.56	+	4.16	79.97	+	2.57	87.44	+	1.61	99.70	+	0.05	29.30	+	9.06	35.51	+	8.27	32.46	+	8.66
RT9	70.32	+	4.84	81.45	+	1.92	88.05	+	1.95	99.72	+	0.05	37.83	+	10.13	41.39	+	9.55	29.31	+	11.52

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Enzyme Activities and Retention of Ca And P Of The Small Intestinal Digesta of Broilers Fed Papua Foxtail Millet Containing Feed

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Abstract

Evaluation of nutritional and anti-nutritive value of Papua foxtail millet (*Setaria italica* sp) in broiler feed showed that it can be used as an alternative to partially replace corn in the feed. It has, however, anti-nutritive compounds that need particular attention when it is used in large amounts. Biological test is performed to determine retention of calcium, phosphorus and activity of enzymes (protease, lipase, amylase) in the small intestinal digesta of male broilers fed Papua foxtail millet containing feed. Twenty four male broilers of 6 weeks old were randomly allotted to 4 treatments of T0 = basal feed (100%); T1 = 90% basal feed + 10% Papua foxtail millet; T2 = 80% basal feed + 20% Papua foxtail millet; T3 = 70% basal feed + 30% Papua foxtail millet. The results showed that the level of 30% Papua foxtail millet in the diet significantly ($P < 0.05$) increased the activity of amylase in the small intestinal digesta of broilers, but at that levels of Papua foxtail millet in the diet did not significantly ($P > 0.05$) affect the activity of protease and lipase as well as the retention of calcium, phosphorus of broiler feed.

Keywords: Papua foxtail millet, enzyme activity, calcium, phosphorus

Introduction

Papua Province is very rich plant species diversity as a source of carbohydrates such as sweet potatoes, taro, sago, yams, Papua foxtail millet or pokem and of course there are many more types of local plants that have not yet been identified. One of the plants of energy source that has long been cultivated as the local food of Papua people is Papua foxtail millet (*Setaria italica* sp), especially those people who live on the island of Biak Numfor, in District Numfor. The main purpose is to strengthen food security and if possible to be used as animal feed.

Corn is the most often used as energy source in poultry feed, but the availability of corn as a feedstuff often at certain moments is difficult to obtain. So, replacement of corn is necessary to maintain productivity of poultry. Results of a study conducted Tirajoh *et al* (2012) for 2 variety of Papua foxtail millet of yellow and red indicated that yellow variety tended to have higher calcium but in the form of phytate which function as antinutritional factor in the broiler feed. On the basis of protein content, Coulibaly and Chen (2011) reported that the total protein content of foxtail millet was 11.9%. On the basis of protein content Papua foxtail millet has higher protein than corn. Other research by Borojeni *et al* (2011) related to the value of protein digestibility, crude fiber, nitrogen retention and metabolizable energy of foxtail millet have been determined, however, the retention of calcium and phosphorus as well as the activity of the enzyme such as amylase, protease and lipase for

small intestine digesta in broilers is not known yet. Therefore, the objectives of this study were to determine as the retention of calcium and phosphorus of Papua foxtail millet as well as the activity of the enzyme amylase, protease and lipase in the small intestine digesta of broilers.

Methodology

Research was carried out in field Laboratory in experimentation belongs to Faculty of Animal Husbandry, University of Brawijaya, Malang. Analysis of the availability of calcium (Ca), phosphorus (P), feed ingredients, and excreta were conducted at the Laboratory of Department of Chemistry, Faculty of Mathematics, University of Brawijaya. Analysis of enzyme activity assay included amylase, protease and lipase, were conducted at the Laboratory of Biochemistry of the Faculty of Mathematics, University of Brawijaya Malang.

Basal diet in this study followed Tirajoh *et al* (2013). The basal feed was formulated to meet requirement of NRC table of standard (1994) as presented in Table 1.

Table 1. Composition and calculated nutritional contents of basal feed

Ingredient	Composition (%)	Nutrient	Content
Yellow corn	50.00	Metabolizable energy (Kcal/kg)	3032.30
Rice polishing	15.00	Crude protein (%)	19.84
Soybean meal	11.00	Crude fat (%)	6.04
MBM	5.00	Crude fibre (%)	4.91
Fish meal	8.00	Ca (%)	1.13
Coconut meal	8.00	P (%)	0.72
DL-Methionine	0.15	Na (%)	0.16
Coconut oil	2.00	Cl (%)	0.16
DCP	0.35	Lysine (%)	1.12
Salt	0.15	Methionine (%)	0.54
Premix	0.35	Tryptophane (%)	0.22
Total	100.00		

The materials were Papua foxtail millet (*Setaria italica* sp) obtained from farmers in Biak Numfor, Papua, 24 Cobb cockerels of 6 weeks old, metabolic cages equipped with waterer and feeder, and tray to collect excreta. Twenty four male broilers of 6 weeks old were randomly allotted to 4 treatments, namely P0 = basal feed (100%); P1 = 90% basal feed + 10% Foxtail millet; P2 = 80% basal feed + 20% Foxtail millet; P3 = 70% basal feed + 30% Foxtail millet. Each treatment used 6 chickens. Each chicken was kept in an individual metabolic cage. Collected excreta was dried in an oven for 24 hours at 60 °C. Analysis of crude protein, crude fibre and energy were followed a standard procedure of AOAC (1998), so did for analysis of calcium and phosphorus. Retention of calcium and phosphorus was determined by using the method of Sholeh *et al*, (2012).

Digesta collection for measurement of the activity of the enzyme (amylase, protease and lipase) was done by slaughtering the chicken, obtaining the small intestinal digesta. For analysis, \pm 1 g sample was weighed and added to ice cold physiological saline solution (PBS) of 8 ml, homogenized and left for 1 h at 4°C. After centrifugation at 3000 rpm for 10 minutes (using the centrifuge temperature of - 4°C), the supernatant was collected. The supernatant obtained was then underwent analysis for the enzymatic activity of amylase, protease, and lipase according to the procedure of Bergmeyer *et al.*, (1981).

Data were tabulated using Microsoft Excel program, processed and analyzed by analysis of variance based on Completely Randomized Design in 4 treatments and each treatment was repeated 6 times. If significant effect existed, then it is being tested by using Duncan Multiple Range Test (Steel and Torrie, 1993). Statistical data calculation was by using GENSTAT program 14th Edition.

Results and Discussion

The result indicated that the effect of various levels of Papua foxtail millet in feed toward enzyme activity (protease, lipase and amylase) of the small intestinal digesta of male broilers of 6 weeks old were presented in Table 1.

Table 1. Mean of the enzyme activity (protease, lipase and amylase) on intestinal digesta of male broilers

Treatments	Enzyme activity (unit/g)		
	Protease	Lipase	Amylase
T ₀	5.48 ± 1.76	168.41 ± 11.45	16.83 ± 1.18 ^a
T ₁	5.50 ± 1.34	167.21 ± 12.34	18.19 ± 0.93 ^b
T ₂	5.55 ± 1.51	164.25 ± 9.71	18.60 ± 1.03 ^b
T ₃	6.09 ± 0.94	159.38 ± 14.88	18.82 ± 1.22 ^b

Superscript (a-b) in the same column indicates significantly different (P<0.05)

Results of analysis of variance showed that the use of various levels of Papua foxtail millet in feed that does not give effect (P> 0.05) on the activity of the enzyme protease and lipase but it significantly improved (P<0.05) the amylase enzyme activity.

Increased Papua foxtail millet in feed might substantially increase the carbohydrate content of feed, so it is then logical that amylase enzyme activity significantly increases. Enzyme activity of protease Papua foxtail millet ranged from 5.48 – 6.09 unit/g, but statistical analysis showed no significant different. Similarly, enzyme activity of lipase was also not significantly different. Enzyme activity of lipase was between 159.38 – 168.41 unit/g. With a previously mention that the use of Papua foxtail millet might slightly increase protein and without changing in fat content might be the reason behind invention of no significant activities of protease and lipase in the current research.

Increased absorption of nutrients of Papua foxtail millet especially carbohydrates will result an increase in the amylase enzyme secretion. Mechanism of action of endogenous amylase enzymes found in the small intestine is able to degrade or breakdown starch contained in Papua foxtail millet into glucose that can be utilized by the body. Piliang and Djojosoebagio (2006) states that the amylase will outline the starch into maltose and maltose is converted into two molecules of glucose by maltase secreted in the succus entericus.

Retention of calcium and phosphorus determined by the use of male broilers of 6 weeks old fed Papua foxtail millet (*Setaria italica* sp) as substitute of corn is presented in Table 2.

Table 2. Mean of retention of calcium and phosphorus in 6 weeks old male broilers

Treatments	retention of calcium (%)	retention of phosphorus (%)
T ₀	58.55 ± 11.90	43.41 ± 4.55
T ₁	62.14 ± 4.98	46.00 ± 6.77
T ₂	65.88 ± 2.65	50.67 ± 5.87
T ₃	67.14 ± 4.46	52.34 ± 6.60

The retention of calcium ranged from 58.55 – 67.14%, while that of phosphorus the values ranged from 43.41 – 52.34%. However, the data of either calcium and phosphorus retention tended to increase as the level of Papua foxtail millet in the feed increase. Results of analysis of variance showed that the treatments did not give a significant difference effect (P>0.05) on the values of calcium and phosphorus retention.

Results of the proximate analysis of protein content of feed when Papua foxtail millet used at 30% also indicated to have higher crude protein content than other treatments. But, it is needed to be clarified whether higher protein content in feed relates to higher retention of calcium and phosphorus. This is due to the possibility that phosphorus in the Papua foxtail millet might also be bound by phytic acid, as common for cereals. Piliang (2007) stated that

protein has a role in the absorption of calcium, of which high protein content in the feed will correlate with an increase in the absorption of calcium. The balance of calcium and phosphorus in the feed is also important when the level of calcium is exceeded the balance it will reduce its absorption in the body.

Conclusion

The use of Papua foxtail millet could replace corn up to 30% in poultry diet, due to an increase in the activity of amylase in the small intestinal digesta of broilers, though it did not increase the activity of protease and lipase as well as the retention of calcium, phosphorus.

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Evaluation of Alabio Duck Diet (*Anas Platyrhynchos Borneo*) on the Chemical Composition of Egg Yolk at Farms in District Alabio South Kalimantan

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Abstract

The objective of the research was to evaluate the nutrition content of alabio duck diets are commonly used by farmer in five village district Alabio South Kalimantan on chemical composition of egg yolk (protein, fat and fatty acid). This experiment used survey method and observation with descriptive analysis. Twelve farmers respondents were used this study and 12 samples of diet, 120 samples of egg and 6 samples of egg yolks. This sample were observed nutrient composition of alabio duck diets, physical quality of eggs and chemical composition of egg yolks (protein, fat, fatty acid). The result showed that alabio duck diet at farm contained 10%-18% crude protein, 1.77%-11.5 % crude fat, 1.2 % - 8.19% crude fiber, 2.65%-9.55% calcium and 0.23%-0.69% phosphor. The physical quality of eggs showed that egg weight 54-68 g and egg yolk color score 5-14. The chemical composition of egg yolks showed that egg yolks contained 10.72% -16.67% crude protein, 24.94%-35.95% crude fat, average content of n-3 PUFA 2.374 %, n-6 PUFA 12.136 % and n-9 MUFA 35.458%. This resulted showed ratio of n6/n3 PUFA was 2.06-16.84 with average was 5.11

Keyword: *alabio duck, chemical composition of egg, fatty acid of egg yolk*

Introduction

Alabio duck is one of the local ducks potentially producing eggs in Indonesia. Alabio many kept in South Kalimantan, which has traditionally and intensive reared. Alabio duck fed diets varied that affect performance and quality of eggs produced. Currently the attention of a healthy diet for the body is very high, especially on the content of fatty acids and cholesterol. Fatty acid content of eggs is also influenced by many factors such as the addition of various sources of feed ingredients (Farhat et al, 1997), varied of oil (Schiavone et al, 2010; Cheng et al, 2006), and genetic (Woloyszyn et al, 2006; Speake et al, 2001). In addition, consumers also need to be more informed about the fatty acid content of egg yolk duck. Consumers expect eggs that contain n-3 PUFA are high and balanced with n-6 PUFA. Not enough data for the chemical composition of eggs alabio duck were maintained by farmers was the reason for this study was conducted.

Methodology

The study used survey methods for 12 farmers as respondent who have Alabio duck husbandry with the scale 22-650 laying duck in district Alabio South Kalimantan in 5 villages are Teluk Sinar village, Rantau Karau village, Hambuku Raya village, Hambuku Baru village, and Hambuku Pasar village. Data collected were analysed by description.

Twelve farmer respondents were interviewed using a questionnaire about the diet were given to alabio duck. Each farmer respondent was taken a diets samples and 10 eggs samples. The physical quality of eggs were measured used 120 eggs from 12 farmer respondent but 6 egg yolk samples from 6 farmer were analysed to chemical composition. Egg samples were weighed and then broken down for measured physical quality and chemical composition of egg. The variable of physical quality of egg i.e., egg weight, egg yolk weight, egg shell weight and yolk egg score color. The variables of chemical composition i.e., protein, fat and fatty acids of egg yolk.

Result and discussion

Alabio duck farmer respondent fed diet varied showed in table 1. The interview result from farmer respondent showed that the farmer respondent was given rice bran, rice grain, sago, salted fish, and golden snail were mixtured commercial diet with ratio varied. The diet were given 3 times were morning, at noon and afternoon.

Table 1. Diets composition of alabio duck

Villages	Feed ingredient used of the farmer respondent					
	Rice bran (%)	Rice grain (%)	Sago (%)	Salted fish (%)	Golden snail (%)	Commer cial diet (%)
Teluk Sinar 1	30.8	15.4	0	10.7	36.8	6.4
Teluk Sinar 2	23.73	13.56	16.95	13.56	11.30	20.34
Rantau Karau 1	23.3	23.3	23.3	0	7.0	23.3
Rantau Karau 2	29.63	36.30	0	4.44	29.63	0
Hambuku Raya 1	23.3	11.6	23.3	11.6	18.6	11.6
Hambuku Baru 1	76.3	0	0	12.2	7.6	3.8
Hambuku Baru 2	19.05	2.72	34.01	13.61	20.42	10.20
Hambuku Baru 3	19.67	8.20	16.39	22.95	16.39	16.39
Hambuku Baru 4	5	0	30	20	40	5
Hambuku Pasar 1	23.59	8.46	24.18	12.70	12.70	15.72
Hambuku Pasar 2	41.5	16	8	16	9.6	8
Hambuku Pasar 3	28.25	0	28.25	28.25	11.30	3.95
Average	28.68	11.30	17.03	13.83	18.45	10.39
Deviation standart	17.27	10.82	12.30	7.58	11.27	7.23

The dominant feed ingredients used as energy sources in the alabio duck diets by all farmer respondent consist of rice bran 23-76%, rice grain 11.6-23% and sago of 8-23.3 %, while golden salted fish and golden snail as protein resources were 10.7-16 % and 7-36.8 %. The commercial diet as main diet and mixture by some feed ingredient. The result of analysed from alabio duck diets showed the content of nutrition diet varied were 10%-18% crude protein, 1.77%-11.5% crude fat, 1.2% - 8.19% crude fiber, 2.67%-9.55% calcium and 0.23%-0.69% phosphor (table 2). Physical quality of egg not far difference between all farmer respondent (table 3).

Table 2. Nutrient content of alabio duck diets

Villages	Dry matter (%)	Crude Protein (%)	Crude fat (%)	Crude fiber (%)	Ash (%)	Ca (%)	P (%)	GE (Kal/kg)
Teluk Sinar 1	89.83	16.88	7.22	5.62	21.29	6.92	0.27	3283
Teluk Sinar 2	91.37	13.03	4.93	8.19	21.59	6.18	0.41	3626
Rantau Karau 1	91.02	12.77	9.29	4.17	23.46	5.89	0.23	3636
Rantau Karau 2	87.86	10.36	1.77	4.17	9.10	2.65	0.41	3671

Hambuku Raya	88.06	10.51	2.27	2.06	29.42	2.67	0.37	3058
Hambuku Baru 1	89.3	13.40	11.55	4.11	15.58	4.37	0.57	4142
Hambuku Baru 2	89.55	10.47	3.23	2.16	15.93	6.69	0.51	3018
Hambuku Baru 3	86.4	10.13	4.93	3.90	14.95	3.38	0.63	3179
Hambuku Baru 4	88.55	14.31	11.55	4.11	27.76	9.55	0.53	2679
Hambuku Pasar 1	86.73	18.77	5.53	1.2	13.02	3.33	0.69	3103
Hambuku Pasar 2	86.91	12.36	3.23	4.32	9.98	5.20	0.48	3400
Hambuku Pasar 3	88.36	15.12	6.20	6.66	10.15	2.75	0.34	3937
Average	88.66	13.18	5.98	4.22	17.69	4.97	0.45	3394.33
Deviation standart	1.61	2.74	3.35	1.95	6.92	2.16	0.14	421.28

Table 3. Physical quality of alabio duck egg

Villages	Egg weight (g)	Egg yolk (%)	Egg white (%)	Egg shell (5)	Egg yolk score color
Teluk Sinar 1	62.88 ± 3.53	34.86 ± 1.42	54.16 ± 1.34	10.98 ± 0.54	6 ± 0.47
Teluk Sinar 2	61.48 ± 3.03	33.08 ± 1.65	55.63 ± 2.02	11.29 ± 1.14	11 ± 2.36
Rantau Karau 1	63.47 ± 3.55	34.23 ± 3.37	55.99 ± 3.33	10.72 ± 0.80	14.70 ± 0.48
Rantau Karau 2	68.24 ± 3.7	35.31 ± 8.0	54.23 ± 8.06	10.46 ± 0.77	13.2 ± 1.14
Hambuku Raya	63.60 ± 4.53	36.26 ± 3.28	52.55 ± 3.46	11.19 ± 0.39	12.6 ± 0.52
Hambuku Baru 1	63.25 ± 3.33	34.05 ± 2.20	54.67 ± 2.45	11.28 ± 0.91	6.4 ± 0.52
Hambuku Baru 2	53.58 ± 4.63	38.18 ± 4.84	49.56 ± 4.64	12.26 ± 1.01	12.9 ± 1.66
Hambuku Baru 3	58.45 ± 5.56	33.63 ± 2.27	54.49 ± 2.76	11.83 ± 0.76	14.11 ± 0.78
Hambuku Baru 4	66.93 ± 3.00	35.20 ± 3.47	54.04 ± 3.23	10.76 ± 0.75	14.7 ± 0.68
Hambuku Pasar 1	62.32 ± 4.24	36.50 ± 2.55	52.15 ± 2.42	11.35 ± 0.65	13.5 ± 0.85
Hambuku Pasar 2	68.50 ± 3.32	33.67 ± 0.72	55.08 ± 1.11	11.25 ± 0.58	13.6 ± 0.7
Hambuku Pasar 3	65.96 ± 6.35	34.33 ± 2.08	54.67 ± 2.06	11.00 ± 0.41	5.4 ± 0.52
Average	63.22	34.94	53.94	11.20	11.51
Deviation standart	4.20	1.46	1.76	0.49	3.51

Composition of protein, fat and fatty acid of egg yolk showed in table 4, and 5. Feed ingredients were used the diets resulted varied chemical composition of egg yolks. The fatty acid content of egg yolk from all farmer respondent were 0.91-3.08% n3 PUFA, 6.35-18.07% n6 PUFA and 30.44-37.74% n9 MUFA. The Average of fatty acid egg yolk showed that 2.374%, n-3 PUFA, 12.136% n-6 PUFA and 35.458% n-9 MUFA. Kazmierska et al. (2005) reported that content of n6:n3 PUFA 12.8 in egg yolk duck. This resulted showed ratio of n6/n3 PUFA was 2.06-16.84 with average was 5.11 lower than resulted of Kazmierska (2005)

Table 4. Crude protein and crude fat of egg yolk alabio duck

Nutrient	Villages					Average
	Teluk Sinar	Rantau Karau	Hambuku Raya	Hambuku Baru	Hambuku Pasar	
Crude protein (%)	13.97	15.93	12.36	10.72	16.67	13.93
Crude fat (%)	35.95	24.93	34.05	28.11	27.37	30.08

Table 5. Fatty acid profile of egg yolk alabio duck

Fatty acid profile	Villages					Average
	Teluk Sinar	Rantau Karau	Hambuku Raya	Hambuku Baru	Hambuku Pasar	
	----- % -----					
Lauric acid	nd	0.02	nd	0.04	nd	0.03

C12:0						
Myristic acid C14:0	0.3	0.39	0.36	0.38	0.35	0,356
Pentadecanoic acid C15:0	0.07	0.06	0.1	0.12	0.09	0.088
Palmitic acid C16:0	19.64	20.25	16.93	20.96	18.97	19.28
Heptadecanoic acid C17:0	0.18	0.18	0.25	0.28	0.29	0.236
Stearic acid C18:0	5.59	5.46	3.76	4.94	6.21`	4.938
Arachidic acid C20:0	0.05	0.04	0.02	0.04	0.04	0.038
Heneicosanoic acid C21:0	0.02	nd	Nd	Nd	nd	0.02
Behenic acid C22:0	0.03	0.02	Nd	0.03	0.02	0.025
Tricosanoic acid C23:0	0.03	0.02	Nd	Nd	0.03	0.027
Lignoceric acid C24:0	0.06	0.04	0.04	0.05	0.03	0.044
Total of SPA	25.97	26.48	21.46	26.84	19.82	24.73
Myristoleic acid C14:1	Nd	0.04	0.05	nd	0.03	0.04
Palmitoleic acid C16:1	0.89	1.67	1.79	1.17	1.13	1.33
Cis-10-heptadecanoic acid C17:1	0.12	0.14	0.24	0.17	0.18	0.17
Elaidic acid C18:1n9t	0.13	0.16	0.22	0.15	0.21	0.174
Oleic acid C18:1n9c	35.63	35.61	30.22	37.43	37.53	35.284
Cis-11-eicosenoic acid C20:1	0.24	0.19	0.14	0.19	0.21	0.194
Nervonic acid C24:1	Nd	0.02	0.03	0.02	0.03	0.025
Total of MUFA	37.01	37.83	32.69	39.13	39.32	37.22
Linoleic acid C18:2n6c	10.43	5.54	3.91	14.2	6.95	8.206
γ -linolenic acid C18:3n6	0.27	0.16	0.06	0.26	0.23	0.196
Arachidonic acid C20:4n6	4.15	3.09	2.24	3.37	4.2	3.41
Cis-8,11,14-eicosatrienoic acid C20:3n6	0.47	0.3	0.14	0.24	0.47	0.324
Linolenic acid C18:3n3	0.27	0.24	0.22	0.47	0.23	0.286
Cis-11,14-eicosadienoic acid C20:2	0.32	0.19	0.17	0.27	0.24	0.238

Cis-5,8,11,14,17 eicosapentaenoic Acid C20:5n3 (EPA)	0.03	0.14	0.17	0.03	0.15	0.104
Cis-4,7,10,13,16,19-docosahexaenoic acid C22:6n3 (DHA)	0.61	2.2	2.69	2.07	2.35	1.984
Total of PUFA	16.55	11.86	9.6	20.91	14.82	14.75
Total fatty acid	79.5	86.17	63.74	86.88	80.16	77.29

Conclusion

Egg yolk alabio duck in district Alabio South Kalimantan had content of 10.72% - 16.67% crude protein and 24.94%-35.95% crude fat. The fatty acid profile of alabio duck content of 2.374 % average n-3 PUFA, 12.136% average n-6 PUFA, 35.458% average n-9 PUFA, 0.104 % EPA and DHA 1.984 %. The ratio n6/n3 PUFA in egg yolk alabio duck was 5.11

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Enrichment of Feedstuff with Fermented Soybean Peel to Increase Rabbit Body Weight

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Abstract

This study aimed at finding out the best feed supplement formula to increase Rabbit Body Weight. A randomized block design with one factor namely the percentage of fermented peel added (0%; 5%; 10% and 15% w/w) on to the plan feedstuff and replicated six times was carry out to run this study. The addition of 10% (w/w) of fermented soybean peel providing the highest dry feed material consumption (41.86 g/head/ day), but the increase of body weight was only (16.83 g/head/day) which is lower than that of the addition of 15% fermented peel (17.45 g/head/day). A significant difference among treatment font on the feed conversion. The lowest feed conversion was obtained in treatment of 15% fermented feel (2.36 g/head/day). After 24 hours of fermentation the slurry become very moist due to the absorption of water from the environmental. To extend the storage stability of the fermented feel the addition of 5% maltodextrin and 0.5% tween 80 shown the best result of granulated fermented feel which is stable at room temperature (25°C) and could with stand until 1 month of storage. The moisture content of granulated feed supplement is about 11.2%. The proximate analysis of granulated flour shown that after being resolution contain the isoflavone of the granulated animal feed supplement is 10,100 ppm.

Introduction

Fermented soybean (tempeh) is one of the most important vegetable protein source which has gained consumen acceptance by most of Indonesian people. Prior to processing the bean was cooked and steamed and the peel of the bean is removed. Kumalaningsih and Surya (2012) and Ardhiansyah *et al.* (2014) stated that about 50.92 – 67.898 kg per year of solid waste year is discarded and sold as animal feed of low prices. Furthermore Nasahi (2010) reported that solid waste contain high valuable bioactive compound as glycoside and should be degraded into three biotic namely dietary fibre, microbes and also isoflavone through fermentation process.

The nutritional benefit of solid waste (peel) should be therefore being socialized to the farmers to enrich the ordinary feedstuff to increase the quality of animal feed. However the preparation practices standing from the show chart, and formulation as well as the storage stability of the healthy feed supplement which could carried out by the farmers should be clearly explained.

de Blas and Wiseman (2010) stated that rabbit is one of the most potential animal having a distinct digestive system which could metabolism dietary fibre and converted to volatile fatty acid which is main factor as source of energy to support the growth of the animal. Socialization of this method to the farmers is urgently required. However the low level of handling and technology of the farmers at rural region become the main hindrance the extension service for making feed supplement.

Under such circumstances, second stages should be therefore being carried out for the product of feed supplement which is easy to perform and mainly at the rural region. The use

of soybean waste (peel) as raw material for making probiotic feed supplement containing microbes is expected to provide beneficial effect.

Effective microbe (EM4) has been commercialized and most of farmers known the use of this organism for the degradation of solid or liquid waste (Saleh, 2008). The inoculation of EM4 on to the solid soybean or peel waste is expected could hydrolyzed the glycoside found in the peel to be several biotic.

However the main important factor is how to stabilize the storage stability of this fermented peel. Previous study carry out by Zulfikar (2015) stated that the use 5% dextrin and 0.5% tween 80 could protect the biotic during storage. The objective of this study is to find out the best processing method for making granulated fermented peel containing bioactive.

The enrichment of the ordinary feedstuff with the granulated fermented soybean waste is thought beneficial not only reducing the environmental problem but also increasing body weight of the animal.

Methodology

Material

Soybean peel was purchased from the small scale traditional fermented soybean (tempeh) located at Malang region, East Java Province, Indonesia. Feedstuff was prepared in the following composition: yellow corn, cake of coconut extraction, rice bran, fish protein concentrate, salt and mineral. The standard feed (BRI) is a from tofu waste

Processing of fermented solid waste for Rabbit feed.

1. The solid waste or peel of soybean was weighed 100 g and process blended and pressed again until the moisture content reached 40%, the pasteurized for 15 minutes.
2. Commercial effective microbe (EM4) was prepared by diluted 10 ml of concentrated liquid EM4 on to 900 ml aquades and added with 2 g of sucrose than incubated at 24 hours to experiment. Solid waste (peel) 100 g of was grinded and pressed to reached a moisture content of 40% (w/w) then pasteurized for 15 minutes, cooled and inoculated with prepared culture of EM4 (1%) then added with 2.5% skin milk, and 2 g of sucrose. Prepared cultures of EM4 (1%) was the inoculated on to the solid soybean waste incubated for 24 hours, and used to enrich the feedstuff based on the treatment.

Feeding Trial

The Rabbit New Zealand variety with weight variete from 200-900 g were used for the feeding trial the selected Rabbit were divided into three groups. Including to the body weight, i.s small, medium, and large size.

Group I consisting of small Rabbit

Group II consisting of medium Rabbit

Goup III consisting of large Rabbit

All the cages were given the code of treatment the feed will be given twice per day based on the body weight. All the Rabbit received dry feedstuff 6% based on the body weight. Observation concerning the feed consumption was carried out everyday.

Statistical Analysis

A randomized block design with one factor (0; 5; 10; and 15%) of fermented feed and replicated 6 (six times).

Chemical Analysis

The chemical composition analysis was determined by AOAC series methode (Horwits *et al.*, 2010). Mineral content (AOAC, 2005), dietary fibre (AOAC, 2005), isoflavone (Zhang and Swartz, 2005), protein (AOAC, 2005)

The New Zealand white rabbit age of one month were used and grouped into 4 groups containing one rabbit. Placed in battery cages or individual pan. Each pan containing one rapid replicated 6 (six) to that is 24 pans.

Result and Discussions

Experiment 1. Effect of enrichment of fermented peels as the Rabbit productivity

1. Dry feed material consumption

Statistical analysis showed that a significant difference between treatment of control and the addition of fermented peel. The results were depicted in Table 5.1 below.

Table 1. Dry feed material consumption

Treatment	Dry Material Comsumption (g/head/day)	Notation
P0 (Control)	39.28	a
P1 (+5% fermentated peel)	40.70	b
P2(+10% fermentated peel)	41.86	b
P3(+15% fermentated peel)	41.23	b

The enrichment of feedstuff with fermented peel from 5% to 15% showed no significant different on the dry material consumption. However the addition of fermented peel by 10% showed the highest feed consumption (41.86 g/head/day). Apparently the presence of fermented peel containing isoflavone has a significant effect on the palatability of feed as reported by (Kumalaningsih and Surya, 2012).

2. The Increase Body Weight

The enrichment of fermented peel also increase the rabbit body weight as shown in Table 2 below

Table 2. The increase body weight

Treatment	The Increase Body Weight (g/head/day)	Notation
P0 (Control)	14.35	a
P1 (+5% fermentated peel)	15.67	b
P2(+10% fermentated peel)	16.83	c
P3(+15% fermentated peel)	17.45	d

The higher increase weight is obtained in treatment of P3 or the addition of 15% fermented peel (17.45 g/head/day). Apparently the more fermented peel added the more increase the body weight. According to Kumalaningsih and Surya (2012) the mixture of the feed supplement not only increase the presence of isoflavone but also enhancement the palatability of feed, consequently this condition improve the feed intake and could increase the body weight.

3. Feed Conversion

The feed conversion is given in Table 3 below.

Table 3. Feed Conversion Ratio (FCR)

Treatment	Feed Conversion Ratio (FCR)	Notation
P0 (Control)	2.74	bc
P1 (+5% fermentated peel)	2.60	b
P2(+10% fermentated peel)	2.49	ab
P3(+15% fermentated peel)	2.36	a

The feed conversion ratio (FCR) is calculated as the following.

$$\text{FCR} = \frac{\text{Feed Intake}}{\text{Average Daily Gain}}$$

Analysis statistic showed that the more concentration of feed supplement the more decrease the feed conversion. The addition up to 15% of feed supplement the feed conversion is 2.36. This is due to the body weight also increase.

Characteristic of the feed supplement

The characteristic of the feed supplement after fermentation is depicted in this Table 4 below

Table 4. Chemical Characteristic of Feed Supplement

Composition	Before Fermentation	After Fermentation
Crude Protein (%)	17.29	23.92
Crude Fat (%)	6.61	9.78
Ash (%)	3.94	4.05
Fiber (%)	40.18	29.36
M. Content (%)	10.03	15.48
Isoflavone (ppm)	5213.44	7121.42

From the Table above it could be seen that the crude protein content before fermentation was 17.29% (w/w) and after 24 hours increase up to 23.92%. Apparently this is due to the fact that EM4 consisting mixture of microbes that although only being fermented for 24 hours the protein content has increased by 23.92 – 17.29%. It is surprising that the crude fiber decreased from 40.18% to 29.36% due to the decomposition of crude fibre by mold or bacteria. This evidence indicated that the cell wall which contain lignin, cellulose and hemicellulose has been converted to be soluble crude fibre.

The presence of low molecule weight of cellulose is very important for the feedstuff, to improve the digestion system, and also increased the availability of dietary fiber which is shortage during the dry season.

Characteristics of blend feed supplement

Table 5. Chemical composition of fermented soybean peel

Hours	Ingredients					
	Protein	Fat	Ash	Moisture	Fibre	Isoflavone
24	23.90	9.79	4.10	15.48	29.48	7121.42
36	25.17	10.38	5.32	15.89	28.31	7011.30
48	26.98	11.03	6.21	16.17	28.01	6987.41

Experiment 2. Effect of filler and emulsifier on the chemical composition and storage stability on granulated flour.

Storage stability of granulated Feed Supplement

Table 6. The Moisture content of fermented and granulated feed supplement show

Hours	Fermented (%)	Granulated (%)
24	30.6	11.2
36	31.3	11
48	37.8	10.5

The moisture content increased substantially during storage after 48 hours the peel very moist and the moisture content is about 37.8% . The granulated flour has the moisture content in the range 10.5 – 11.2% and not increase during storage at room temperature (27°C). This avoidance indicated that the method for the granulated flour production has been

established. According to Narsih (2013), the use of maltodextrin and tween 80 shown a promising result. Kumalaningsih *et al* (2011), reported that maltodextrin has very soft and gentle carbohydrate and could be absorbed by the organism during storage. The proximate composition of granulated flour is showed in the Table 7. The isoflavone of the granulated flour is above 10,100 ppm. Hernawati (2010) stated that the existent of isoflavone in the animal feed is important to support the growth and increase the rabbit body weight.

Table 7. Chemical Composition of Granulated Flour

Composition	Before Fermentation (%)	After Fermentation (24 hours) (%)
Crude Protein	14,92	16,26
Crude Fat	7,89	12,51
Ash	11,76	4,77
Fiber	20,83	37,89
M. Content	13,44	6,55
Isoflavone	0.000127	0.0078

Conclusion and recommendation

1. Enrichment of plain feed supplement with fermented peel improve the body weight of rabbit.
2. The use of 5% maltodextrin and 0.5% tween 80 could stabilize the granulated flour during storage.

Recommendation

The feeding trial with granulated flour should be further investigated to confirm the prospect of the granulated flour as feed supplement to substitute the existing imported feed supplement used.

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Correlation of NDF (Neutral Detergent Fiber) with *In Vitro* Gas Production on Various legumes

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Abstract

The objective of research was to determine the correlation of *Neutral Detergent Fiber* (NDF) with *In Vitro* Gas Production on various legumes. The following experiment was to measure the gas production and NDF degradation of *Calliandra calothyrsus*, *Gliricidia maculata*, *Leucaena leucocephala*. The method was used NDF analysis to measure of NDF degradation and in vitro gas production analysis with incubation 4, 8, 12, 24, 48, 72 and 96 hours. The regression model of NDF with *In Vitro* Gas Production used $Y = a + bX$. Regression between NDF degraded with gas production on *Calliandra calothyrsus*, *Gliricidia maculata*, *Leucaena leucocephala* are : $Y = 3.4757 + 1138.2X$; $Y = 1.3487 + 1132.1X$; $Y = -4.895 + 1301.2 X$ and correlation coefficient are $r = 0.98$; $r = 0.96$ and $r = 0.95$ respectively. Those patterns showing significant correlation between NDF degradation of legumes and gas production.

Keywords: NDF, in vitro gas production, legume.

Introduction

Forage nutritional value is different depending on the type and species of plants. Differences in nutrient content will affect the quality of forage, it will have an impact on different responses to the degradation characteristics of forages. Forage is composed of cell walls and cell nuclei are bound by cellulose lignin and hemi cellulose. Degradation ability and adaptability of rumen microbes depends on the availability of the nutritional value of feed ingredients, this will affect the level of digestibility and degradation characteristics of Neutral Detergent Fiber (NDF) forage.

Measurement of gas production *in vitro* is a method that can be done to predict the value of digestibility of feedstuffs in the rumen by way of incubating the sample in rumen fluid and anaerobic buffer medium at a temperature of 39° C with a variation of the incubation period (Makkar et al., 1995).

NDF levels decrease due to increased lignin in plants resulting in reduced hemi cellulose. Hemi cellulose and cellulose is a component of the cell wall that can be digested by microbes. High levels of lignin causing microbes are not able to perfectly digest the hemicellulose and cellulose. (Crampton and Haris 1969).

The purpose of the study was to determine the relationship between the content of NDF degraded by the gas production.

Methodology

Legume forage materials used are: *Calliandra calothyrsus*, *Gliricidia maculata* and *Leucaenaleucocephala*. Fistulated PFH cow with weight about 380 kg. All forage legume measured gas production using rumen fluid as inoculum source by following the method of

Makkar et al. (1995). The gas volume is recorded after incubation of 4, 8, 12, 24, 48, 72 and 96 hours. Buffer solution (per 1 liter) consists of: NaHCO₃ 35 gram + NH₄HCO₃ 4 grams, dissolved in 1 liter of distilled water. Macro-mineral solution (each 1 liter) comprises: Na₂HPO₄ KH₂HPO₄ 5.7 gram + 6.2 gram + 0.6 gram of MgSO₄ 7 H₂O + NaCl 2.22 grams dissolved in 1 liter of distilled water. Micro-mineral solution (per 100 ml) consisting of: CaCl₂ 2 H₂O 13.2 grams + 10 grams MnCl₂ 4 H₂O + H₂O CoCl₂ 6 1 gram + FeCl₃ 6 H₂O 0.8 grams, was dissolved in 100 ml distilled water until its volume. Resazurin solution: 0.1 grams resazurin diluted with distilled water until the volume are 100 ml. Reducing agents solvent (made just before taking rumen fluid) consisting of 0.58 g Na₂S 9H₂O + 3.7 ml of 1 M NaOH. A buffer solution comprising a mixture of: 1095 ml of distilled water, buffer 730 ml, 365 ml of macro minerals, trace minerals 0.23 ml, resazurin 1 ml, reductor 60 ml. NDS solution (Neutral Detergent Solution) (Goering and Van Soest, 1970): Dodecyl lauryl sulfate (C₁₂H₂₅NaO₄S) 30 grams, EDTA (Ethylene diamine Tetra Acetic) (C₁₀H₁₄N₂Na₂O₈) 18.61 grams, 4.56 grams Na₂HPO₄.12 H₂O, Na₂B₄O₇ 6.81 grams, Ethoxy ethanol 10 ml, 5 grams Na₂SO₃. NDF degradation was measured in incubation 4, 8, 12, 24, 48, 72 and 96 hours. Methods of statistical analysis using the equation: Y = a + b X, which Y is the production of gas and X is the degradation of NDF. Estimates of the constants a and b using SPSS Ver. 16.

Results and Discussion

There were various nutritional content of the legume tree, it is influenced by diverse plant species, age of cutting, environment, and climate (Table 1).

Table 1. Nutritive value of legumes

Legume	DM	OM*	CP*
<i>Calliandra calothyrsus</i>	24.75	90.59	26.25
<i>Gliricidia maculata</i>	24.51	91.35	23.47
<i>Leucaena leucocephala</i>	23.45	92.39	30.38

Note : *% DM

In Figure 1. It is seen that there is a relationship between the time of incubation with gas production. The pattern of the lowest gas production is *Leucaena leucocephala*, then *Calliandra calothyrsus* and the highest is *Gliricidia maculata*, with a correlation coefficient $r = 0.973$, $r = 0.983$ and $r = 0.986$. In Figure 2 is seen that there is a relationship between the incubation time with the degradation of NDF. The lowest NDF degradation patterns are *Leucaena leucocephala*, then *Calliandra calothyrsus* and the highest is *Gliricidia maculata*, with each a correlation coefficient in order are $r = 0.965$, $r = 0.963$ and $r = 0.942$.

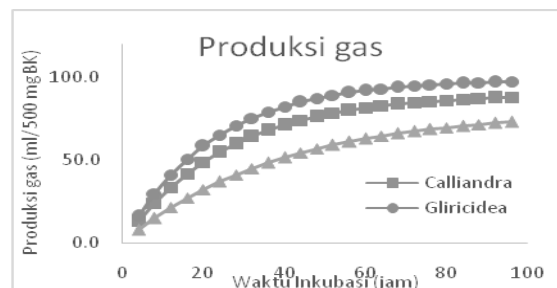


Figure 1. Relationship between the incubation time and gas production for 3 types of legumes.

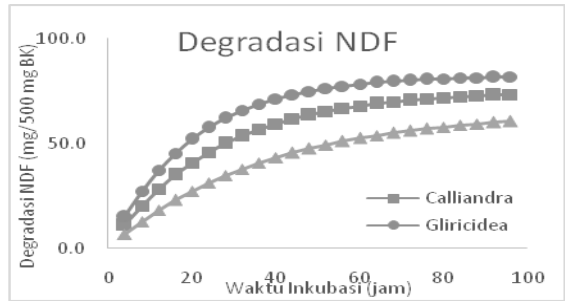


Figure 2. Relationship between the incubation time and NDF degradation in 3 types legumes

The pattern of the lowest gas production in *Leucaena leucocephala* (Figure 1) this is because there are tannins in the forage that would inhibit the degradation that causes low gas production. The lowest NDF degradation patterns on *Leucaena leucocephala* (Figure 2) this because lignin contained in the forage that would inhibit the degradation of NDF. NDF levels decrease due to increased lignin on forage which resulted in decreasing hemi cellulose. Hemi cellulose and cellulose were component of the cell wall that can be digested by microbes. High levels of lignin causing microbes are not able to perfectly digest the hemicellulose and cellulose (Crampton and Haris, 1969).

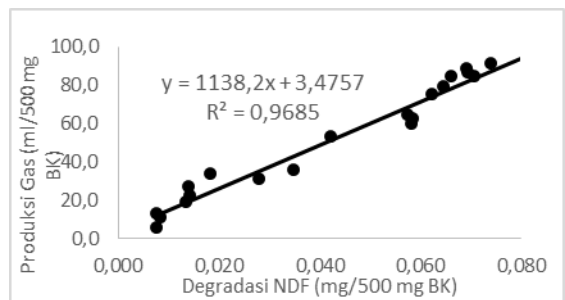


Figure 3. The relationship between the NDF degradation with gas production *Calliandra calothyrsus*

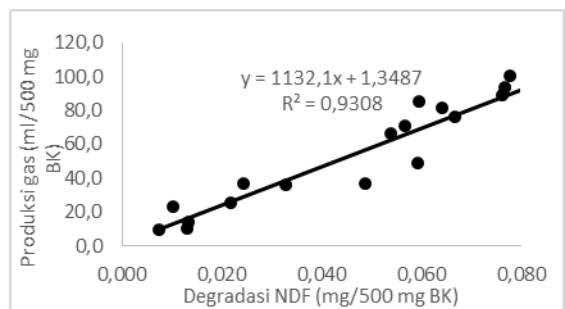


Figure 4. Relationship between NDF degradation with gas production *Gliricidia maculata*

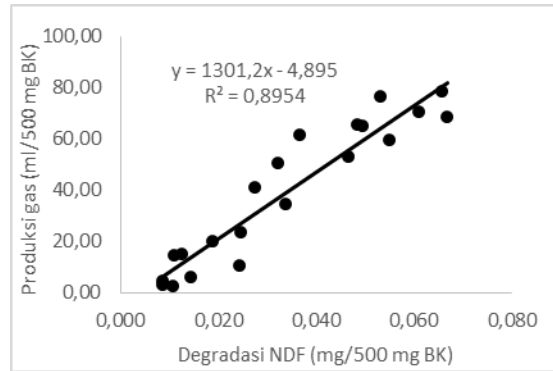


Figure 5. The relationship between NDF degradation with gas production *Leucaena leucocephala*

In Figure 3, 4 and 5 it appears there is a positive relationship between NDF degradation with gas production in *Calliandra calothyrsus*, *Gliricidia maculata* and *Leucaena leucocephala* with a correlation coefficient $r = 0.98$, $r = 0.96$ and $r = 0.95$.

Doane et al. (1997) suggest that the correlation between NDF degradation with gas production in alfalfa obtained $r = 0.96$. According to Calabro et al. (2001) states that there is a correlation between gas production with the degradation NDF of forage which average determination coefficient $R^2 = 0.97$.

Conclusion

It can be concluded that there is a relationship between the time of incubation with gas production and degradation of NDF, also there is a very close correlation between NDF degradation with gas production in *Calliandra calothyrsus*, *Gliricidia maculata* and *Leucaena leucocephala*.

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Effectiveness of Feeding Fermented Noni Leaf Meal on Body Resistance, Protein Utilization Efficiency and Performance of Crossbred Kampong Chickens

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Abstract

The purpose of the present study was to examine the effect of feeding fermented noni leaf powder (*Morinda citrifolia*) on the body resistance, nitrogen retention, protein utilization efficiency, and performance of crossbred kampong chicken. Experimental animals were 150 birds of kampong crossing chickens of 21 days old with average initial body weight was 219.353 ± 16 g. Feed ingredients consisting of corn, soybean meal, meat bone meal (MBM), rice bran, fish meal, fermented noni leaf meal (FNLM) and mineral mix. Ration was formulated containing 19% protein and ME 2900 kkal/kg for starter, and 17% protein and ME 2800 kkal/kg for finisher period. A completely randomized design (CRD) with 5 treatments and 5 replications (6 birds each) was assigned in the present study. The treatments applied were dietary inclusion level of FNLM as follows: T0 = none, T1 = 3%, T2 = 6%, T3 = 9% and T4 = 12%. Parameters measured were percentage weight of lymphoid organs (spleen and bursa fabrisius), heterophile lymphocyte ratio (H-L ratio), nitrogen retention, protein utilization efficiency, and performance. The results showed that feeding FNLM significantly ($P < 0.05$) increased bursa fabrisius weight, but decreased body weight when fed FNLM at 12%. However, there were no significant ($P > 0.05$) effect on spleen weight, H-L ratio, nitrogen retention and protein digestibility. Conclusion of this study is that dietary inclusion of FNLM up to 9% can be fed for crossbred kampong chickens without any detrimental effects.

Keywords: *fermented noni leaf meal, fabrisius and spleen weights, H-L ratio, performance, crossbred kampong chicken*

Introduction

Crossbred kampong chickens are the filial of cross-mating between pure male kampong chicken and female modern laying chickens. Offsprings obtained from such mating are reared and grown to be the commercial purposes for meat production only, but not for breeder hens or cocks. The way of improving the productivity of kampong chicken by cross breeding system due to the low productivity and slow growth (Rahayu *et al.*, 2010). Growth rate of crossbred kampong chickens in average is relatively higher than that of their uncestor. Products of kampong chicken as well as its filial is still becoming the interesting preference for the Indonesian community (Pramono, 2006). In the recent year, the product of crossbred kampong chicken was in demand due to their softness meat with lower price as compared to that of pure kampong chicken. Faster growth of the birds could be maintained by providing high quality feed with appropriate component of protein sources. However, as a consequence that the higher quality of the feed, the more expensive price of the feed.

Therefore, it is important to find an alternative protein source with low price and non-competitive ingredient to human need. Noni or morinda leaf is one possible unconventional feedstuff that can be applied for poultry feed component due to its high nutritional contents such as protein (21.1%) , Ca (10.3%), β -caroten (161 ppm), and vitamin C (406 ppm).In addition, the superiority of morinda leaf is known to contain restorative power of antimicrobe and antioxidant. However, in contradictory to its high nutritional contents, morinda leaf contain high fiber and antinutritive compounds such as tannin and saponin which are being the handicape for nutrients utilization. Thus, it would be better to provide special treatment through fermentation to reduce fiber and also antinutritive compounds prior to feeding the animal. The present study was focused on the feeding effect of fermented morinda leaf meal on body resistance and performance of crossbred kampong chickens.

Methodology

Experimental animals were 150 birds of 21-day crossbred kampong chicken with an initial body weight was 219 ± 9.09 g (CV was 4.15%), which were purchased from the breeder of Yogy Farm, Yogyakarta when they were day old chick. Feed was composed of yellow corn, rice bran, fish meal, soybean meal, meat bone meal, mineral mix, and fermented noni leaf meal (FNLM). The ingredients were formulated containing 19% protein and 2,900 kkal/kg metabolisable energy for starter, 17% protein and 2,900 kkal/kg metabolisable energy for finisher period. The experiment was conducted using a completely randomized design with 5 treatments and 5 replications (6 birds each). Dietary treatments were the inclusion level of FNLM, namely T0 (none as control), T1 (3%), T2 (6%), T3 (9%), and T4 (12%). Experimental parameters were percentage weight of bursa fabricius and spleen, ratio heterophil-lympocyt, protein digestibility, N retention, and body weight gain. Data were analyzed using analisis of variance and Duncan test at 5% probability.

Results and Discussion

Relative weight of bursa fabricius significantly ($P < 0.05$) due to feeding FNLM at higher levels, especially T3 and T4 (Table 1). Natural substances as flavonoid and polifenol are the chemical components of FNLM that can be assumed to have function to prevent limphoid organ from natural immunosupression. Previous study (Purba, 2007) indicated that noni leaf contained some functional chemical compounds, namely saponin, flavonoid, polifenol and tannin. Tannin in high dose, of course, act as an anti-nutritional factor, but at lower level it function as prebiotic. Prebiotic serve as a “nutrient” for intestinal beneficial bacteria such as *Lactobacillus acidophilus* and *Bifidobacterium*, and the growth of phatogenic bacteria such as *E. coli* and *Salmonella* sp. retarded due to the acidic intestinal condition produced by *Lactobacicillus* bacteria. This mechanism improved intestinal ecology and supported by the presence of plant fiber of noni which stimulated intestinal peristaltic, thus increased nutients supply and bettergrowth of bursa fabricius.

However, feeding FNLM until 9% (T4) didn't affect spleen and H/L ratio (Table 1). This can be assumed that saponin and tannin contents of FNLM didn't cause any toxic state so that spleen activity was not affected. The present results suggested that feeding FNLM at 9% had no negative effect on body resistance although that at 12% was also indicated the same effect. The stabil body resistance indicated by normal spleen weight was supported by lower level of H/L ratio (Table 1). Tannin consumption due to dietary inclusion of FNLM was at lower maximum level, so that its effect was not detrimental as described by Kumar (2005). Ratio of H/L found in the present study tended to be higher than that reported by Tamzil *et al.* (2013) in pure kampong chicken, namely ranged between 0.16 to 0.21. In addition, nitrogen retention and protein digestibility in some case in general was usually consistent with body weight gain as reported by Cholis (2014) that protein supply and amino

acids availability are the substrate for protein deposition supporting growth of birds feeding inulin derived from dahlia tuber. However, the results of this study showed that body weight gain in T4 (12% FNLM) decreased although both N retention and protein digestibility were unchanged. It can be stated that the most important anti-nutritional factor of FNLM, such as tannin and saponin, was not exert their direct detrimental effects on growth because the amount consumed was predicted at low level. The previous researchers (Noor, 1997; Kumar, 2005) described that tolerance limitation of poultry on saponin and tannin was 3.7 and 2.6 g/kg, respectively.

Table 1. Body resistance, protein utilization and body weight gain of crossbred kampong chickens fed fermented noni leaf meal

Parameter	Treatment				
	T0	T1	T2	T3	T4
Bursa fabricius (%)	0,07 ^c	0,08 ^{bc}	0,09 ^{ab}	0,11 ^a	0,11 ^a
Spleen (%)	0,51	0,50	0,48	0,48	0,51
H/L ratio	0,80	0,77	1,04	0,95	0,76
N retention (g/bird/d)	1,09	1,22	1,16	1,05	1,23
Protein digestibility (%)	78,74	78,83	79,45	74,65	78,43
Body weight gain (g)	514,16 ^a	503,83 ^a	472,79 ^{ab}	481,65 ^{ab}	419,95 ^b

^{a-c}Values within the same row followed by different supercript indicate significantly different (P<0.05)

Conclusion

Feeding FNLM at the level of 9% is able to increase bursa fabricius weight and maintain spleen weight, H/L ratio, N retention, protein digestibility, and body weight gain, but when dietary level of FNLM is increased up to 12% decreases body weight gain.

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**Oral Presentation 3 Focus Session:
Genetic Breeding and Conservation**

Friday, 21 October 08:00-09:40

Room: Semeru

Measurement of Reactive Oxygen Species (ROS) in High and Low Residual Feed Intake Cattle

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Abstract

Residual feed intake (RFI) is a measure of net feed efficiency, an economically important trait in livestock. The RFI of an animal depends on the ability of the animal to consume less feed than expected based on their weight gain and weight maintained during the feed testing period. Animals that eat less than expected are said to have a negative RFI and are deemed more efficient. Recent work has implicated mitochondrial function as being involved in the feed efficiency of livestock including cattle, sheep, pigs and poultry. The objective of this study was to examine the reactive oxygen species (ROS) in the mitochondria of high and low residual feed intake animals. Liver samples were used to measure the ROS activity using the protein carbonyl assay. The results indicated the ROS concentration was significantly different between the high and low residual feed intake groups.

Keywords: *residual feed intake, mitochondrial function, cattle, reactive oxygen species*

Introduction

Mitochondria are the sites of energy production in the form of cellular ATP (Kolath *et al.*, 2006). Known for its unique double membrane structure, the inner mitochondrial membrane is the site of the electron transport chain in which a series of electrons are transferred between protein complexes in order to produce ATP.

In the event that the rate of electron entry into the respiratory chain and the rate of electron transfer through the chain are mismatched, the production of superoxides increases at Complex I and Complex III (Nelson and Cox, 2008). Superoxide ion (O₂⁻), hydrogen peroxide (H₂O₂), and hydroxide radical (OH⁻) are the most common forms of these reactive oxygen species (ROS) (Seifried *et al.*, 2006). ROS can cause oxidative damage to all types of molecules and hence, organelles, but the damage is normally prevented by the superoxide dismutase and catalase enzymes that metabolize the ROS (Nelson and Cox, 2008). Although ROS are natural by-products of various normal mitochondrial and cellular activities, an excessive amount of these compounds can damage the mitochondria in a range of pathologies involving cellular proteins and lipids (Seifried *et al.*, 2006; Murphy, 2009). This damage results in less efficient mitochondria. Thus, calculating the level of ROS in the cell is an indicator of the efficiency of the electron transport in the mitochondria.

Studies have been conducted in high and low residual feed intake broilers and a link between chicken breast muscles mitochondria function with residual feed intake was indicated (Bottje *et al.*, 2002). It was found that the mitochondria from the low RFI broilers had less electron leakage in the mitochondria compared to the high RFI broilers. The authors

suggested that this leads to improved respiratory coupling in the low RFI broilers, increasing their efficiency. In addition, mitochondria from the low RFI broilers had a lower level of reactive oxygen species (ROS) as measured by the amount of protein carbonyl (Bottje *et al.*, 2004). The authors postulated that the higher level of ROS in the high RFI broilers causes mitochondrial damage and reduces the activity of the Complex I-IV enzymes

A relationship between mitochondria function and feed intake has been also observed in cattle. In a study using muscle mitochondria from Angus steers (Kolath *et al.*, 2006), the high and low RFI groups had no difference in the mitochondria function, however, the rate of mitochondrial respiration was greater in the low RFI steers indicating greater efficiency. In contrast to the results in broilers, Kolath *et al.* (2006) observed the ROS was increased in the low RFI cattle mitochondria.

Based on these previous studies, it would appear that mitochondrial function may differ between animals selected for high and low RFI. Thus, the objective of this study was to determine the level of ROS present in the mitochondria using a sensitive protein carbonyl assay in samples from high and low residual feed intake cattle in order to observe any differences between the two groups. It was hypothesized that the level of ROS would be decreased in the mitochondria of the low RFI animals implying less mitochondrial damage and more efficient mitochondrial function.

Methodology

Samples used in this study were taken from the livers of 20 high and 20 low residual feed intake Angus Trangie selection line cattle. Liver samples were sliced after slaughter to fit in a 10 ml tube and frozen immediately. Samples were stored at -80°C until analyzed. The Bradford assay was performed prior to enzyme assay experiment in order to determine the amount of protein in each sample. The protein carbonyl assay was performed using a Protein Carbonyl Assay Kit (*Cayman Chemical Company*) according to manufacturer's protocol. This assay was designed to monitor reactive oxygen species (ROS) activity by calculating protein carbonyl, which is by far the most general indicator commonly used. A total of 100 µl (1-10 µg) of mitochondria sample was prepared in separate tubes and the reaction conducted by following the manufacturer's protocol. A final volume of 220 µl of mixture was transferred to a 96-well plate. Control tubes were also included in this experiment. A Benchmark Plus Microplate reader (*Biorad*) was used to measure the absorbance at 360-385 nm. The calculation of protein carbonyl was as the following equation:

$$\text{Protein Carbonyl (nmol/ml)} = [(\text{CA}) / (*0.011 \mu\text{M}^{-1})](500 \mu\text{l}/200 \mu\text{l})$$

*The actual extinction coefficient for dinitrophenylhydrazine at 370 nm is $22,000\text{M}^{-1}\text{cm}^{-1}$ ($0.022 \mu\text{M}^{-1}\text{cm}^{-1}$). This value was adjusted for the path length of the solution in the well.

Results for the biochemical assays were analysed using the T-test with a two-tail distribution and two sample unequal variance to determine the statistical differences between the samples. Regression analysis was performed to determine the strength of the relationship between the enzyme assays with the residual feed intake related traits

Results and Discussion

All 20 samples of the high residual feed intake animals were successfully assayed for the protein carbonyl activity. The average for protein carbonyl content in the high residual feed intake group was 5.9 ± 0.3 pc/mg protein. For the low feed intake group, the protein carbonyl assays were successful for all 20 samples. The average for the low feed intake was 9.7 ± 0.6 pc/mg protein. The low RFI group had 64% greater protein carbonyl content than high RFI group, which was significantly different based on the T-test ($p=0.018$).

A regression analysis of the protein carbonyl content and RFI and the body composition traits was also performed. The protein carbonyl concentration and RFI were

highly significant ($F=0.007$) and the relationship was moderate ($r=0.42$) (Figure 1). The protein carbonyl concentration was not significant for any of the body composition traits although the correlation with rib fat was strong ($r=0.69$).

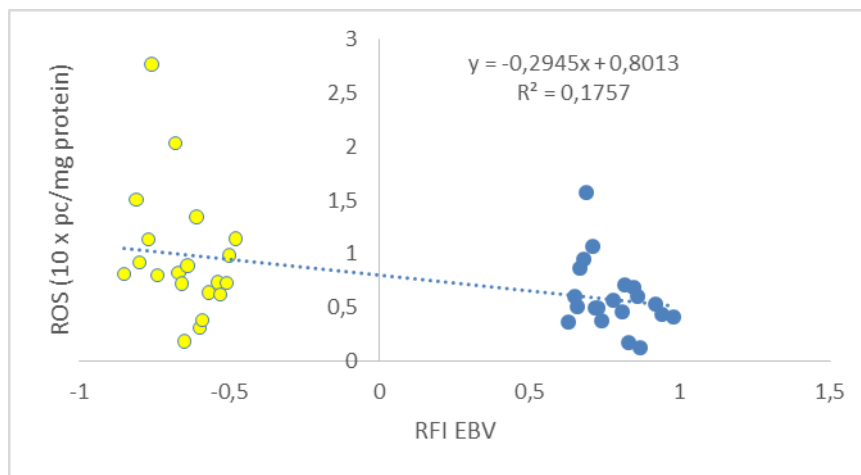


Figure 1 Correlation between mid-parent RFI EBV and ROS activity.

Conclusion

It was hypothesized that the low residual feed intake animals, which are more efficient, would have greater enzyme activities and would have less ROS. However, the low RFI group had a higher ROS concentration, as measured by protein carbonyl. Thus, the hypothesis that the more efficient RFI animals will have lower ROS is rejected.

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Application Ultrasound Imaging for Prediction of Carcass Quality in Bali Cattle

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Abstract

This study aimed to obtain carcass quality characteristics in Bali cattle using ultrasound imaging. A total of 81 heads of Bali cattle consist of males and females with various age ranging from 1-6 years were collected to get the data of body weight and carcass qualities. All of samples came from breeding center (BPTU-HPT Bali) and PT KAR Bogor. The carcass quality such as backfat thickness (BFT), longissimus dorsi thickness (LDT), rump fat thickness (RFT), rump thickness (RT), marbling score (MS) and the percentage of intramuscular fat (PIF) were estimated using ultrasound imaging. Ultrasound imaging was performed on 4.5-6.5 MHz frequency with a depth of 8.8-13 cm. Measurements of BFT, LDT, MS and PIF were conducted on 12-13 ribs, while the measurement of RT and RFT were conducted between *ischium* and *illium* bones. Ultrasound images data were stored in JPEG format and then were analyzed using Image-J software. Body weight and carcass quality among traits were descriptive analyses. The results showed that the performance of body weight and carcass quality differs between males and females, as well as among the age variations in Bali cattle.

Keywords: Bali cattle, ultrasound imaging, carcass quality

Introduction

Carcass quality characteristics has highly an economic traits and should be predicted, because selected superior cattle can't be slaughtered. Ultrasound imaging has been used widely to observe meat quality characteristic such as intramuscular fat of beef cattle both quantitatively and qualitatively (Kim *et al.* 1998). Furthermore ultrasound imaging can be used for predicting meat and fat characteristic of live animal, particularly for intramuscular fat percentage and marbling score (Gupta *et al.* 2013). Prediction of longissimus muscle area, subcutaneous fat thickness and rump fat thickness can be done accurately using ultrasound imaging with coefficient of determination between ultrasound imaging data and real data after slaughter about 0.98 or correlation value about 0.96 (Malendez dan Marchello 2014).

Bali cattle (*Bos javanicus*) is one of origin genetic resources of Indonesia and it is having potential as meat producer (Martoyo, 2012). Although Bali cattle frame is small, but their carcass percentage is high about 52.72-57.6% (Hafid and Rugayah 2009). Moreover this cattle have subcutaneous fat thinner than PO (Yosita *et al.* 2012). According to USDA (2014) beef carcass grade yield influenced by layers of fat on rib, loin rump, clod, flank, cod/udder and ribeye area. With limitation of Bali cattle carcass quality data, ultrasound imaging usage is important to applied in Bali cattle. Previous study showed that ultrasound imaging has been used widely on beef cattle (Nunes *et al.* 2015). The objective of this study was to obtain carcass quality characteristics in Bali cattle using ultrasound imaging.

Methodology

Total number of Bali cattle used in this research were 81 heads consist of 62 males and 19 females with various age ranging from 1-6 years were collected from Bali cattle breeding center (BPTU-HMT) Bali province and PT Karya Anugrah Rumpin (KAR). All samples fed with feed concentrate as much as 1% of body weight and grass in the amount of 10% of body weight. The variables observed were body weight (BW) and carcass quality (backfat thickness (BFT), longissimus dorsi thickness (LDT), rump fat thickness (RFT), rump thickness (RT), marbling score (MS) and the percentage of intramuscular fat (PIF)) were estimate using ultrasound linier transducer having frequency 4.5-6,5 MHz with a depth of 8.8-13 cm. Measurements of BFT, LDT, MS and PIF were performed on 12-13 ribs (Ulum *et al.* 2014), while the measurement of RT and RFT were performed between *ischium* and *illium* bones (Silva *et al.* 2012). Determination of MS was calculate based on the Aus-Meat standard (<http://www.wagyu.org.au/marbling/>) and the PIF was analyzed based on Deaton *et al.* (2000). Ultrasound images data were stored in JPEG and then analyzed using Image-J software. Descriptive analyses were performed using SAS program.

Result and Discussion

Ultrasound imaging result of Bali cattle shows in Figure 1. Significant analysis of body weight and carcass quality in different age was presented in Table 1 dan Table 2. Based on the results back fat thickness (BFT) in yearling Bali cow about $.59 \pm 0.40$ mm and then a sharp increase ensue to the two uears cattle. Zajulie *et al.* (2015) reported that age has significant influence to slaughter weight, carcass weight, carcass componen and fatty. The two years old cows have BFT about 5.39 ± 0.54 mm. Lee *et al.* (2014) reported ultrasound back fat thickness of Hanwoo cattle about 5.10 ± 2.60 mm with an area of rib area about 51.20 ± 7.7 cm². Yosita *et al.* (2012) reported that back fat thickness in Bali bulls aged 2.5 - 3.5 years with body weight average about 300-400 kg has BFT about 8.4 mm.

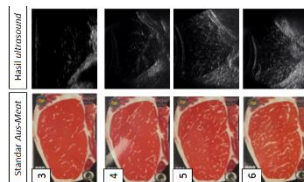


Figure 1. Marbling score measurement AUS-Meat standart vs ultrasound image

Table 1. Body weight and carcass

Variable	Age (year)	
	1	2
BW (kg)	86.7±20.0 ^a	198.±23.4 ^b
LDT (mm)	33.6±4.9 ^a	53.9±5.4 ^b
BFT (mm)	1.6±0.4 ^a	5.4±0.5 ^b
RT (mm)	40.5±4.9 ^a	58.1±5.8 ^b
RFT (mm)	1.2±0.5 ^a	5.8±0.6 ^b
MS	1.9±1.2 ^a	4.5±1.0 ^b
PIF (%)	3.4±2.3 ^a	13.5±3.4 ^b

quality of Bali cows

Note: ^{a,b,c} Means with superscript differ ($P < 0.05$),

Table 2. Body weight and carcass quality of Bali bulls

Variable	Age (year)			
	1	3	4	6
BW (kg)	98.5±21.7 ^a	316.1±104.0 ^b	373.0±69.9 ^b	465.6±47.4 ^c
LDT (mm)	32.6±5.3 ^a	50.8±9.4 ^b	57.9±7.5 ^c	68.9±10.4 ^d
BFT (mm)	1.4±0.3 ^a	1.6±0.5 ^a	2.3±0.8 ^b	3.3±0.6 ^c
RT (mm)	39.7±3.5 ^a	82.2±5.6 ^b	82.3±8.9 ^b	90.2±11.3 ^c
RFT (mm)	1.0±0.2	-	-	-
MS	2.6±1.2	2.6±1.1	3.0±1.2	3.8±0.8
PIF (%)	4.0±2.0 ^a	7.5±3.9 ^b	11.0±4.4 ^{bc}	10.3±2.1 ^c

Note: ^{a,b,c} Means with superscript differ ($P < 0.05$),

Several studies reported that different cattle breed has variation of marbling score such as MS of Sumba Ongole is 2-3 (Priyanto *et al.* 2015), Limousin and Shorthorn are 3 and 4, respectively (Cundiff *et al.* 1993). Based on this result, carcass quality prediction using ultrasound imaging is the recent applicative approach and this method can be applied to estimate carcass quality of Bali cattle.

Conclusion

In conclusion, the characteristics of Bali cattle carcass qualities can be predicted using ultrasound imagery. Body weight and carcass qualities of bali cattle influenced by aged.

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Diversity of Insulin Growth Factor-1 (Igf-1) Gene of Kacang Goat in Kota Gorontalo and Regency of Bone Bolango Province of Gorontalo

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Abstract

41 samples of DNA genome of kacang goat blood in the Kota Gorontalo (21) and Bone Bolango Regency (20) has been extracted in the Faculty of Animal Science, Biotechnology Laboratory of Integrated Hasanuddin University. Amplification and Genotyping is applied by Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) method using the restriction enzyme *HaeIII*. The analysis of IGF-1 gene from both locations shown two kinds of alleles (A = 0.951, B = 0.048) and two kinds of genotype (AA = 0.902, AB = 0.975), observed heterozygosity (H_o) = 0.097 and expected heterozygosity (H_e) = 0.093. Partially gene IGF-1 in the Kota Gorontalo has two kinds of alleles (A = 0.952 and B = 0.047) and two genotypes (AA = 0.904, AB = 0.095), H_o = 0.095 and H_e = 0.092. Instead IGF-1 gene in Bone Bolango Regency have two kinds of alleles (A = 0.95, B = 0.05) and two genotypes (AA and AB = 0.90 = 0.10) with H_o = 0.10 and H_e = 0.097. Based on the results, it can be concluded that IGF-1 gene in kacang goat of Kota Gorontalo and Bone Bolango regency are polymorphic so it can have opportunity for doing selection.

Keywords: *Genetic Diversity, Insulin-Like Growth Factor-1, Kacang Goat*

Introduction

Livestock growth (prenatal and postnatal) is the change in body size (shape and size) due to changes in organs and tissues until it reaches the size and shape characteristics of each animal. Growth and development of the body in the field of animal husbandry is very important and it can be an indicator of the success of the management of maintenance.

The rate of growth and development of livestock affected by many factors, both internal and external. Growth is internally regulated by a group of growth hormones, directly and indirectly, including Growth Hormone (GH), Growth Hormone Receptor (GHR), Insulin Like Growth Factor - I (IGF-I), and Pituitary Specific Transcription Factor - I (PIT-I). IGF-I is one of the hormones that are often used in studying candidate genes to be used as a genetic marker for selection (Sumantri et al 2009). IGF-1 is a small peptide of 70 amino acids with a molecular mass of 7649 Da (Laron, 2001). IGF-1 is a mediator of a wide range of biological effect, for example, increase the absorption of glucose, stimulates myogenesis, inhibits apoptosis, participate in genetic activation of the cell cycle, increase lipid synthesis, stimulates the production of progesterone in granular cells, and intervention in the synthesis of DNA, proteins, RNA, and in cell proliferation (Etherton, 2004). IGF-1 gene controls the

formation of the hormone IGF-1 and are often used to detect genetic diversity in sheep and cattle, but the goats especially kacang goats still lacking.

Kacang goat is a Indonesian native goat are cultivated by small and medium farmers with the main aim to get benefit from the sale of the meat. Kacang goat is essential to preserve its existence as one of the Animal Genetic Resources (AGR). During the maintenance period, kacang goat do not require significant costs because they are able to adapt to various environments with a low quality feed and this is causing a lot of kacang goat breeders maintained by the people.

Genetic improvement towards increasing the quality and quantity of mutton kacang goat can be initiated by a selection based on the phenotype and genetic. Selection is based on the appearance of genetic information can be done using IGF-1 gene diversity based on a particular method so that it can be used as Marker Assisted Selection (MAS) later. This study aims to determine the genetic diversity of IGF-1 gene of kacang goat in Gorontalo city and Bone Bolango regency, Gorontalo province.

Methodology

Collection of blood samples obtained from the Kota Gorontalo (21) and Bone Bolango Regency (20) so that the total sample was 41 goats. Blood from the jugular vein (about 3 ml) accommodated using venojet needles and tubes containing EDTA vacuttainer subsequently collected and stored in a refrigerator temperature of 4° C prior to extraction of genomic DNA.

The procedure and the process of extracting genomic DNA, DNA amplification target, and Genotyping Fragment IGF-1/*Hae*III gene by the method of Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) was conducted at the Laboratory of Biotechnology Integrated, Faculty of Animal Husbandry, University of Hasanuddin according to research Tunisia (2013). Primers used for amplification of the gene IGF-1 consists of a forward primer with the DNA sequence 5'-CACAGCGTATTATCCCAC-3 'and reverse primer with a DNA sequence 5'-GACACTATGAGCCAGAAG-3' (Liu, et al 2010).

Genotype and alleles frequencies were calculated by using Nei and Kumar (2000). The Hardy–Weinberg (HWE) equilibrium were tested by chi-square test (X^2). The value of observed Heterozygosity (H_o) and Expected Heterozygosity (H_e) were based on heterozygosity formulas by Nei and Kumar (2000) and counted with PopGene 2 version 1.31 software (Yeh et al 1999).

Results and Discussion

Amplification and Genotyping IGF-1 Gene

The long of IGF-1 gene fragment were successfully amplified is 363 bp (Figure 1) according to research conducted by Liu, et al (2010) that the PCR amplification products for goats in IGF-1 gene exon 4 is 363 bp.

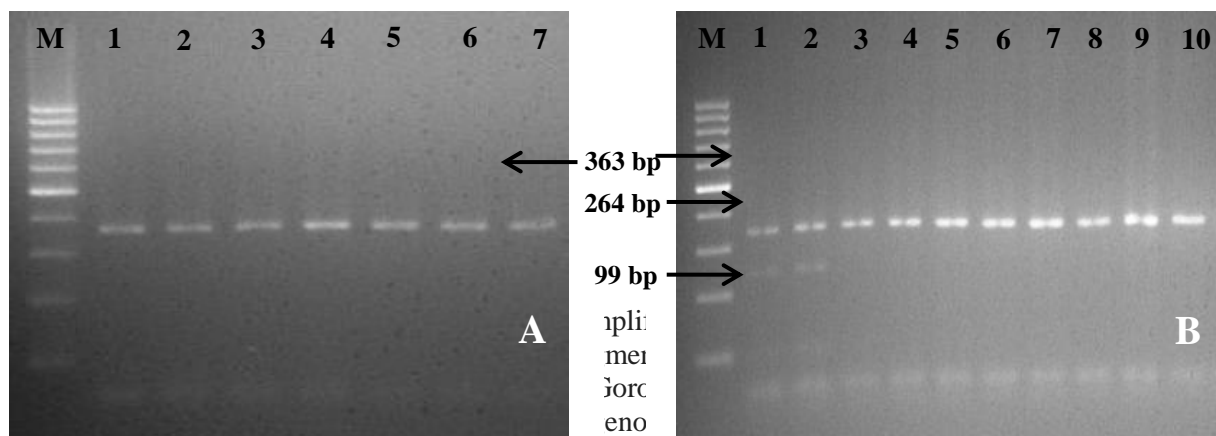


Table 1. Frequency of genotype, allele frequencies, and heterozygosity value of IGF-1|HaeIII gene on Kacang Goat in Kota Gorontalo and Bone Bolango Regency, Gorontalo Province

Area	n	Genotipe	Genotype Frequency	Allele Frequency		heterozygosity		X ²
				A	B	Ho	He	
Kota gorontalo	21	AA	19 (0,904)	0,952	0,047	0,095	0,092	0,025
		AB	2 (0,095)					
Bone Bolango	20	AA	18 (0,90)	0,95	0,05	0,10	0,097	0,027
		AB	2 (0,10)					
Kota Gorontalo dan Bone Bolango	41	AA	37 (0,902)	0,951	0,048	0,097	0,093	0,079
		AB	4 (0,097)					

Description: degrees of freedom (df) = 1; $X^2_{0,05} = 3.84$ and $X^2_{0,01} = 6.64$

Results of the IGF-1 gene analysis on 41 samples of kacang goat, obtained two kinds of genotypes AA and AB while genotype B was not found (Table 1). The frequency of AA genotype (0,902) higher than genotype AB (0,097). AA genotype had one fragment size 363 bp, AB genotype 3 each fragment size 363 bp, 264 bp, and 99 bp (Figure 1). This result does not vary much with the research of Tunnisia (2013) in kacang goats in Jeneponto who obtained the AA genotype (0,914) and genotype AB (0,860), but in contrast to the study of Liu et al (2010) who obtained three kinds of genotype namely AA (0.487 and 0.277), AB (0.239 and 0.236), and BB (0.274 and 0.486) on the IGF-1 gene xinjiang goat and nanjiang cashmere goat.

Based on the value of genotype frequencies, the number of alleles found is 0.951 higher than the B allele is 0.048. Although the B allele is low, but these results have indicated their IGF-1|HaeIII polymorphic genes in Kacang Goat in Kota Gorontalo and Bone Bolango Regency. Nei (1987) said that an allele is said to be polymorphic if it has an allele frequency is equal to or less than 0.99. Nei and Kumar (2000) states that genetic diversity occurs when there are two or more alleles in a population (typically more than 1%).

Heterozygosity and Hardy-Weinberg Equilibrium

Analysis of the value of observation heterozygosity (Ho) was 0.097 and the value expectations of heterozygosity (He) was 0.093 (Table 1). These results (Ho closer to 0) indicates the diversity of the IGF-1|HaeIII gene kacang goat in Kota Gorontalo and Bone Bolango Regency quite low. Nei (1987) states that the value of heterozygosity ranged between 0-1, heterozygosity value equal to 0 means that measured between populations that have a genetic relationship is very close and if it is equal to 1 then the population have no relationship or genetic linkage at all.

The results of chi-square analysis of IGF-1|HaeIII gene in 41 samples that was obtained shows that Kacang Goat in Kota Gorontalo and Bone Bolango Regency is in equilibrium ($X^2_{count} 0.079 > X^2_{table} 3.84$) based on the law of Hardy-Weinberg as a result there is no selection, mutation, migration, and genetic drift. Hardy Weinberg law states that dominant and recessive gene frequencies in a population large enough will not change from generation to generation if no selection, migration, mutation, genetic drift (Hardjosubroto, 1998).

Conclusion

IGF-1|HaeIII Gene in Kacang Goat Kota Gorontalo and Bone Bolango Regency is polymorphic. Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) methods in the IGF-1|HaeIII gene generates allele A (0.951) and allele B (0,048) with

AA genotype (90.2%) and AB (9.75%). Genotype frequency of IGF-1 gene in equilibrium by the law of Hardy Weinberg.

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Identification of Single Nucleotide Polymorphism of Melanocortin 4 Receptor Gene in Bligon Goat

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Abstract

Melanocortin 4 Receptor (MC4R) is one of candidates gene for growth traits and feed intake in mammals. The objective of this research was to identify the genotype of Menocortin 4 Receptor gene in Bligon goat. Blood samples from 40 Bligon goats were used for DNA extraction. Primer used was designed from *Capra hircus* genome in Genbank Accession Number NM_001285591. Primer CapraPF:5'-ATTTCCAAGTGATGCCGACC'3 and CapraPR:5'-CTCCAACAAGCTGATGACCC-'3 were used to amplify 387 bp of PCR product. Using DNA sequencing, a Single Nucleotide Polymorphism (SNP) was detected in Bligon goat. The SNP identified in this research was g.256 G/A. The results of DNA sequence of PCR product in Bligon goats were used for restriction map of specific enzyme using Bioedit version 7.2.0. Based on restriction mapping, HpyCH4V (A'CG_T) was detected to recognize SNP region. Restriction enzyme HpyCH4V can be used for genotyping of targeted gene using PCR-RFLP method and it will be associated with growth traits and feed intake in Bligon goat.

Keywords: *Melanocortin 4 Receptor (MC4R), Bligon Goat, PCR, sequencing, restriction enzyme*

Introduction

Among the various types of local livestock, goats were the most reared livestock in Indonesia (Murdjito, et al., 2011). Various of goat breeds in Indonesia include Kacang, Peranakan Etawa (PE), Bligon, Kejobong, Gembrong, Marica, Samosir, Muara and Bengal goats (Hartatik, 2014). The goat which have widely reared was Bligon goats. Bligon goat is breed by crossing local Kacang with Peranakan Etawah goats and they have a blood profile over 50% of Kacang goat (Budisatria, et al., 2012).

The growth of goat affected by genetic and environmental factors, as well as both of the interaction. Genetic factors that encode growth traits can be passed down to offspring, so it can be used in livestock breeding programs. Over the past decades, molecular genetics has found candidate genes with have large effects on growth traits one of which is a *melanocortin 4 receptor*.

Melanocortin 4 receptor (MC4R) gene in goats located in chromosome 24 based assesion number NC_022316.1 (Anonymous, 2015). MC4R gene is part of a seven-transmembrane G protein receptor in the brain, especially the double in the hypothalamus (Dubern, 2015). MC4R gene has an important role in regulating feed intake, energy balance and body weight in mammals (Liu et al (2010); Song, (2012)). MC4R gene is also involved in sympathetic nerve activity, adrenal, thyroid function, media work leptin in regulating energy

balance and homeostasis (Zhang et al, 2008). Polimorfisme the MC4R gene associated with growth traits and feed intake in pig (Fontanesi, et.al, (2013), in cattle (Liu et al (2010) and sheep (Song, (2012); Wang et al (2015)). However no reported the gene study identified in Bligon goats. Therefore, the aimed of study was to identify the SNPs of MC4R gene in Bligon goat.

Metodology

Blood sampling and Isolation DNA. The blood samples were collected using K3EDTA vacutainer containing about 3 mL for each goat through the jugular veins of 40 goats in Gunung Kidul, Yogyakarta. Samples of blood then isolated using *SYNCTM DNA Exstraction Kit* (Genetika Science Indonesia).

Primer design. Primers were designed using *oligoprimer primer3* software after alignment DNA sequens of MC4R gene based on Genbank Acc. No. NM_001285591, JN 107563.1, JN 58091, NM_001126370.2, JQ710684.1 and EU622853.2 to seek the position of the *single nucleotide polymorphism* (Hartatik, 2016). We used Genbank NM_001285591 as a template. Primers were used in the study are listed on the Table.1.

Amplification DNA. The DNA fragments of MC4R gene was amplified using PCR (*Polymerase Chain Reaction*) method. PCR was performed with the target MC4R gene in a total reaction volume of 30 mL comprising 10µl DDW, primer F and R, respectively: 1,5µl, PCR kit (KAPPABIOSYSTEMS) 15 mL and 2µl DNA. DNA Amplification was done as many as 35 cycles with temperature of predenaturation 94 °C for 3 minutes, denaturation 94 °C for 30 seconds, annealing 55,9 °C for 30 seconds, extention 72 °C for 30 seconds and followed by a final extension 72 °C for 10 minutes.

Tabel 1. Oligonucleotide primers for the goat MC4R gene

Primer set	PCR Product size	AT
CapraPF: 5'-ATTTCCAAGTGATGCCGACC'3	387 bp	55,9
CapraPR: 5'-CTCCAACAAGCTGATGACCC-'3		

Sequencing. PCR products of 40 samples were sequenced using the same primer, CapraPF and CapraPR. Sequencing analysis was performed using 1stBASE services through PT. Genetika Science Indonesia.

Analysis of DNA sequences in Bioedit. Identification of single nucleotide polymorphisms (SNPs) was performed by using Bioedit ver. 7.2.5.

Result and Discustion

A total 387 bp MC4R gene was amplified using primers designed. Multiple sequence alignment for 40 of Bligon goat were performed with Bioedit program to identify SNPs. There was no polimorphism found in all samples. As a results only one genotype was identified for this fragment of MC4R gene in this study. The possible reason for that monomorphic in this study may because of the low genetic diversity in the population study due to the rotation of male goat in the flocks was not well organized.

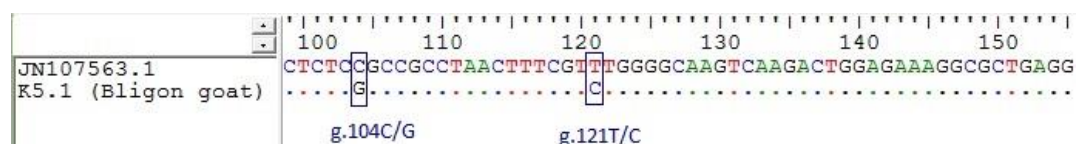


Figure 1. The SNPs identified in MC4R gene by compred with *Capra hircus* (JN 107563.1)

The g.104C/G and g.121T/C SNPs were identified in 5'untranslated region in this study (Figure 1). In other studies, four variation in the promoter region were detected in bovine (Zhang, et. al. 2009). Liu, et. al. (2010) reported five SNPs in 5'UTR and one SNP in

exon were identified in cattle and found the significant association of -129A/G in 5' untranslated region with growth traits.

Conclusion

The present study of MC4R gene in Bligon goat was monomorphic with direct sequencing. Two SNPs were detected in the 5'UTR region of MC4R gene in Bligon goat compared to *Capra hircus* (JN 107563.1).

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Assosiation of Leptin Genes Polymorphism with Average Daily Gain of Local Cattle at Ciamis West Java

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Abstract

Leptin polymorphisms which is caused by SNP Arg25Cys at exon 2, have association with the productivity, fat deposition and carcass quality. The objectives of this research was to identify polymorphism of Leptin gene based on Arg25Cys and their association with average daily gain (ADG) of local cattle in Ciamis West Java. The data of Leptin gen polymorphism and ADG were obtained from 18 Ciamis local cattle. The DNA was isolated from blood by the standard phenol/chloroform method, and amplified by PCR Genotyping was conducted by direct analyzed from sequencing result. A Single Nucleotide polymorphism (SNP) Arg25Cys was identified by nucleotide alignment by MEGA 4. The result shows that the Leptin gene in Ciamis local cattle was polymorphic and there were three alleles i.e. C (58.3%), T (27.8%) and H (13.9%). There were no significant association between Leptin gene polymorphisms with ADG at Ciamis local cattle.

Keywords: ADG, Leptin, Meat quality, Polymorphism

Introduction

Leptin gene polymorphism on beef and dairy cattle showed that there are correlation between their polymorphism with productivity. The research of Munoz *et al.* (2008) showed that the leptin gene could be used for genetic selection program on Colombian Creole cattle, because there is a correlation between leptin gene polymorphism with backfat thickness and longissimus dorsi area. The study of Several studies have shown that SNP in exon 2 of Leptin gene contributed to fat accretion which was responsible for carcass fat quality, fat deposition, and backfat thickness (Buchanan *et al.* 2002; Nkrumah *et al.* 2004; Schenkel *et al.* 2005; Lusk *et al.*, 2007; Kononof *et al.*, 2005). Leptin gene polymorphism is caused by mutations in the nucleotide sequence C1180T, effect in a change encode protein from arginine to Cysteine (Arg25Cys). Mutations in these positions is a causative mutation, which has changes in the function of leptin in the physiological processes of the body (Buchanan *et al.* 2002). Based on the above information, this study aims to determine the leptin gene polymorphism caused SNP on exon 2 and their correlation to average daily gain and carcass percentage of local cattle in Ciamis.

Methodology

The Leptin gene polymorphisms and the data of ADG was taken from 18cattle. The DNA was isolated from blood by the standard phenol/chloroform method. The sequence target of Leptingene was amplified through Polymerase Chain Reaction (PCR) using forward

primer 5'CTCACTGCTGCGTGGTCTAC3'; revers 3' GCACTAGGATTCCGGTCTGG 5'cover a part of intron 1, exon 2, and part of intron 2. Genotyping of Leptin gene was analyzed by direct sequencing and was alignment using MEGA 4 program, the association between genotype with average daily gain analyzed by T test.

Result and Discussion

Leptin Gene Polimorphism

Leptine gene sequence target consist of intron 1, exon 2 and a part of intron 2, with 620 bp length. Nucleotide sequence was aligned by MEGA 4. Here is the alignment result:

```

190   200   210   220   230   240
...|...| ...|...| ...|...| ...|...| ...|...| ...|...|
Bos
taurusTGTGCCCATCCGCAAGGTCCAGGATGACACCAAACCCTCATCAAGACAATTG
TCACCAG
Alel C..... C.....
Alel H.....A.....
Alel T .....T.....

```

Figure 1. Alignment result of Leptin gene based on SNP (Arg25Cys/C1047T) and Arg25His/G1048A (access number EU313203.1)

Leptin gene polymorphism based on nucleotide substitution cytosin by tymin is a *non synonymous mutation* or *missense mutation* which amino acid encode changed arginine to cystein. In the present study, it was found new mutation (non synonymous muatation) at Arg25His/G1048A (access number EU313203.1) that was nucleotide substitution from Guanine to Adenine that changes encode amino acid from Arginine to Histidine (H allele).

Tabel 1. Genotype and Allele Frequency of Leptin Gene of Ciamis Local Cattle

	Genotype				Allele		
	CC	CT	CH	TT	C	T	H
Amount	6	4	5	3	21	10	5
Frequency (%)	0,33	0,22	0,28	0,17	0,58	0,28	0,14

The frequency of C (0,58%) allele was higher than T (0,28) and H allele (0,14%). These results were in accordance with other study which analyzed SNP in Leptin gene exon 2 (Arg25Cys) showing the frequency of C allele was higher than T allele. The study of Buchanan *et al.* (2002) using 55 Charolais cattle and 17 Simmental cattle found 34% and 32% for T allele respectively whereas C allele were 66% and 68% respectively. The H allele was not found in the study of Leptin gene in *Bos taurus* as well as *Bos indicus*. Therefore, the H allele was considered to be a specific allele for Indonesian local cattle.

Assosiation Leptin Gene Polimorphism with Average Daily Gain

These results showed there was no significant differences ($P \geq 0.05$) between four genotypes which can be identified (Table 2).

Table 2. Average Daily Gain Based on Leptin Genotype on Local Cattle in Ciamis

Parameter	n	Genotype			
		CC	CT	CH	TT
		.n = 6	.n = 4	.n = 5	n = 3
ADG (kg/head/day)	18	0.55 ^{ns} ± 0.19	0.63 ^{ns} ± 0.17	0.70 ^{ns} ± 0.2	0.65 ^{ns} ± 0.17

Note n = Number of sample; ns= non-significant ($P \geq 0,05$)

These result was in accordance with the study of Nkrumah *et al.* (2004) that stated differences between Leptin genotype based on SNP Arg25Cys/ R25C was non-significant

effect on average daily gain, feed intake and feed efficiency, but there was an association with back-fat thickness. Furthermore, the study of Buchanan *et al.* (2007) on Angus and Hereford cattle based on leptin gene, breed and end point interaction showed there was no significant effect on ADG between CC and TT genotype, but significant ($P < 0.05$) on Charolais cattle. Some studies show the SNP at exon 2 gene leptin, has impact to fat developing, of which carcass fat quality, fat deposition, back fat thickness and milk fat (Buchanan *et al.* 2002; Nkrumah *et al.*, 2004; Schenkelet *al.*, 2005; Kononofet *al.*, 2005; Lusk *et al.*, 2007). The ADG is a quantitative trait that were influenced by many pairs of genes (Polygenes) (Martinez and Saladana 2012).

Conclusion

Leptin genes in local cattle at Ciamis were polymorphic. There was no association between Leptin gene polymorphism based on SNP Arg25Cy and Arg25His with ADG.

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Single Nucleotide Polymorphism (SNP) Using Growth Hormone (GH) Gene of Results Reciprocal Crosses Tegal with Magelang Duck

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Abstract

The objective of this research was to polymorphism identification based on SNP using GH gene of results reciprocal crosses Tegal with Magelang duck. The crossbred male Tegal and female Magelang duck was named GALLANG (F1) and crossbred female Tegal and male Magelang duck was named MAGGAL (F1). Research administered 336 GALLANG ducks and 392 MAGGAL ducks for blood sampling. Research was subject to experiment method. Primary pair used was primer forwards L3487 5'-CTAAAGGTGCAGAAGCAGGG-3' and primer reverse H3678 5'-AGGTATTGCACTGGGGTCAG-3'. This research successfully obtain identification of SNP gene GH found in SNP c.3678T>A caused high and medium body weight growth, but low body weight was found in SNP c.3579A>G. Thus individuals with high and medium body weight were determined by genotype AA, while duck with low body weight was found in genotype GG. Conclusively, polymorphism were found related to growth characteristics in crossbred Tegal and Magelang duck.

Keywords: Single Nucleotide Polymorphism (SNP), Growth Hormone (GH) gene, reciprocal crosses, Tegal duck, Magelang duck

Introduction

Tegal and Magelang duck are two of 15 Indonesian native duck species, thriving in Central Java and prominent in production. Purwantini *et al.* (2015) reported that Tegal duck has higher potential as layer than Magelang duck, while Magelang duck has higher initial body weight production than Tegal duck. Tegal and Magelang duck crossbreeding is viable to obtain offspring with prominent vital body measure and egg production. Reciprocal crosses is a back cross (Welsh, 1991). Crossing male Tegal and female Magelang duck is labelled GALLANG, while male Magelang and female Tegal duck is MAGGAL.

Polymorphism identification is based on SNP analysis with GH gene. Growth Hormone is single polypeptide emitted with many physiological functions in animals (Qian *et al.*, 2012), such as forming bones (Millar *et al.*, 2010). Structure GH gene in poultry contains five exons and four introns. According to Zhang, *et al.* (2014), the second exon of GH gene in some geese offspring is relatively long, the other four exons are short and all SNP is located on the second exon, highly polymorphic and this is very useful for genetic research.

Based on the afore mentioned background, it is essential to investigate polymorphism identification is based on SNP analysis using GH gene. The significance of this research was providing fundamental information on local duck crossbreeding that is expected to gain higher economical value and is expected to produce new strains of duck.

Methodology

Blood sampling was taken from 336 GALLANG and 392 MAGGAL for experiment research. Production characteristics was based on mean and standard deviation of eight week old weight and growth. Total DNA was isolated from blood sampling using DNA Isolation Kit (Geneaid). Amplifying GH gene area followed PCR technique with primer forwards L3487 5'- CTAAAGGTGCAGAAGCAGGG-3' and primer reverse H3678 5' AGGTATTGCACTGGGGTCAG-3'. PCR product was 191 bp to sequence and analyze the nucleotide order. **Single Nucleotide Polymorphism (SNP) Analysis.** Analysis of nucleotide sequence result was conducted to determine variation or diversity compared with the sequence in GeneBank database (AB158760.2). Base sequence of GH gene in Mallards (*Anas platyrhynchos*) was 5.218 bp.

Result and Discussion

Identification of GH gene polymorphism. Sequence PCR products 191 bp GH gene sample of GALLANG and MAGGAL was followed by sequence alignment between GH gene data from GenBank (AB158760.2) and GH gene sequenced PCR product of GALLANG and MAGGAL ducks using Clustal W and BioEdit program.

Single Nucleotide Polymorphism (SNP) GH gene of GALLANG and MAGGAL duck was observed in c.3579A>G and c.3678T>A. Mutation base Adenin (A) into guanine (G) occurred at 3579 nucleotide (nt), while thymine (T) into adenine (A) occurred at 3678. Single Nucleotide Polymorphism c.3678T>A was found in F1 G6P (GALLANG duck) with high body weight and in M8P (MAGGAL duck) with medium body weight. Single Nucleotide Polymorphism c.3579A>G was found in F1 M4O (itik MAGGAL) with low body weight. G6P, F1 G6P, M2K, F1 G2M had high body weight, G2M, F1 G2M, M8P, F1 M5P had medium body weight and G5Hj, F1 G7P, M4O, F1 M4O had low body weight. Therefore, SNP c.3678T>A caused high and medium body weight, while SNP c.3579A>G caused low body weight. Hiyama *et al.* (2012) reported that GH gene promoters in Mandalay, Khayan and Sittwe ducks in Myanmar were detected at 8 band from genome, highest frequency was at 244, 294, 586, and 665.

Electropherogram result showed that each nucleotide produced different colored peaks, as shown in sequenced electropherogram products. It indicated that F1 G6P and M8P was homozygote shown from one G peak in electropherogram. Fig.4 shows that duck with high and medium body weight had AA genotype, while low body weight had GG genotype. Accordingly, individuals with high and medium body weight was determined by AA genotype, and the low body weight was determined by GG genotype. Zhang *et al.* (2014) reported two SNP mutations and 10 genotypes (AA, BB, CC, DD, AB, AC, AD, BC, BD and CD) of GH gene contributing to production performance in huoyan geese in China. Makhous *et al.* (2013) found three alleles A, B and C and six genotypes, AA, AB, AC, BB, BC, and CC contributing to egg production in Iran native chicken. Noor (2000) stated that heterozygote was the parameter of genetic diversity in a population based on proportion per locus. The change from A to G base indicated transition mutation, a transition purine (G or A) with other purine or pyrimidine base T or C with other pyrimidine (Yao *et al.*, 1996; Lewin, 2000 *cit* Mu'in, 2008). Yu *et al.* (2012) stated that two SNPs with high significance was c.52G>A and c.376G>A (GenBank Acc. No. EU877264).

Conclusions

Polymorphism related to body weight were found in reciprocal crossbred Indonesian native ducks between Tegal and Magelang duck indicated by standard deviation and Single Nucleotide Polymorphism (SNP) in GH gene.

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Color Variation of Indonesian Native Ducks

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Abstract

Morphology are keys to differentiate breed, other than genetics. The unique nature of Indonesian ducks hasn't been properly documented. Hence, this study was proposed to compare color variation as one of various morphology aspects of Indonesian native ducks. A number of 191 ducks from six varieties namely Alabio, Magelang, Rambon, Pegagan, Pitalah, and Bayang were recorded for 19 traits: bill color, bill pattern, nostrils color, beak color, eyes (bright part & dark part), crown color, cheek color, neck color, breast color, abdomen color, back color, wings secondary, wings primary, tail color, thigh color, webbed color, shank color. As results, Hundreds percent of bill color in Alabio duck is yellow while other ducks were dominated with black color. For nostrils color three ducks having 100% black color, only Magelang and Bayang have yellow (3.3%) and black color (3%), respectively. All the ducks have black color for bill nail except Magelang duck. The bright part of eye were vary from blue, grey, brown, and yellow. The bright eye in Rambon and Bayang duck were dominated with yellow color (100%). The dark part of eye indicated 100% having black color in all ducks. Crown, cheek and neck color were covered with 100% white brown in Alabio ducks. The others ducks were vary from brown, light brown, dark brown and black color. Alabio duck seems more uniform among population based on their morphological appearances. In conclusion, the morphological among Indonesian native ducks have various color and pattern.

Keywords: duck, morphology, native, Indonesia

Introduction

Indonesia has various local duck that arise along Indonesia archipelago. It believed that ancestor of Indonesian duck come from *Mallard* duck (*Anas domesticus*) that domesticated from *wild Mallard* (*Anas boscha*) and derived from water fowl class (2012 Suharno and Setiawan). Most of them have been certified by Indonesian Agricultural Ministry. In Java island, there are three local duck namely Tegal, Magelang and Mojosari. In Bali Island is well known as Baliness duck and Alabio duck in South Borneo. Sumatera island has spesific ducks namely Pegagan Bayang, Pitalah and Talang Benih.

Mostly, the duck's name refers the location of the duck have been domesticated. The ducks have various plumage colour, body size and pattern. It may due to Indonesian ducks are the hybrids ducks which the result of crossing between local and imported ducks. For breeding purpose to produce the high quality of both meat and egg production, the analyzing of morphology of the ducks is a basic and important to study.

Three chosen islands (Java, Sumatera, and Borneo) provide biggest number of duck population, with more than 16 million ducks in Java, 4 million ducks in Sumatera, and 2 million ducks for Borneo (2013, BPS) and therefore we choose 6 breeds from those island; they are Alabio from Borneo, Tegal and Rambon for Java, and Bayang, Pitalah and Pegagan for Sumatera.

Methodology

This study conducted in 5 regions in Indonesia; Pelaihari (South Kalimantan province) for Alabio duck, Magelang (Center of Java province) for Magelang duck, Cirebon (West Java province) for Rambon duck, Palembang (South Sumatera) for Pegagan duck, and Padang (West Sumatera) for Pitalah and Bayang ducks. A total of 191 ducks of the females sex from six Indonesian local ducks were used in this study, including Alabio (39 heads), Magelang (30 heads), Rambon (32 heads), Pegagan (30 heads), Pitalah (30 heads), and Bayang (30 heads). They were reared by farmers under a traditional system in the different area, but Alabio by government institution. The data collected were descriptively analysed.

Results and Discussion

Nineteen morphological traits have been recorded (data are not presented). Some morphological traits such as head, neck, back, abdomen, primary and secondary feather of wings, and tail have spesific color and pattern among the ducks. Some traits has similarities across all breeds, those are; dark part of eyes is black, bill nail is black, and similarities with different body parts, such as; cheek and crown, and webbed and shank. In Magelang duck indicated having white ring in their neck and no indicated in others. Magelang ducks have 11 types based on their plumage pattern, those are Jarakan Polos, Bosokan, Kalung Ombo, Kalung Ciut, Gambiran, Jarakan Kalung, Jowo Polos, Klawu Borok, Cemani, Wiroko, and Putih Polos (Ayu, et.al., 2016). Pegagan duck also have 3 different strain based on their feather namely Kelabu Tampu, Jarak Coklat, dan Jarak Hitam. Kelabu Tampu classified with grayish feather in body that goes darker (brown in neck and black in head, primary wings' and tail), Jarak Coklat mainly covered by light brown feather that goes to yellowish/golden, and Jarak Hitam derived from dark brown feather with black strip spot appearances. Alabio duck seems have uniformity compared to other due to they reared and controlled by using breeding program which conducted by breeding research center belong to government. Figure 1 showed the physical appearnces of six Indonesian native ducks. The pattern of feathers among some varieties were described in Figure 2. Generally, a higher phenotypic variation of traits indicates a higher genetic variation. This condition can be able guarantees for a sufficient selection response. This is important because directional selection on morphological traits, which commonly occurs in natural populations (Kingsolver et al., 2001).

Figure 1

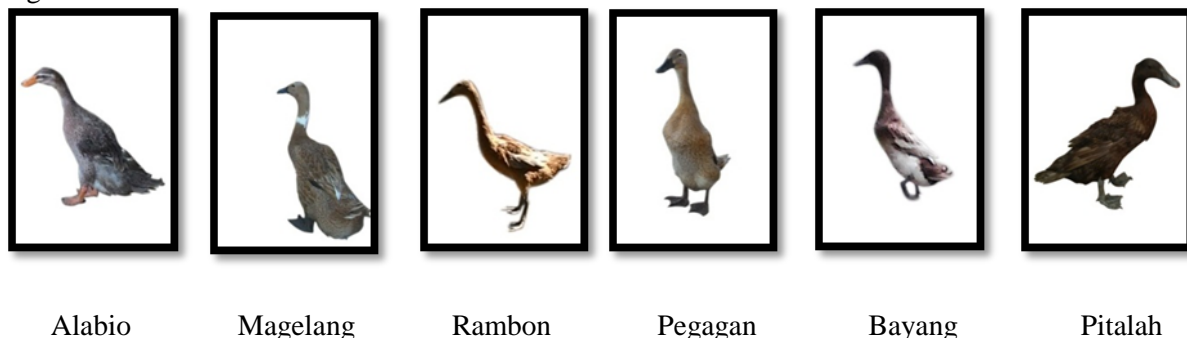


Figure 2



	Alabio	Pegagan	Bayang	Pitalah	Bayang	
Body parts	Alabio	Magelang	Rambon	Pegagan	Pitalah	Bayang
Bill Color	100% Yw	96,7% Bl 3,3% Yw	100% Bl	96,7% Bl 3,3% Br	100% Bl	100% Bl
Eye (bright part)	41% blue	40% Gr 36,7% Yw 23,3% Br	100% Yw	96,7% Y 3,3% blue	94% Yw 3% Br 3% blue	100% Yw
Crown and cheek color	100% Wt Br	90% Br 6,7% Bl 3,3% Wt	67% LB 30% DB 3% Bl	36,7% KT 36,7% JC 26,6% JH	80% Bl 20% Br	63% LB 37% DB
Neck color	100% Wt Br	86,6% Br 6,7% Bl 6,7% Wt	96% Br 3% Bl	36,7% KT 36,7% JC 26,6% JH	66,7% Bl 33,3% Br	60% LB 40% DB
Breast color	100% Br	90% Br 6,7% Bl 3,3% Wt	45,5% DB 48,5% LB 3% Bl 3% Wt	36,7% KT 36,7% JC 26,6% JH	70% Bl 26,7% Br 3,3% Wt	60% LB 40% DB
Abdomen color	100% Wt	66,6% Br 16,7% mix 16,7% Wt	88% Br 9% Wt 3% Bl	36,7% KT 36,7% JC 26,6% JH	66,7% Bl 33,3% Br	63% LB 33% DB 3% Wt
Back color	100% Br	96,7% Br 3,3% Wt	91% Br 3% Wt 3% Bl	36,7% KT 36,7% JC 26,6% JH	70% Bl 30% Br	60% LB 40% DB
Wings secondary	100% Wt Br	80% DB 16,7% Bl 3,3% Wt	48,5% LB 45,5% DB 3% Wt 3% Bl	36,7% KT 36,7% JC 26,6% JH	70% Bl 30% Br	67% LB 33% DB
Wings primary	100% Wt Br	86,7% LB 13,3% Wt	69,7% LB 27,3% DB 3% Bl	36,7% KT 36,7% JC 26,6% JH	63,3% Bl 36,7% Br	67% LB 33% DB
Tail color	100% Wt Br	96,7% Br 3,3% Bl	54,5% DB 54,5% LB 3% Bl	36,7% KT 36,7% JC 26,6% JH	73,3% Bl 26,7% Br	60% LB 40% DB
Thigh color	100% Br	73,3% Br 23,3% Wt 3,3% Bl	76% DB 18% LB 3% Bl 3% Wt	36,7% KT 36,7% JC 26,6% JH	70% Bl 30% Br	60% LB 37% DB 3% Wt
Shank and webbed color	100% Yw	86,7% Br 10% Bl 3,3% Yw	94% Bl 6% Yw	60% Bl 40% Br	43,3% Bl 26,7% Gr 26,7% Yw 3,3% Br	100% Bl

Bl= Black, Br= Brown, LB= light brown, DB= dark brown, Wt= White, Yw= yellow, KT= kelabu tampu, JC= jarak coklat, JH= jarak hitam,

Conclusion

The Indonesian native ducks were having different morphology and fully evidenced through this study. Characterisation of these ducks at molecular level will be the best approach for proper selection and conservation of these unique germplasm in the future.

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Polymorphism of Growth Hormone Gene in Selecting Etawah Crossbred (PE) Goats

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Abstract

Although Etawah Crossbred (PE) goat is considered to be dual purpose (meat and milk) goat, it is mainly raised for meat production. Since early 1990, there has been a growing interest of the farmer in some places to raise PE goat for milk production without sacrificing its role to produce kids for meat. Although milk yield of PE goat was not as high as milk yield of some other dairy goats, the ability of PE goat to cope with harsh local environment, particularly climate and feed conditions, was an advantage. Therefore, raising PE goat would still be an important part of farmer activities in the rural areas in Indonesia. Identification of the genes underlying livestock production traits leads to more efficient breeding programs and it is a promising way to improve production traits of farm animals. Growth hormone is a polypeptide hormone which is the major regulator of the metabolic procedures of growth and development and it is encoded by GH gene. In this study, we aimed to detect the genetic polymorphism of GH gene in major Etawah Crossbred (PE) goat using PCR-RFLP. The PCR amplified fragment were digested with *HaeIII* endonuclease and the result showed the presence of two genotype CC and CD. The total frequency were 47% and 53% for CC and CD genotype respectively in 94 tested goats. Statistical analysis showed that in the fragment amplified by the pair of primer, CD genotype had significant higher birth weight and weight of 100 days old (weaning weight) than CC genotype ($P < 0.01$). In conclusion that GH gene may be a mayor gene or linked to the mayor gene to affect the weight traits and the polymorphic site could be used to select the goat weight in marker-assisted selection program.

Keywords: goat; birth weight; weaning weight; GH, PCR-RFLP

Estimation of Heritability and Breeding Value for Birth Weight in Bali Cattle

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Abstract

Studies on heritability and breeding value for birth weight of Bali cattle were conducted at the station of Bali Cattle Breeding and Forage in Serading, Sumbawa, West Nusa Tenggara, Indonesia. Data on birth weight of Bali cattle during 2009 and 2014 were used in this study. Effect of sire and year on birth weight was analyzed using analysis of variance. Variance component was estimated using REML method and heritability for birth weight was estimated using sire model applying genetic model of Genstat software (version 16). The result showed that birth weight of male (15.38 ± 2.26 kg) was significantly higher than those of female (14.20 ± 1.83 kg). Heritability value was 0.12. Effect of sire on birth weight of progeny was highly significant. The highest breeding value for birth weight was sire number 1452 with the mean of birth weight of progeny was 16.56 kg. It could be concluded that improvement of birth weight in order to improve survivability of Bali cattle could be done by selection for the high genetic value of sire.

Keywords: *birth weight, breeding value, heritability*

Quality of Semen and Production Frozen Semen of Different Breed and Individual Beef Cattle

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Abstract

This study aims to determine differences in the quality of semen and semen production capabilities in various breed of Beef cattle. This study is based on secondary data Artificial Insemination Centre Lembang West Java, Indonesia. The material used is a Brahman cattle = 12 head, Ongole cattle = 11 head, Angus cattle = 5 head, Limousin cattle = 55 head. Simental cattle= 56 head, Madura cattle = 5 head and Aceh cattle = 4 head. Semen Collecting is done routinely starting in July 2014 till July 2015. Semen Collection amount depends on the number of cattle that are capable of producing a minimum of 11 times as much semen collection. The parameters measured were volume of semen (ml), percentage of progressif motility (%), Concentration (milion), Total of sperms motility and the amount of straw are produced every semen collection (straw/collection). Results showed sequentially in Brahman cattle, Ongole cattle, Limousin cattle, Simental cattle, Madura Cattle and Aceh cattle. Volume of semen is = $7,17 \pm 2,18$ ml; $6,07 \pm 1,09$ ml; $7,24 \pm 1,70$ ml, $6,96 \pm 1,09$ ml, $6,78 \pm 1,12$ ml, $4,88 \pm 0,53$ ml, and $4,30 \pm 0,71$ ml, there is no significant difference ($P > 0,05$) of difference Breed but there are significant differences between individuals within the same breed ($P < 0,05$). Average Progressif motility is $63,88 \pm 9,72\%$; $66,22 \pm 5,66\%$; $54,88 \pm 18,43\%$; $62,15 \pm 6,82\%$; $61,22 \pm 9,51\%$; $64,11 \pm 5,66\%$; $55,22 \pm 1,35\%$. There is significant difference ($P < 0,05$). Consentration sperms is $1116,96 \pm 317,94$ milion/ml; $1005,51 \pm 199,73$ milion/ml; $1068,83 \pm 116,24$ milion/ml; $11,41,96 \pm 190,65$ milion/ml; $1098,79 \pm 225,30$ milion/ml; $1053,25 \pm 239,41$ milion/ml; $856,05 \pm 136,85$ milion/ml. There is significant difference ($P < 0,05$) and There are significant differences between individuals within the same breed ($P < 0,05$). Total motile spermatozoa is $5.162,82 \pm 2.261,61$ milion/ejaculation; $5005 \pm 1565,88$ milion/ejaculation; $4.090 \pm 1.088,22$ milion/ejaculation; $29.486 \pm 20.147,79$ milion/ejaculation; $5018 \pm 1.529,57$ million/ejaculation; $3.370,66 \pm 624,29$ milion/ejaculation $3.494,95 \pm 769,73$ milion/ejaculation. There is significant difference ($P < 0,05$) and there are significant differences between individuals within the same breed ($P < 0,05$). Number of straw per day collection is $312,78 \pm 105,17$ straw/day collection, $305,90 \pm 82,42$ straw/day collection, $277,93 \pm 8,48$ straw/days collection, $317,66 \pm 60,77$ straw per day collection, $324,56 \pm 69,37$ straw per day collection, $206,36 \pm 22,39$ straw per day collection, $217,25 \pm 52,76$ straw per day collection. There is significant difference ($P < 0,05$) and there are significant differences between individuals within the same breed ($P < 0,05$).

Keywords: sperms motility, consentration, total of sperms motill, number straw per day collection

Introduction

Artificial Insemination (AI) is most important single technique devised for the genetic improvement of animals, because a few select male produce enough sperm to inseminate thousands of females per year (Ax et al, 2008^b). AI in the broadest sense is the use of a technological process involving semen collection for the obtainment, processing, and deposition of male gametes in the female genitals to fertilize the oocyte (s), thereby by passing semen deposition by natural mating. The driving force behind commercial AI is to disseminate superior genes with genetic merit in to population at an affordable cost. The important genetic traits, depending on the species, include the rate of muscle production and milking gains (Hopkins and Evans, 2003).

Artificial insemination has been proven to improve the productivity of cattle, so that artificial insemination is applied at the level of the livestock industry and farm people in Indonesia. Artificial Insemination Centre in Indonesia there are 2 that the national level is in Singosari Malang and Lembang, West Java. Bull in Artificial Insemination Centre Lembang consists of various breed namely Local cattle consisted of Brahman cattle, Ongole cattle, Madura cattle, Bali cattle and Aceh cattle, while imported beef cattle consisting of Limousin cattle, Simmental cattle and Angus cattle.

Semen production is influenced by body weight has a positive correlation with the circumference of the scrotum, because most testicular volume contains tubules seminiferi which function to produce spermatozoa, but it is also influenced libido which affects the volume of seminal plasma that produced (Hafez, 2008) and (Garner and Hafez, 2008).

Semen volume, motility individual and frozen semen production in cattle Limousin, Simmental, Ongole and Brahman conducted in the Central Artificial Insemination Ungaran show differences (Zamuna, Susilawati, Ciptadi and Marjuki, 2016). Continued by Nyuwita, Susilawati and Isnaini (2015) The study was conducted in the same place the increasing age of 3.4 years 7 and 8 in cattle Simmental will increase semen volume, but the motility and concentration descend.

Bali cattle as one of the indigenous cattle breeds raised in many villages of Indonesia have good adaptability and high fertility. However, the genetic performance of Bali cattle is still low, so that their productivity have not maximum yet (Sumadisa et al, 2015) This study aims to know the differences semen quality fresh and frozen semen production in different breed beef cattle and and in different individuals at the same breed

Methodology

Collection and preparation of semen: Fresh semen was obtained from the center of Artificial Insemination located in Lembang west Java. Several provision from standrd of SNI are the individual motility shout be at least 70%, the minimum mass motility should be 2+, spermatozoa were stored at a concentration 5×10^6 The material used in this study is the breed beef cattle semen, which is the breed Angus cattle = 12 head (359 semen collection), Limousin = 11 head (4335 semen collection), Simmental = 5 head (4406 semen collection), Aceh cattle = 55 head (236 semen collection), Brahman cattle = 56 head (789 semen collection), Madura cattle =5 head (465 semen collection) and Ongole cattle = 4 head (832 semen collection). Semen collection using Artificial Vagina with semen collection frequency 2 times a week.

This research used records semen Volume, sperms Motility, sperms concentration, total motile sperms and the amount of straw that can be produced, records obtained from July 2014 until July 2015. The method used is the method of randomized block design experiment

Results and Discussion

Volume semen

The quality of semen consisting of semen volume, percentage motility, sperm concentration and total motile spermatozoa. The average volume of semen that most are Angus cattle ($7,24 \pm 1,70$ ml) followed by a Brahman cattle ($7,17 \pm 2,18$ ml), Limousin cattle ($6,85 \pm 1,09$ ml), Ongole cattle ($6,73 \pm 1,09$ ml), Simental cattle ($6,63 \pm 1,12$ ml), and the least is the volume of cattle Aceh ($5,10 \pm 0,71$ ml). Semen volume Angus cattle are most, but not statistically significantly different from the Limousin, Simental, ongole and Brahman cattle and significantly different ($P < 0,05$) with Madura and Aceh cattle. Between individuals semen volume cattle of Angus, Aceh, Madura, and Ongole indicated significant differences ($P < 0,05$). Based on these results indicate variation in volume between breed and between individuals is very large. Results were almost the same as research Zamuna et al (2015) doing research in AI Ungaran the data in 2014 for the breed Limousin cattle, Simental, PO and Brahman there is a difference, Result researc Sumeidiana, dkk.(2007) the average volume of semen inter-breed Simental, Limousin and Brahman cattle did not show any differences

Motility of sperms

The average percentage motility most of the largest cattle Ongole ($65,74 \pm 5,66\%$), followed by Aceh cattle ($65,39 \pm 1,35\%$), Madura cattle ($64,11 \pm 5,66\%$), Brahman cattle ($63,90 \pm 9,72\%$), Limousin cattle ($63,20 \pm 6,82\%$), Simental cattle ($61,03 \pm 9,51\%$) the least was Angus cattle ($54,88 \pm 18,43\%$). Statistical analysis sperms motility indicates no significant difference ($P > 0,05$). to each and every individual in the same nation showed significant differences ($P < 0,05$). Results were consistent with the results of research Zamuna et al (2015).

The concentration of spermatozoa

The average concentration of spermatozoa which most is in Simmental cattle ($1.165,47 \times 10^6 \pm 225,30$ /ml), followed by Limousine cattle ($1.127,83 \times 10^6 \pm 190,65$ /ml), Brahman cattle ($1.116,96 \times 10^6 \pm 317,94$ /ml), Ongole cattle ($1.086,37 \times 10^6 \pm 199,73$ /ml), Angus cattle ($1.068,83 \times 10^6 \pm 116,24$ /ml), Madura cattle ($1.054,25 \times 10^6 \pm 239,41$ /ml), Aceh cattle ($960,66 \times 10^6 \pm 136,85$ million /ml). Statistical analysis sperms concentration the breed different cattle indicate a significant difference ($P < 0,05$), The concentration of spermatozoa as well as among individuals in each breed showed significant differences ($P < 0,05$). The data is still within the normal ranges are in accordance with the opinion of Ax et al (2008^a) Sperm concentration ranges from 2×10^8 sperm/ml in youngs bulls to $1,8 \times 10^9$ sperm/ml in mature bulls.

Total Spermatozoa yang Motil

The average total motile spermatozoa were Limousin cattle ($29.486,33 \times 10^6 \pm 20.347,79$), Brahman cattle ($5.162,82 \times 10^6 \pm 2.261,61$), Simental cattle ($5.018,14 \times 10^6 \pm 1.529,57$), Ongole cattle ($5.004,99 \times 10^6 \pm 1.565,88$), sapi Angus ($4.090,05 \times 10^6 \pm 1.088,22$), Aceh cattle ($3.493,95 \times 10^6 \pm 769,73$) dan yang paling sedikit pada sapi Madura ($3.370,66 \times 10^6 \pm 624,29$). Statistical analysis total motile spermatozoa indicate a highly significant difference ($P < 0,01$), Total motile spermatozoa between individuals in each breed showed significant differences ($P < 0,05$).

Based on the numbers on these results do not different from the results of research Zamuna et al (2015) The average total motile spermatozoa in Simental bull is $5.532,9 \times 10^6 \pm 2314,2$; Limousin bull = $7.908,9 \times 10^6 \pm 3.851,2$; Filial Ongole bull = $5.651,6 \times 10^6 \pm 2.418,4$, Brahman Bull = $3.053,3 \times 10^6 \pm 4.356,6$. An average of these parameters did not show significant differences in various breed cattle. Ahmed *et al.* (2014) Indicates that the total spermatozoa different cattle breeds are substantially different

Total motile spermatozoa is affected by body weight and age research results Nyuwita et al (2015) The average total motile spermatozoa Simmental cattle at the age of 3 years = $8341.8 \times 10^6 \pm 1.282,5$; age 4 years = $7471.7 \times 10^6 \pm 845.6$; age 7 years = $8.857 \times 10^6 \pm 662,7$ and 8 years = $7.820.3 \times 10^6 + 2.229.4$ Results of analysis of variance showed that age give real effect to total motile spermatozoa Simmental cattle.

Ax et al (2008^b) The bull can be collected twice daily for optimal sperm out put . The average to strive for is a total of 30 bilion sperm cells. Akhter, *et al.* (2013) that there are differences in the number of motile spermatozoa between breed cattle on the number of motile spermatozoa fresh semen.

Number of straw produced per semen collection

Number of straw every collection semen that most is on the Simmental cattle $324,56 \pm 69,37$ straw/collection, continued Limousine cattle = $317,66 \pm 60,77$ straw/collection, Brahman cattle = $311,78 \pm 105,17$ straw/collection; Ongole cattle = $305,90 \pm 82,42$ straw/collection; Angus cattle = $277,93 \pm 8,48$ straw/collection, Aceh cattle = $217,25 \pm 52,76$ straw/collection and the least amount is Madura cattle = $206,35 \pm 22,39$ straw/collection. Number of straw each collection showed no significant difference ($P > 0,05$)

Conclusion

The quality of sperms which consists of the percentage of progressive motility, concentration, total motile spermatozoa as well as the number of frozen semen straw produced per day there are differences between breeds of beef cattle and also between individuals within the same breed, only the volume of semen that there are differences among the cattle.

Oral Presentation 3 Focus Session:

Livestock Production

Friday, 21 October 08:00-09:20

Room: Anjasmoro

Physical Carcass Characteristics from Body Composition of Timor Pigs Boar Kept Extensively in the Province of East Nusa Tenggara - Indonesia

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Abstract

An experiment was conducted to study the body composition of Timor pigs boar kept extensively with aged range from 2 to 3.9 months, 4 to 5.9 months, and 6 to 7.9 months. 18 Timor pigs boar used in this study. They were kept extensively by people in the Province of East Nusa Tenggara (ENT), eastern Indonesia. They were purchased from variety of locations that represent the coastal areas and mountainous regions of the island of Timor. Their age represent the three age ranges, namely; 2 to 3.9 months as starter; 4 to 5.9 months as grower; and 6 to 7.9 months as finisher. They were kept temporarily for 14 hours before they were slaughter. The local pig body composition of Timor pigs boar kept extensively had a percentage carcass weight of 74.08% and percentage of non-carcass weight 15.70%. Their averaged age range from 4 to 5.9 months had a percentage of carcass weight 76.08% and percentage non-carcass weight of 13.92%. Finally, their age range from 6 to 7.9 months had a percentage carcass weight of 76.18% and percentage non-carcass weight of 13.82%. The physical carcass characteristics of Timor pigs boar with percentage carcass weight during the period of starter, grower and finisher of 74/08%, 76.08% and 76.16% respectively were with in the normal range of 60 – 90% from live weight of pigs. It can be concluded that the composition of the body weight of Timor pigs boar kept extensively in the province of ENT, Indonesia has increased in line with increased age as an indication of the normal growth and development of the animal's body.

Keywords: carcass, Timor pig, boar, East Nusa Tenggara

Introduction

Indonesian native pigs originating from pig-wild boar that has been tamed, for example, Nias pigs, pigs Karawang, pigs in Bali, Sumba pigs, Timor pigs etc. The good quality of pigs imported from Indonesia is ever brought Landrace, Yorkshire, Tamworth, Berkshire and Poland China. Crosses between local pig and pig imports are common. Pigs have a growing body of cross breeding and the use of feed that is better than local pig (Dilaga, 2013). In general, pig farming in Indonesia is the third-largest producer of meat for human consumption, following poultry and ruminants. Pork alone accounted for about 8% of Indonesia's total meat consumption compared to broiler (55%), native chickens (10%), goat (7%), and others (1% - Figure 1) with its per capita meat consumption from livestock in Indonesia is still lower compared to many countries (Henuk and Bakti, 2016). Although the majority of the population in Indonesia are Muslim (90%), several provinces have religious views that coincide with the consumption of pork, such as Bali, East Nusa Tenggara (ENT), Sulawesi, and Papua. The

Province of ENT, eastern Indonesia, has the largest pig population in the country with pigs having economic and cultural significance (Leslie, 2012).

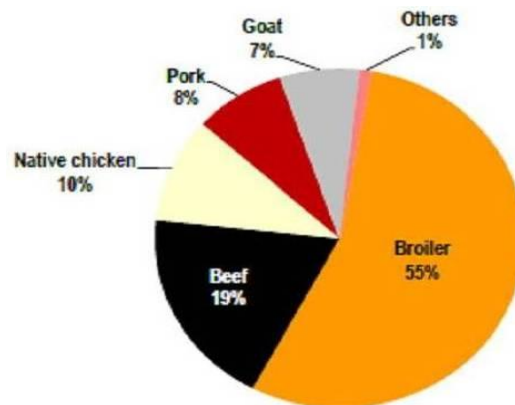


Figure 1. Indonesia's total meat consumption from livestock. (Henuk and Bakti, 2016)

Timor pigs particularly is widely used in traditional ceremonies and their meat is preferred by the community rather than crosses pigs. They are generally kept extensively and to meet their needs based on the availability of food in the surrounding neighborhood. This leads to low productivity and their body composition vary from one location to another (Wea, 2004). For this reason, the aim of this study was to investigate the body composition of Timor pigs boar kept extensively with aged range from 2 to 3.9 months, 4 to 5.9 months, and 6 to 7.9 months.

Methodology

18 Timor pigs boar used in this study. They were kept extensively by people in the Province of ENT, eastern Indonesia. They were purchased from variety of locations that represent the coastal areas and mountainous regions of the island of Timor. Their age represent the three age ranges, namely; 2 to 3.9 months as starter; 4.5 to 5.9 months as grower; and 6 to 7.9 months as finisher. They were kept temporarily for 14 hours before they were slaughtered.

Results and Discussion

The average data of physical carcass characteristic include live weight, carcass weight, and non-carcass weight of Timor pigs boar kept extensively in different ages was shown in Table 1.

Table 1. Mean body composition of Timor pigs boar kept extensively in different ages.

No. of pigs	Aged (months)	Body composition (g)		
		Live weight	Carcass weight	Non-carcass weight
6	2 – 3.9	5100	37781,7	800,67
		(4200-6100)	(74.08%)	(15.70%)
6	4.5 – 5.9	15000	11412,00	2088,00
		(14200-16000)	(76.08%)	(13.92%)
6	6 – 7.9	18216,7	13876,67	2520,00
		(17500-19500)	(76.18%)	(13.82%)

Based data on Table 1 indicated that the body composition of Timor pigs boar kept extensively with age range 2 to 3.9 months had a live weight ranged between 4200-6100g with an average of 5100g; and their carcass weight range 3180-4489g on average 3778.17 (74.08%) and non-carcass weight ranged from 600-1001g on average 800,67g (15.70%). Moreover, their averaged age range from 4 to 5.9 months had a live weight ranged between 14200-16000g with an average of 15000g; and their carcass weight range 10839-12060g on average 11421g (76.08%) and non-carcass weight ranged from 1941 to 2280g on average 2088g (13.92%). Finally, their age range from 6 to 7.9 months had a weight range between 17500-19500g with an average 18216.7g; and their carcass weight range 13450-14640g on average 13876.67g (76.18%) and non-carcass weight ranging from 2300-2920g on average 2520g (13.82%).

The physical carcass characteristics of Timor pigs boar with percentage carcass weight during the period of starter, grower, and finisher of 74.08%, 76.08% and 76.16% respectively were within the normal range of 60 – 90% from live weight of pigs recommended by Einsminger (1991). In general, the composition of the body weight of Timor pigs boar kept extensively in the province of ENT, eastern Indonesia has increased in line with increased age as an indication of the normal growth and development of the animal's body (Einsminger, 1991).

Conclusion

Body composition Timor pigs boar kept extensively and they slaughtered and produced different weight cut, carcass weight, non-carcass weight according to their different growth rates.

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Effect Equilibration Time in The Process of Freezing The Quality of Semen Wagyu Bull Using Diluent ®Andromed

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Abstract

This studies aimed to know the effect of long equilibration of Wagyu cattle semen on the semen quality and to determine the influence of individuals on the quality of Wagyu cattle semen on different equilibration time. The material used in the form of Wagyu cattle fresh semen is derived from 9 times collecting process from 3 bulls. The collection process conducted one time a week for each bull by using an artificial vagina. All bulls are maintained by good management in PT. Austasia Stockfeed breeding unit. Fresh semen that was used had average value of individual motility percentage of 75% and the mass motility 3+. The diluent used was AndroMed®. This research method is experimental laboratory with 3 treatments and 10 repetition. The treatments were three long equilibrations time span with P1 (3 hours 30 minutes), P2 (4 hours), and P3 (4 hours 30 minutes). The observed variables include the percentage of individual motility at the time before freezing and after freezing and total motile spermatozoa (TMS). Data analysis used analysis of variance and design used was a randomized block design nested two stages. The results of this study indicates that the equilibration time difference (P1, P2, and P3) no significant effect ($P > 0.05$) to percentage of individual motility of spermatozoa in Wagyu cattle. Wagyu cattle bull individual differences influence on semen quality before freezing and post thawing. Bull 1 has the best quality of spermatozoa percentage value with the value of the percentage of individual motility spermatozoa before freezing and post thawed with the value $61.67 \pm 2.50\%$ and $35.51 \pm 7.71\%$.

Keywords: *semen quality, individual motility, post thawing*

Introduction

Efforts to improve the productivity of livestock and to overcome the limitation of the number of superior male can be done by improving the genetic quality of livestock through the AI program. In the Frozen semen production process. here are several things that greatly affect the quality of the semen. including the freezing process. In this process occurs a critical point temperature on spermatozoa to survive due to cold shock. Spermatozoa adapted with glycerol in cold temperatures. This process is also known as equilibration. Based on the above description need to do research on the effect of long equilibration of the quality of frozen semen ie individual motility after thawing back (post thawing motility) in spermatozoa Wagyu cattle.

Methodology

Research conducted at the Laboratory of Production PT. Austasia Stockfeed breeding unit Dusun Bawang Kijang, village Negara Batin, District Jabung, East Lampung regency. The material used in this study a superior male fresh semen trained Wagyu beef derived from 9 times the storage of 3 bull. The process of semen collection performed 1 time per week per individual cattle using artificial vagina. Fresh semen were found to have an average percentage of 75% motility individual and mass motility 3+. Dilution semen using commercial diluent is ®Andromed. This research uses experimental methods. The design used was a randomized block design (RAK) Nested two stages. After collection, fresh semen evaluation macroscopically and microscopically. Semen that has been qualified directly diluted using diluent ®Andromed. and the equilibration process is then performed in accordance with the treatment. The final stage is in thawing using warm water temperature of 37-38 ° C. Data obtained by the individual motility of semen before freezing and after diluted (post thawing) 3 treatment time equilibration semen, which is 3 hours 30 minutes (P1), 4 hours (P2), and 4 hours 30 minutes (P3) of each of the three superior male semen trained.

Result and Discussion

Fresh Semen Quality

The volume of fresh semen obtained from each individual bull is different The average of the volume of semen per ejaculate were used in this study sequentially that is *bull* 1 (8 ± 0 ml), *bull* 2 ($10 \pm 1,80$ ml), and *bull* 3 ($8,83 \pm 3,88$ ml). Fresh semen Wagyu cattle in this study includes normal for the type of beef cattle.

Individual Motility of Bull1, Bull 2 and Bull 3 is $75,00 \pm 5,00$ %, $73,33 \pm 2,89$ % and $76,67 \pm 2,89$ %, Viability $93,96 \pm 3,82$ %, $90,73 \pm 1,68$ % and $93,46 \pm 0,67$ %, Abnormality of Bull 1, Bull 2 and Bull 3 is $5,85 \pm 0,80$ % , $7,04 \pm 4,07$ % and $4,46 \pm 1,82$ % , Concentration of Bull 1, Bull 2 and Bull 3 is $1.726,70 \pm 676,56$ (Milion/ml), $1.403,30 \pm 317,70$ (Milion/ ml) and $1.486,67 \pm 234,60$ (milion/ml).

Individual Motility (%) at Before Freezing and Post Thawing on Different bull

Individual motility of spermatozoa in the semen wagyu beef are significant differences ($P < 0.05$) between different individuals of Before Freezing and Post thawing. Individual Motility of *bull* 1, 3 and 2 sequentially is $61,67 \pm 2,50$ %, $58,33 \pm 5,00$ % and $55,00 \pm 0,00$ % on observations before freezing . Post Thawing Motility *bull* 1= is $35,51 \pm 7,71$ %, *bull* 2 is $25,05 \pm 4,39$ %, and *bull* 3 is $30,09 \pm 4,12$ %

Individual Motility (%) at Before Freezing and Post Thawing on Different Treatment

Individual motility of spermatozoa wagyu cattle at different equilibration time showed that there were no significant differences ($P > 0.05$). between treatments for each individual bull either a different time of observation before freezing and post thawing.

Individual motility Before Freezing of Treatment 1, 2 and 3 on Bull 1 is the same = $61,67 \pm 2,89$ %, Bull 2 in the same = $55,00 \pm 0,00$ and Bull 3 is the same = $58,33 \pm 5,77$ %. Post Thawing Motility of Treatment 1, 2 and 3 on Bull 1 = $30,69 \pm 7,32$ %, $35,69 \pm 10,48$ % and $40,14 \pm 2,77$ %; Bull 2 = $25,56 \pm 6,31$ %, $25,00 \pm 6,01$ % and $24,58 \pm 0,72$ % ; Bull 3 = $29,58 \pm 3,70$ %; $30,97 \pm 0,87$ % and $29,72 \pm 7,18$ %. The data below the post-thawing motility SNI 40% (BSN, 2008) The result of the calculation of chi-square (X^2) indicates that PTM these results were not significantly different ($P > 0.05$) with the expected value of 40%. Based on these descriptions, then frozen semen in this study may still be used for inseminated.

Conclusion

1. Older equilibration time does not cause differences in semen motility before freezing and Post thawing on Wagyu cattle, but the individual differences that affect the quality of semen.

2. Bull 1 has a percentage value of best quality with the percentage of spermatozoa motility before freezing and post thawing was $61.67 \pm 2.50\%$ and $35.51 \pm 7.71\%$. Post thawing Motility shows that frozen semen can still be used for the AI

Acknowledgments

Thanks to the breeding unit PT Austasia Stockfeed Jabung, East Lampung which has provided research facilities.

The Effect of Cherry Leaf (*Muntingia Calabura*) Extract on Hatchability and Embryo Mortality Hybrid Duck Egg

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Abstract

The aims of this research were to measure cherry leaf (*Muntingia calabura*) extract concentration used immerses treatment on hatchability and mortality in hybrid duck egg. Method was used in this experiment completely randomized design with five treatments and four repetition: P0 (without treatment), A0 (chemical antibacteria), P1 (10% *Muntingia calabura* leaf extract), P2 (20% *Muntingia calabura* leaf extract), and P3 (30% *Muntingia calabura* leaf extract). The research used four hundred eggs and used semi automatical machine for 28 days. Data of this research were analyzed using one –way Anova. The result showed that the effect of *Muntingia calabura* leaf extract was highly significant different ($P < 0,01$) on hatchability and embryos mortality. The best treatment was 20% concentration of *Muntingia calabura* leaf extract. The conclusion of this research was 20% concentration of *Muntingia calabura* leaf extract has hatchability amount 87,74% and embryos mortality amount 12,26%.

Keywords: *Muntingia calabura*, antibacteria, hatchability, embryos mortality

Introduction

Duck is the one of kind poultry which has important role for egg and meat production. The problem in Indonesia DOD (*Day Old Duck*) population still has lowest in which have impact on lack of duck meat and duck egg. This problem needs solution to increased DOD population in mass capacity. Most hatchery farm using hatchery machine for egg hatchery media, but result of egg hatchability still low because most of problem was hygiene of duck egg has bad condition. One important thing that must be concern was egg shell cleanliness.

Outer part in egg was egg shell which has not clean condition because excreta, pathogen bacteria available in excreta and it will cause abnormality in embryo. Anderson (2012) mentioned *Staphylococcus aureus* and *Salmonella sp* harmful bacteria most discover on egg shell. Those bacteria can cause hatching process failed through death embryo (Soeripto and Poeloengan, 1991). Therefore disinfection process must be applied in egg hatchery.

Disinfection process used chemical antibacterial or usually called *formaldehyde*. This liquid can cause death embryo and high mortality in egg hatchability if the dose is overrated (Nandhra et al., 2012). This statement reinforced by Zamzamy et al.(2015) was using chemical disinfectant with low concentration cannot kill pathogen bacteria on egg, while if use high concentration can kill egg embryo. Consequently need a solution like herbal material that come from nature and can replace *formaldehyde*. Cherry leaf (*Muntingia calabura*) is a natural resource could be inhibiting even kill pathogen bacteria on egg.

Muntingia calabura leaf has many active compounds that can work as antibacterial there are flavonoid, saponin and tannin (Kurniawan et al., 2013). Flavonoid have a role to inactivated function of bacteria and tannin can inhibit extracellular enzyme bacteria and requisition substrate that used for bacterial growth as of can inhibit bacteria growth.

Big potential in *Muntingia calabura* leaf with antibacterial compound have a chance to replace *formaldehyde* in hatchery fumigation proceed. Therefore author doing a research about utilization of *Muntingia calabura* leaf as natural antibacterial also the effect on hatchability and mortality in hybrid duck egg.

Methodology

Duck egg hatchery was take place at hatchery farm in Junrejo village, Batu, Malang regency. Extraction process of *Muntingia calabura* leaf was in Materia Medica Laboratory, Batu, Malang regency. The research used four hundred eggs and used semi automatical machine for 28 days. Hybrid duck egg was found local farmer in Junrejo village, Batu, Malang regency. All duck egg which used for research has been selection based on egg shell color, egg shape and egg weight. The research method was field experiment by completely random design with five treatments and four repetition: P0: without treatment (as a control), A0: 2.5 chemical antibacterial + 100 ml aquadest (as negative control), P1: 10% concentration= 10 ml *Muntingia calabura* leaf extract + 90 ml aquadest, P2: 20% concentration= 20 ml *Muntingia calabura* leaf extract + 80 ml aquadest , P3: 30% concentration= 30 ml *Muntingia calabura* leaf extract + 70 ml aquadest. Variable that observe in his research was percentage of hatchability and mortality hybrid duck egg. Data of this research were analyzed using one –way Anova and will followed by Duncan Multiple Range Test.

Result and Discussion

Result of this research by using *Muntingia calabura* leaf extract and other concentration will be serving in table 1.

Table 1. Percentage of hatchability and embryo mortality on several treatment

Treatment	Hatchability (%)	Embryo Mortality (%)
P0	78,38 ^a	21,62 ^d
A0	81,13 ^{bc}	18,87 ^{bc}
P1	83,51 ^c	16,49 ^b
P2	87,74 ^d	12,26 ^a
P3	80,81 ^{ab}	19,19 ^{cd}
Sign	***	***

*** = highly significant different

The data showed by giving *Muntingia calabura* leaf extract more efective than control treatment (P0). The best treatment was 20% concentration of *Muntingia calabura* leaf extract with result has hatchability amount 87,74% and embryos mortality amount 12,26%.

According Fujiawati, et al. (2011) during hatching process, oxygen were need for embryo respiratory, if the embryo lack of oxygen it will cause mortality. Enhancement of egg hatchability caused by active compound in *Muntingia calabura* leaf extract can inhibit the growth of pathogen bacteria which has negative effect on hybrid duck egg hatchery. The mechanism tannin as antibacterial to inhibit extracellular enzyme and requisition substrate that need for the growth of pathogen bacteria or tannin work in egg

metabolism directly by inhibit oxydation process that prevent egg will release gas and water (Nurwantoro et al., 2004).

Conclusion

Muntingia calabura leaf extract with 20% concentration could be used as natural antibacterial in hybrid duck egg hatchery process to increase egg hatchability and decrease embryo mortality.

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Preliminary Study on Estimation of Energy Requirement for Eating Through Urinary Creatinine In Local Male Sheep

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Abstract

This study was aimed to determine the relationship between eating behavior (the number of chewing and eating) and urinary creatinine in local male sheep. The materials used in this study were 12 heads of local male sheep aged one year old with an average body weight of 25.04 ± 0.44 kg (CV = 6.24%). The study was done based on a completely randomized design (CRD) using 3 treatments and 4 replications. All sheep were fed concentrate feeding at 2.3% of body weight and various rice straw ad libitum. Parameters measured were dry matter intake (DMI), the number of chewing, eating times, and the amount of creatinine excreted through urine. The data obtained were analysed by correlation and regression. The results showed there were a strong relationship between urinary creatinine and eating behavior, i.e. chewing activity and eating time, being 0.890 and 0.809, respectively. The energy required for one hour eating activity could be estimated 5.686 kJ.

Keywords: *eating behavior, local male sheep, rice straw, creatinin*

Correlation Between Crude Protein Levels in The Diets and Carcass Weight and Carcass Percentage in Thin Tailed Lambs

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Abstract

The aim of this experiment was to know the correlation between crude protein levels in the diets and carcass weight and carcass percentage of thin tailed lambs fattened after weaning. This experiment used 12 thin tailed lambs, aged approximately 3 months with body weight ranged at 12.9-18.61 kg. Feeding given was arranged to allow 12, 14 and 16% crude protein and TDN at 60% using the following feeds ingredients such as rice bran, cassava peel, sugar cane top, cassava flour, soybean meal, fish meal, molasses and minerals. The lambs were slaughtered after 3 month feeding treatment. Carcass from slaughtered animal was weighed to obtain carcass weight and percentage to slaughter weight. The data obtained was analyzed using correlation analysis. Slaughtered weight was found ranged at 19.62-29.89 kg resulted carcass weight at 8.23-14.13 kg or equal to 41.94-49.56% carcass percentage. The correlation between crude protein levels in the diets with carcass weight and carcass percentage of thin tailed lambs were weak, being 0.22 and 0.32, respectively. Thus, it can be concluded that crude protein levels in the diets was positive and weak correlated to the carcass weight and carcass percentage in thin tailed lambs fattened after weaning.

Keywords : lambs, crude protein levels, carcass weight, carcass percentage

Introduction

Thin tailed sheep is one of the sheep used for fattening purposes. In addition, this sheep has several advantages including a high level of prolificacy, resistant to disease and heat and resistant to environmental conditions (Mulliadi and Arifin, 2010). Fattening can be performed on lamb after weaning which is considered has a faster growth rate than on sheep.

Lambs that are in growing period required high protein and TDN levels to support the rapid growth of lambs (Prima *et al.*, 2016), and in turn it can increase the carcass production of lambs. The previous research showed that addition of high protein can support the rapid growth and increase the carcass weight and carcass percentage of sheep (Purbowati *et al.*, 2005). Increasing levels of protein in the diets from 14.48% to 17.42% were able to increase carcass percentage from 43.81 to 45.62% at 12 months of age of sheep (Purbowati, 2007). However, there is a different in growth pattern in lamb and sheep. The growth of lamb is more in non-carcass portion (viscera, head, bottom leg) rather than of carcass portion. Therefore, it is needed to be evaluated on a high protein levels in feeding lambs after weaning on carcass weight and carcass percentage.

Methodology

This experiment used 12 thin tailed lambs, aged approximately 3 months with body weight ranged at 12.9-18.61 kg. They were fed a pelleted complete feed composed of rice

bran, cassava peel, sugarcane top, cassava flour, soybean meal, fish meal, molasses and minerals which was arranged to give crude protein of 12, 14 and 16% with total digestible nutrients (TDN) was at 60%. The feed and water were given ad libitum.

The lambs were slaughtered after 3 months rearing under those feedings. Lambs were fasted for 6 hours prior to be slaughtered. After being slaughtered and carcassing, the carcass of lamb was aging at 17°C in 10 hours, then was weighed to determine carcass weight.

The data was obtained and analyzed using correlation analysis. The relationship between the two variables could be seen from the magnitude of the correlation value where value from 0 to 0.199 (very weak); 0.2 to 0.399 (weak); 0.40 to 0.599 (medium); from 0.60 to 0.799 (strong); and 0.80 to 1 (very strong) (Sugiyono, 2007).

Result and Discussion

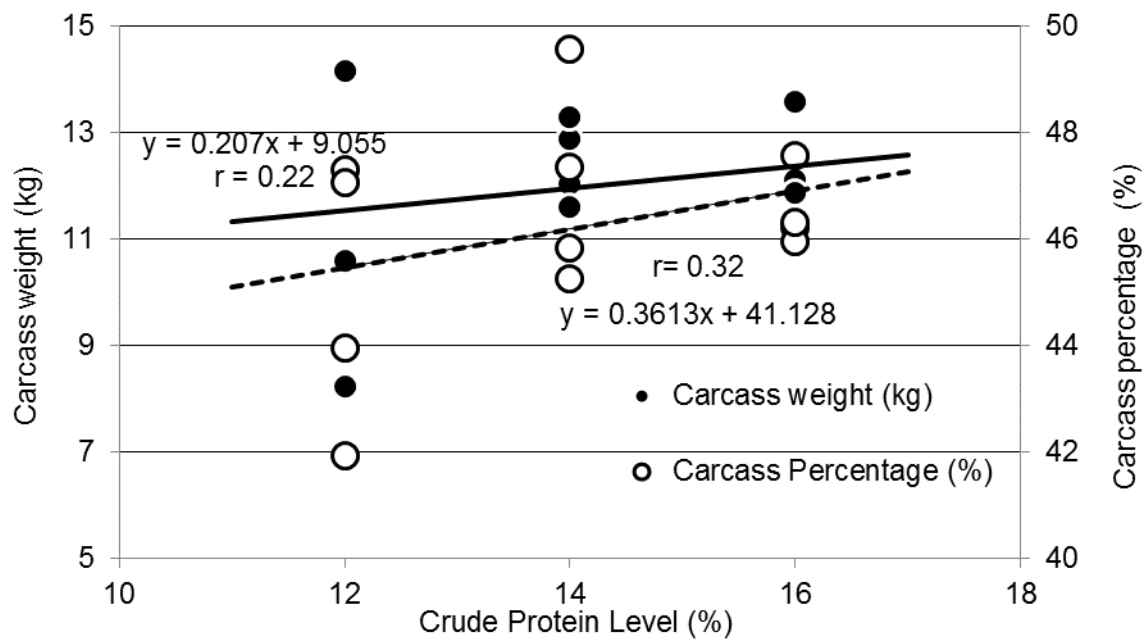


Figure 1. Correlation between crude protein levels in the diets (12, 14, 16%) and carcass weight (kg; solid line) and carcass percentage (%; dotted line) of lambs.

The result showed that feeding with different crude protein levels has a weak ($r= 0.22$) correlation to the lamb carcass weight. It was comparable to the value of the correlation to the percentage of lambs carcass. Feeding with crude protein levels had the weak ($r= 0.32$) correlation to percentage of lambs carcass. Figure 1 showed the correlation of crude protein levels in the diet and carcass weight and carcass percentage. The results showed that every 2% increasing in protein content of feed could increase the percentage of carcasses by 0.7% in a lamb after weaning. This was in contrast with the previous research conducted by Purbowati (2007) that every increase in the diets of 3% protein content of feed could increase the percentage of carcasses by 2% in sheep. This result indicated that the strength of correlation between crude protein levels in the diet and the carcass percentage was differ between lamb and sheep, in which sheep was more correlated than of lamb. This phenomenon agreed to the fact that the body part which grow faster in young animal is a non-carcass, while in mature animal is mainly on carcass portion (Owens et al., 1993).

Conclusion

Based on the result of experiment, it can be concluded that crude protein levels in the diets was positive and weak correlated to the carcass weight and carcass percentage of thin tailed lambs fattened after weaning.

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Correlation Between Yield Grade and Rib Eye Muscle Area with Different Fed Level Protein of Male Thin-Tailed Weaning Lamb

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Abstract

This study was set up to investigate yield grade and rib eye muscle area of male thin-tailed of weaning lamb fed different levels of crude protein (CP). Twelve of weaning lambs aged ± 6 months were used with slaughtered weights $\pm 25,82$ kg (CV=13,71%). Feed contained 12-16% of CP and 60% of total digestible nutrient (TDN), and fattened during 3 months. The backfat thickness at the 12th rib (surface area LD muscle) was measured by using calipers, and calculated the yield grade value by formulating as $0.4 + (10 \times \text{backfat thickness in inches})$. Rib eye muscle area measurements on the rack of ribs to 12 and 13 by using millimeter block and glass. All data were analyzed using correlation analysis. The results showed that protein levels has low correlation with the yield grade value ($r = 0.136$). The protein levels of the rib eye muscle area also has low correlation ($r = 0.166$). It can be inferred that the yield grade and rib eye muscle area have low correlation with protein levels in the feed.

Keywords: *weaning lamb, yield grade, rib eye muscle areae.*

Correlation Between Fecal Rough Particle and Feed Digestibility on Thin Tail Lambs

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Abstract

This study aimed to explore fecal rough particle and its correlation with feed digestibility in lambs. Twelve weaning lambs around 3 months old with body weight of $15,03 \pm 0,24$ kg (CV= 1,61%) has been used in this study. Data were collected by soaking 10 gram of fecal with 50 ml of water during 24 hours, then sifted that has been soaked through the strainer til got around 0.10 mm of the cavity size. Feed used in this study contained peel of cassava, *molasses*, sugar cane top, rice bran, dried cassava, soybean meal, fishmeal, and minerals. The lambs fed ration containing $\pm 12 - 16\%$ of crude protein and 60% of total digestible nutrient (TDN). Data were analyzed using correlation-regression to find the correlation between fecal rough particle and feed digestibility. The result showed that fecal rough particle and feed digestibility has highly positive correlation valued of 0,787 (= strong; $P < 0,05$). The conclusion of this study was fecal rough particle has highly correlation with feed digestibility.

Keyword: *digestibility, fecal rough particle, weaning lambs*

Phenotypic Characteristics of Aceh Cattle on Different Sex and Age in Smallholder Farmers

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Abstract

This study was aimed to measure phenotypic characteristics of Aceh cattle on different sex and period of age in smallholder systems. Three areas (MuaraBatu, Sawang and Nisam sub Districts in North Aceh District) were used to collect data. Phenotypic characteristics were collected from 278 cattle (132 young and 146 adult cattle) with different sex and age. The result showed that male Aceh cattle were heavier and higher in young stage than female ones. In older stage, male Aceh cattle were also higher and had bigger girth of chest (GC) than female ones. However, length of the body (LB), depth of chest (DC) and height at hip (HH) of both male and female cattle were not significantly different on young and adult stages.

Keywords: *Aceh cattle, phenotypic characteristics, smallholder farmers*

Introduction

Aceh cattle is one of Indonesian local cattle and very potential as a meat animal. Aceh cattle is categorized as small cattle which contributes meat production in Aceh Province. North Aceh District is one of the most populous of Aceh cattle.

Phenotypic characteristics of an animal can be measured from their body sizes (Abdullah *et al.*, 2006), and it can be used to identify visually and to determine the ideal growth of the animal (Rosahastuti, 2008 *cit.* Ibrahim, 2016). Some body sizes such as height at withers (HW), girth of chest (GC) and length of body (LB) have a correlation and can be used to predict body weight and describe the performance of the cattle (Hardjosubroto, 1994).

Body weight and body sizes of male Aceh cattle are higher than female cattle on the same age. However, Aceh cattle were indicated of getting smaller from 1926's to 2006's (Abdullah *et al.*, 2006).

This study was conducted to measure phenotypic characteristics of Aceh cattle in smallholder farming systems. It can be used to compare phenotypic characteristics of Aceh cattle in the past and in the future and as a recommendation for a good breeding policy of sustainable use of Aceh cattle.

Methodology

This study was conducted in done in North Aceh District and involved three sub districts, i.e. Muara Batu, Sawang, and Nisam. The 278 cattle were characterized by observing exterior qualitative performances, such as color, body, and face to identify Aceh cattle. Quantitative phenotypic characteristics of 278 cattle consisted of bull, heifer and cow

(132 young and 146 adult cattle) belong to smallholder farmers were collected by weighing and taking length of the body (LB), girth of chest (GC), height at withers (HW), depth of chest (DC), height at hip (HH) and length of head (LH) and width of head (WH). The age of each animal was determined by inspecting its teeth (Djanah, 1984). When 0.5 – 1.5 pairs of temporary incisors or pinchers replaced by the permanent pinchers indicates as young cattle and when 2 or more pairs of temporary pinchers is replaced by permanent ones, indicates as adult cattle. The data were analyzed using analysis of variance (ANOVA).

Results and Discussion

The phenotypic characteristics of Aceh cattle is presented in Table 1. Male Aceh cattle are much heavier than female ones in young ages. However, the body sizes of adult male and female cattle were not different. It is not in agreement with Abdullah *et al.* (2006) who reported that adult male Aceh cattle (176.05 kg) are significantly heavier than female ones (158.26 kg).

Body of male Aceh cattle tended to be longer than females cattle in both young and adult stages, but not statistically proved. This result is in line with Abdullah *et al.* (2006) that reported that male Aceh cattle (103.61 cm) were relatively longer than the females (102.91 cm), but not statistically proved. Adult Aceh cattle in this study were longer than of Aceh cattle which were reported by Abdullah *et al.* (2006) but shorter than which reported by Menkens (1926 *cit.* Abdullah *et al.*, 2006) (126.0 cm) and Katingan male cattle (122.6 cm) and Katingan female cattle (115.9 cm) (Utomo, 2015). According to SNI No. 7651.3:2013, length of the body of Aceh cattle is 107 – 116 cm for 24 – 36 months old of male and 82 – 87 cm for 15 – 18 months old of female cattle.

Table 1. Phenotypic characteristics of Aceh cattle in different sex and age periode.

No	Variable	Young		Adult	
		Male	Female	Male	Female
1.	BW (kg)	148.04±48.66 ^a	130.85±29.73 ^b	191.13±25.58	169.02±28.91
2.	LB (cm) ^{ns}	105.29±11.22	103.28±11.70	117.35±5.90	112.89±6.16
3.	GC (cm) ^{ns}	125.54±15.55	122.88±9.97	141.00±4.69 ⁱ	132.63±7.56 ^j
4.	DC (cm) ^{ns}	53.10±8.26	51.17±8.14	57.60±5.47	54.71±3.85
5.	HW (cm)	99.37±10.12 ^a	95.91±5.95 ^b	105.90±2.07 ⁱ	100.28±4.79 ^j
6.	HH (cm) ^{ns}	102.94±9.82	101.44±5.44	107.95±2.42	105.61±5.03
7.	HI (%) ^{ns}	46.91±5.37	46.02±4.36	45.38±3.03	45.95±5.27

BW = Body weight, LB= length of the body, GC = girth of chest, DC = depth of chest, HW= height at wither, HH = height at hip and HI = head index, is calculated by dividing length of head from the width of head in percentage.

^{ns} not significantly different, ^{a,b} and ^{i, j} different superscripts at the same row indicates significant different (P<0.05)

Male Aceh cattle had a bigger (<0.05) of GC than female Aceh cattle in young stage but not significantly different in older stage. There is similiar with Abdullah *et al.* (2006) who reported that the male Aceh cattle (135.25 cm) were bigger (P<0.01) in GC than female cattle (128.52 cm). The GC of Aceh cattle in this study were in the range of GC according to SNI No. 7651.3:2013: which 135 – 143 cm for 24 – 36 months old of male and 94 – 99 cm for 15 – 18 months old of female cattle.

The chest of young and adult male Aceh cattle were relatively deeper than female ones, but not statistically analyzed. The different result was reported by Abdullah *et al.* (2006) that chest of male Aceh cattle (48.10 cm) were significantly deeper than female Aceh cattle (45.25 cm). In this study, DC of Aceh cattle was smaller than those reported (62.8 cm) by Merkens (1926 *cit.* Abdullah *et al.*, 2006).

Both young and adult male Aceh were significantly higher ($P < 0.05$) than female ones. Aceh cattle in this study were higher than those (101.50 cm for male and 99.19 cm for female) which reported by Abdullah *et al.* (2006) but shorter than those (115.5 cm) which reported by Merkens (1926 *cit.* Abdullah *et al.*, 2006) and Katingan cattle (17.1 cm for male and 102.6 cm for female) which were reported by Utomo (2015). Height at the withers of Aceh cattle in this study were in the range of the HW according to SNI No. 7651.3:2013 (105 – 112 cm for male in 24 – 36 months of age and 86 – 90 cm for female in 15 – 18 months of age).

There is no significant difference on HH of young and adult male and female Aceh cattle. However, Abdullah *et al.* (2006) found that male Aceh cattle (107.45 cm) were higher ($P < 0.01$) at their hips than female Aceh cattle (103.70 cm). In this study, Aceh cattle were shorter in their hips compared to Katingan cattle (112.4 cm for male and 105.9 cm for female cattle) (Utomo, 2015).

There is no significant difference on HI of Aceh cattle in both sexes and periods of age. The differences in the body sizes are influenced by sex, race, age, body weight, and feed for cattle (Blakely and Bade, 1991).

Conclusion

Male Aceh cattle in the smallholder systems, were heavier and higher than female ones in young stage, and had larger GC and were higher than female ones in older stage. Other sizes such as LB, DC HH, and HI of Aceh cattle in both sexes and periods of age were not different.

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Oral Presentation 3 Focus Session:

Veterinary & Health Care

Friday, 21 October 08:00-09:30

Room: Welirang

The *in vitro* Antibacterial Activity of *Muntingia calabura* against *Staphylococcus aureus* and *Streptococcus agalactiae*

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Abstract

The present study investigated the possible antibacterial activity of methanol, ethanol and aqueous extracts of *Muntingia calabura* using *in vitro* discs diffusion method. The sterilized blank discs (5mm diameter) was impregnated with 10 μ L of the respective extract (the concentration: 10%, 20%, 30%, 40%, 50%, control (iodip) and tested against *Staphylococcus aureus* and *Streptococcus agalactiae* were obtained from fresh milk CMT scor 3. Statistical analysis showed that extract from methanol, ethanol and aqueous were effective in inhibiting growth of *Staphylococcus aureus* bacteria as control treatment at concentration 30% (6.85 ± 0.35 ; 6.43 ± 0.65 ; 6.62 ± 0.19 vs. 6.34 ± 0.07 mm) respectively. Inhibiting zone for *Streptococcus agalactiae* from methanol and aqueous was effective as control at concentration 30% (7.42 ± 0.62 ; 7.77 ± 0.37) while from ethanol it's effective as control treatment at concentration 30%, 7.77 ± 0.37 mm. Inhibiting zone against *Streptococcus agalactiae*s slightly bigger compare to *Staphylococcus aureus*. The increasing concentrations of extract will higher inhibiting zone area. We concluded that *Muntingia calabura* has potency to be used as an antimicrobial activity against the *Staphylococcus aureus* and *Streptococcus agalactiae*.

Keywords: *in vitro*, antibacterial, inhibiting zone area

T Prevalence of trematodes infection in sacrificial cattle in some mosques Manokwari regency West Papua province Indonesia

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Abstract

Diseased organs in slaughtered cattle can be sources of zoonotic threats to man if not detected and controlled. Based on the fact and information that has never done inspection of animals and sacrificial meat when cutting. While believed that the cattle has been infected by worm parasitic, because of rearing system are still traditional. The objective of this study was conducted to determine prevalence of trematodes infection in sacrificial cattle in some mosques Manokwari regency, West Papua province. Seventy two livers and feces of cattle were examined for *Fasciola* sp infections and 52 of rumens of slaughtered were examined for the presence of *Paramphistomum* sp. The statistical analysis was computed on the number of cases of fasciolosis and presence of *Paramphistomum* sp determined at post-mortem inspection to the total number of cattle slaughtered expressed in percentage. The prevalence of fasciolosis was 15,27% (11/72) and paramphistomidae fluke was 18,52% (10/52) in sacrificial animals.

Keywords : prevalence, trematodes, sacrificial cattle, Manokwari

Introduction

Trematode parasite is one of the major problems lowering ruminant productivity (Vercruysse and Claerebout, 2001). These parasitic diseases are found in water lodged and marshy grazing field, a condition anticipated to be ideal for the maintenance of the intermediate host snails and hence high prevalence of trematode infection. Prevalence of trematode worms infection in Bali cattle is quite high, Putra (2002) reported prevalence in Kuta district Bali province was 61,5%.

Helminth parasite are various species of these genera but the economically important ones are *Fasciola* sp and *Paramphistomum* sp. Helminthic infections cause considerable economic loss in livestock due to condemnation of organs and meat production. Moreover, accurate data has not yet been produced on the occurrence of fasciola and paramphistomums in Manokwari regency West Papua province. The moment of the Eid Mubarak in Manokwari regency have serious problem condition in slaughter cattle because of was never done inspection of animals and sacrificial meat when cutting. Besides it is believed to be that the livestock are cut in this day were infected worms parasite based on traditional rearing system. This may also be taken into account for the high incidence of parasitic diseases especially worm parasites. This present study was conducted to determine the prevalence of trematodes infection by faecal and postmortem examination in sacrificial cattle in several mosques Manokwari regency.

Methodology

The study area was in Manokwari regency of West Papua province especially at eight mosques that sacrificial cattles are slaughtered in the Eid Mubarak moment. Seventy two fecal samples for parasitological examination were collected from rectum of each sacrificial cattle and in the laboratory, coproscopic examination was performed to detect the presence of fasciola eggs using the standard sedimentation techniques (Hansen and Perry, 1994). Fifty two rumens of slaughtered were inspected after being opened and washed for the presence of *Paramphistomum* sp. The livers were examined for fasciola by making length-wise incisions of the ventral side of the liver in such a way that the bile duct is cut open. The examination was then done by pressing the liver with the thumbs while holding it firmly on the slab or bench. The prevalence of liver fluke was calculated using the formula below:

$$\text{Prevalence (\%)} = \frac{\text{Number of existing case}}{\text{Size of population}} \times 100\%$$

Summary statistics were produced for each parameter and descriptive statistic such as tables was used to analyses the prevalence of liver and rumen fluke in Manokwary regency.

Results and Discussion

Liver flukes (*Fasciola*) were detected in 11 (15,27%) of the 72 slaughter sacrificial cattle examined in 8 mosques Manokwari Regency. Table 1 shows the prevalence of *Fasciola* sp in sacrificial cattles in 8 mosques. From the total of 52 rumens of cattle slaughtered, 10 (18,52%) were positive for *Paramphistomum* sp. The results of the prevalence of *Paramphistomum* sp in sacrificial animals in 8 mosques are shown in Table 2.

Table 1. Prevalence of *Fasciola* sp in sacrificial cattles in 8 mosques

No.	Name of Mosque	Number examined	Number infected	Percentage Infection (%)
1.	Darul Ulum Mosque	6	6	100.00
2.	Al Fatah Mosque	4	0	0.00
3.	Al Madinah Mosque	6	0	0.00
4.	An Nur Mosque	8	1	12.50
5.	Nurul Huda Mosque	9	1	11.11
6.	Al Islah Mosque	10	0	0.00
7.	Ridwanul Bahri Mosque	12	3	25.00
8.	Abattoir Manokwari	17	0	0.00
Total		72	11	15.27

Table 2. Prevalence of *Paramphistomum* sp in sacrificial cattles in 8 mosques

No.	Name of Mosque	Number examined	Number infected	Percentage Infection (%)
1.	Darul Ulum Mosque	6	6	100.00
2.	Al Fatah Mosque	0	0	0.00
3.	Al Madinah Mosque	0	0	0.00
4.	An Nur Mosque	8	1	12.50
5.	Nurul Huda Mosque	9	1	11.11
6.	Al Islah Mosque	0	0	0.00
7.	Ridwanul Bahri Mosque	12	1	0.00
8.	Abattoir Manokwari	17	2	11.76
Total		52	10	18.52

The highest and lowest of overall infection were recorded during slaughtered sacrificial cattle in the Eid Mubarak. The highest prevalence rate of *Fasciola* sp and *Paramphistomum* sp infection were seen in Darul Ulum Mosque.

From the current study, *Fasciola* sp were demonstrated in 15.27% of inspected fecal sample. This indicates that the transmission cycle of the parasites is active in the region and it causes the risk of human infection. About prevalence of the *Fasciola* sp in other area has been reported 36% in Mengwi sub-district of Bandung regency (Putra, 2014), 94.40% were in Central Lombok district (Astiti and Panjaitan, 2012), 3.00% were in Libureng district Bone regency (Anggriana, 2014) and 18.29% were Karangasem regency of Bali province (Sayuti, 2007), and in abattoir Semarang city were 24.65% (Herliani, 2007).

About prevalence of *Paramphistomum* sp were reported 80.00% in Wosu sub-district West Bungku district Morowali regency (Widnyana, 2013). In other area Darmin (2014) reported that prevalence of paramphistomiasis in Bali cattle of Libureng sub-district Bone regency were 57.00%. The probable reasons of increased infection rate of trematode may include, (1) attributed mainly to the variation in the climatic and ecological conditions such as altitude, rainfall and temperature, and (2) livestock farming traditional. The possibility of cause to highest prevalence in rainy season may be the availability of optimal conditions of environment for the transmission, growth and development of parasitic life cycle stages.

Conclusion

This study has clearly demonstrated the presence of *Fasciola* sp and *Paramphistomum* sp in sacrificed cattle slaughtered in several mosques in Manokwari regency. Although the rate of infection is moderately low, the economic implications should not be overlooked. The rearing system, the traditional way of livestock farming in Manokwari regency may also be taken into account for the high incidence of parasitic diseases.

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IDENTIFICATION OF SWINE DISEASE, PREVENTION AND TREATMENT (A CASE STUDY IN PINASUNGKULAN VILLAGE BITUNG CITY)

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Abstract

This study aims to identify of swine disease, prevention and treatment. Respondents are members of the pig farmers, in the Pinasungkulan Village, Bitung City. This study uses in-depth interviews, analysis descriptive data on 45 farmers which maintains pigs farming. The results showed that the swine disease is colibacillosis with common signs of persistent of diarrhea (profuse), watery stool, yellowish white in color, causing water loss in swine. Breeders cure itself of the disease, by giving diarrhea medicine commonly given to humans, the drug-containing colloidal Attapulgit active and Pectin. To reduce and avoid colibacillosis disease, has been suggested for farmers to provide prevention of disease through vaccines colibacillosis, while also maintaining the cleanliness of the cage, through the processing of pig manure into compost or biogas.

Keywords: *colibacillosis, pig*

Introduction

The development of of farm pigs, potentially in North Sulawesi, is because there are 69.17% of the population are Christians who are potential consumers of pork (Sulawesi Utara dalam Angka, 2015). Pinasungkulan village Bitung City, is one of the areas that develop pigs farming, to provide for pork in Bitung city and surrounding areas.

Generally, pigs reared traditionally, characterized by not managing pig manure, but the waste is just dumped into the river. Such conditions, cause disease in pigs. According to Mertaningsih and Hassan (1985), the incidence of the disease is generally triggered by the presence of predisposing factors such as poor sanitation cages, pigs under conditions of stress or lack of colostrum piglets. The disease is endemic in pigs due to poor management, such as not pay attention to the cleanliness of the cage, and can result easily infected piglets from the mother during breastfeeding.

Pig whose age 2 months or periods starter easily infected by disease diarrhea (scours) with higher mortality rates. Scours (diarrhea) that afflicts pigs this phase can be caused by various infections, such as worms, salmonella and dysentery. Scours (diarrhea) is a symptom of enteritis disease due to inflammation of the digestive tract or bowel, prevention and treatment is usually done by farmers by way aureomycin treatment for 15 days on food or aureomycin Soluble Powder in drinking water will cost a pretty expensive (Sihombing, 2006).

Traditionally managed farms, generally do not yet know how to prevent and eradicate the swine disease. Based on these problems, studies have been conducted to identify diseases that are often found in pigs in Pinasungkulan village Bitung City. Identification of the disease is done by asking directly to pig farmers about the disease that is often experienced by his pigs, then proved by direct observation in pigs and stables as well as the environment around the cage.

Methodology

This research was conducted in the village Pinasungkulan Bitung City, at 45 pig farmers, which has about 70 breeding pigs. In-depth interviews conducted on all pig farmers, accompanied by direct observation in pigs and stables, as well as the environment around the cage. The list of questions about the disease that had attacked pigs, about the vaccine, and the handling has been done by breeders, used in the interview. The data is then analyzed descriptively to describe the identification, prevention and treatment of swine diseases.

Result And Discussion

Characteristics of Respondents

Characteristics of pig farmers in the village Pinasungkulan, described by the level of age, education level, and long tried to livestock. Based on research, it is known that the average age of farmers is 37-60 years old with long tried livestock around 1-3 years. Almost all farmers have the last education is high school first. Until now, there are no special health worker in the village Pinasungkulan animal health.

Swine Disease of Pig Farming, Prevention and Treatment of Swine Disease

The largest losses were felt by farmers, when the disease in cattle, then the costs of treatment. More perceived loss of livestock has earned more if dead. On a traditional farm in the Village Pinasungkulan Ranowulu District of Bitung, a disease that often affects pigs of diarrhea accompanied by inflammation in the joints. Death occurs mainly in pigs puppies or neo natal (Suardjana et al, 2016). Death of piglets in the area can reach 40% of the population of piglets. Breeders still less knowledge for handling the disease, because there are no animal health workers who visited the area. Treatment with drugs that give the "enterostop" and activated carbon (norit.) Antibacterial farmer knew just sulfite, namely preparations sulfa dose is not known. Therefore, need guidance / mentoring more intensive that his cattle could be saved. Based on the symptoms mentioned by farmers and by direct observation, suspected of piglets affected by *basillus coli*, such as *escherisia coli* (Cantey, 1985, Rahardjo, et al., 2002). This is possible by a cage sanitation is not good (Sitohang et al, 2013). Pig manure discharged to the environment or the river, so it can happen to other cattle reinfection.

Conclusion

Farming of pigs traditionally managed, generally does not handle waste properly, because only livestock manure dumped into rivers. In these conditions, pigs are generally susceptible to disease colibacillosis.

Efforts to prevent the disease is to vaccinate pigs, pig manure is collected and subsequently are not disposed of immediately. Besides sanitary enclosure needs to be done to avoid pigs exposed to other diseases.

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Residues of Aflatoxins in Liver, Meat, and Egg of Alabio Duck Collected From South Kalimantan, Indonesia

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Abstract

A limited survey was conducted to determine aflatoxins residues in the products of Alabio duck. In total of 48 liver samples, 42 meat samples, and 38 egg samples were analyzed for determinations of aflatoxin B1 (AFB1) and aflatoxin M1 (AFM1) using Enzyme-Linked Immuno-Sorbent Assay (ELISA) tests. Results showed high occurrences and levels of aflatoxin residues in the products of Alabio duck. AFB1 was found in all liver samples, with concentrations ranging from 53 to 77 ppb (average: 65 ppb). AFM1 was found in all of liver, meat, and egg samples. The highest level of AFM1 was found in liver which was ranging from 105 to 1,215 ppt (average: 304 ppt). High level of AFM1 was also found in meat, namely between 71 to 128 ppt (averaged: 91 ppt). Although found at low level, AFM1 was detected in egg, which was ranging from 10 to 36 ppt (average: 19 ppt). This survey showed high contamination of aflatoxins in Alabio duck products that indicated liver, meat and egg of Alabio duck collected from the area of survey were harmful for the consumer.

Keywords: aflatoxin, aflatoxin residue, alabio duck, duck products

Introduction

Aflatoxin is a secondary metabolite produced mainly by toxigenic strains of *Aspergillus flavus* and *A. parasiticus*. Aflatoxin B1 (AFB1) is the most toxic and carcinogenic compound among group of mycotoxin. A metabolite of AFB1 (Aflatoxin M1: AFM1) is found in tissues, milk or egg of animals that ingest aflatoxin contaminated feed. AFB1 and AFM1 are highly toxic, carcinogenic, teratogenic and mutagenic for human, therefore they have been classified as human carcinogen by International Agency for Research on Cancer (IARC) since 2002 (El-Tras et al., 2011). Tropical climate and improper storage conditions contribute on fungal development and toxin production (Bryden, 2012). Previous surveys showed high occurrence and levels of aflatoxins contamination in feedstuffs and concentrate feed from Indonesia (Bahri et al, 1995; Agus et al., 2013).

Compare to other poultry, very few observations have been conducted to observe aflatoxin contamination in duck products. Alabio duck (*Anas platyrhynchos borneo*) is an Indonesian indigenous duck breed developed in South Kalimantan and is famous for high egg and meat production (Suryana et al., 2012). As well as in other Asian countries, duck farming plays an important role in rural economic development and to satisfy meat and egg consumption in Indonesia (Tai and Tai, 2001). However, duck is one of the most sensitive animals to aflatoxin exposure. Therefore, it is important to investigate the contamination of aflatoxins residues in liver, meat, and egg of Alabio duck.

Methodology

Survey was conducted in the center area of Alabio duck development, namely Hulu Sungai Utara District, South Kalimantan. As many as 48 liver samples, 42 meat samples, and 38 egg samples were collected from 25 farmers, 3 poultry slaughter houses, 4 meat retailers, and 5 restaurants. AFB1 content in liver was analyzed using ELISA kit AgraQuant® ELISA Aflatoxin B1 (Romer Labs, Singapore). AFM1 in liver, meat and egg were analyzed using ELISA kit AgraQuant® ELISA Aflatoxin M1 Sensitive (Romer Labs, Singapore). Ground samples (5 g) were extracted in 25 mL of 70% methanol. The solutions were shaken vigorously for 3 min using vortex mixer. The extract was filtered through Whatman No. 1 filter paper. Finally, the filtrate was diluted two times with the provided assay buffer. Following extraction, the samples underwent ELISA assay procedures as described in the ELISA kit protocols. The absorbance in micro-well plates was measured using an ELISA reader, and AFB1 or AFM1 concentrations were calculated based on a semi-logarithmic equation derived from the standard curve.

Results and Discussion

Result showed all of samples were contaminated with aflatoxin residues (Table 1). AFB1 concentration in the liver was ranging from 53 to 77 ppb (average = 65 ppb) that surpassed AFB1 tolerable limit in food as regulated by BPOM, namely 15 ppb (BPOM, 2009). This result also higher than previous studies on AFB1 residue in the liver of poultry, such as reported by Bintvihok et al. (2002), those were 0.31 ppb for Khaki Campbell duck and 0.33 ppb for broiler. High concentration of AFB1 in the liver of Alabio duck also indicated high level of AFB1 exposure from contaminated feed consumption. After the absorption in the gastrointestinal tracts, AFB1 will be metabolized in the liver by microsomal enzymes. Thus, liver is the target organ of AFB1 toxicity (Voelkel et al., 2011). Recent reviews indicated ducks is more susceptible than turkey and broiler to the cytopathology effects of AFB1 exposure (Rawal et al., 2010). This result suggested that liver of Alabio duck is harmful for the consumer due to high prevalence and level of AFB1 contamination in this product.

Table 1. Aflatoxin residues in the products of Alabio duck

Aflatoxin Residue	Sample	Positive Sample (%)	Concentration		
			Min	Max	Mean
AFB1 (ppb)	Liver (n=48)	48 (100%)	53	77	65
AFM1 (ppt)	Liver (n=48)	48 (100%)	105	1,215	304
	Meat (n=42)	42 (100%)	71	128	91
	Egg (n=38)	38 (100%)	10	36	19

High prevalence of AFM1 contaminations was also found in the liver, meat and egg of Alabio duck (Table 1). Among of animal products, the highest AFM1 concentration was found in the liver (304 ppt) meanwhile the lowest concentration was found in the egg (19 ppt). AFM1 is main metabolite of AFB1 that is produced in liver and excreted through urine, feces, milk, tissues and egg (Voelkel et al., 2011). The rate of AFB1 transformation into its metabolites varies between animals and others factors, such as diet, rate of ingestion, digestion rate, animal health, liver biotransformation capacity, and animal production (Becker-Algeri et al., 2016).

Report on AFM1 residue in the products of duck is still limited; especially in the egg. Zaghini et al. (2005) reported no residues of AFM1 detected (< 0.01 ppb) in egg of laying hens fed with diet containing 2,500 ppb AFB1 for four weeks. Similarly, negative detection of AFM1 in the liver also resulted in that experiment, confirmed that only small quantities of

aflatoxins are likely to be stored in the hen tissues. Maximum tolerable limits of AFM1 concentrations in the liver, meat and egg are not yet regulated by BPOM. According to the maximum tolerable limit of AFM1 in milk (500 ppt), the averages of AFM1 concentration in liver, meat and egg of Alabio duck did not surpass the limit (BPOM, 2009). However, high prevalence and levels of AFM1 contaminations in this study was worrying, especially detected level of AFM1 in the egg, that suggested the products of Alabio duck was harmful for the consumer.

Conclusion

High prevalence and levels of aflatoxin residues were found in the products of Alabio duck. The substantial levels of AFM1 the products of Alabio duck collected in this study indicated the products are harmful for the consumer.

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Extraction of Bioactive Components of Cocoa Leaves by Product and Their Activation as Antioxidants and Antimicrobials

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Abstract

The study aims to perform the extraction of bioactive components of the cocoa leaves by product and as an antioxidant and antimicrobial activity in vitro. Begins with the extraction treatment of the cocoa plant leaves using three types of solvents which hexane, ethyl acetate and ethanol. cocoa leaf used are fresh leaves trimmed and dried cocoa farmers, samples were extracted by maceration with hexane, ethyl acetate and ethanol. Test conducted with DPPH antioxidant, while the antibacterial tests carried out by the agar diffusion method. The results showed that the type of ethanol produces a stronger antioxidant activity with IC50 value of 67,83 µg/mL compared with the solvent ethyl acetate with IC50 value of 76,41 µg/mL. As for the antimicrobial activity were also obtained with the same results that ethanol is obtained diameter higher inhibition against test bacteria *Staphylococcus* diameter respectively inhibition of 8,32 to 18,01 mm while the diameter of the inhibition of *E. coli* obtained by 6,65 to 16,67 mm while the solvent ethyl acetate inhibition smaller diameter in the range of inhibition respectively 3,97 - 11,93 mm for *Staphylococcus aureus* and 3,25 to 7,16 mm for *E. coli*. This study concluded that the leaf extract of cocoa plants using ethanol has antioxidant and antimicrobial activity higher than the ethyl acetate extract, so it is very likely to produce a natural preservative.

Keywords: extraction, cocoa leaves, bioactive components, antioxidants, antimicrobials

Introduction

Cutting of cacao leaf represent the way to maintain the formed of crop frame, arranging the productive leaf spreading, and also stimulus the forming new leaf, flower and fruit. This way have a potential waste, thereby, its exploiting study as source of antioxidant and antimicrobials is relevant execution. In line with result of research of Osman et al., (2004) that the cocoa leaf contain bioactive in the form of fenolat compound which function as antioxidant, that also reported by Yang et al., (2011) that cocoa leaf conteint polyphenol, flavonoid glycoside, theobromine and catechins. All those compounds have potenciales antioxidant and antimicrobials.

Substance and Method

Equipment and Substance

The main equipment use is a rotary evaporator, analytic weighing-machine, shaker wiggle and a set equipment of spectrophotometer SHIMADZU Model the UV 160 and FTIR. The substance are cocoa leaf of Lindak type and various type of solution such as hexane,

acetate ethyl, ethanol and microbe (collection at the Lab of Microbiological Faculty of Medicine Brawijaya University, Malang).

Work Method

The first step is flour the cococ leaf which have been dried. Hereinafter, the ekstraktion of cocoa leaf by maserasi with each sampel 100g as much 3 times, uses the hexane solution, ethyl of acetate and etanol 96% with the comparison 1:4. The measurement of antioxidant activities were conducted by using method of DPPH assay. The ability to catch the free radical from the extract substance by measuring the degradation absorbance from condensation of methanol DPPH of wavelength of 517 nm, with the attendance of examinee extract (Krings And Berger, 2001). The first concentration of DPPH condensation is 0.1 mM, and observing after 30 minute. If absorbance drastically dropped (condensation turn into yellow) before 30 minute, it's required the thinning of sampel condensation. The antioxidant activity is expressed as $\% = \frac{(A_{control} - A_{sampel})}{(A_{control})} \times 100\%$. The test of antibacterials activity used diffusion jelly method (Ayad Et al., 2000) to know the potential of antibacterials of cocoa leaf with perforasion method by bacterium breeding test planted 1 ose at 10 ml liquid media, then perform incubation at temperature of 37°C during 24 hours. Then, taken 100 µ L from this breeding and mixed into 20 mL jelly media at temperature of 45°C, then hushed at the room temperature until jelly media become compact, then made hole with the diameter 8 mm. Hereinafter, put 100 µ L filtrate of extract cocoa leaf in the hole using three type of solute according to the certain concentration (100, 1000, 10.000, and 100.0000 mg/ml) and then incubate at temperature of 37°C during 24 hours. The light zona formed around the hole is measured by using push shove. The Test-bacterium used were Escherichia coli, Salmonella Sp and Staphylococcus aureus. The research design use the Complete Random Design (RAL) with three (3) treatment and four (4) restating. The treatment covered three (3) types of solution, namely hexane, ethyl of acetate and etano, 1 and 3 (three) times repeated, therefore is obtained 9 treatment unit. The observation variables was skringing fitokimia and continued with the test of antioxidant and antimicrobials from result ekstraksi of three (3) types solvents.

Result and Solution

Rendemen of Fitokimia Compound of Cocoa Leaf Ekstact

The extraction with maceration method produced 2,12 gr rendemen of extract heksana, 4,15gr of ekstrakt etanol, as described at Tables 1. Based on the skringing fitokimia result shows the plavonoid compound, polifenol and tanin for all extract type, except hexane extract compound.

Table 1. Rendemen and result of analysis qualitative compound fitokimia extract of leaf kakao

Faction of Compound	Extract of heksana	Extract of ethyl of acetate	Extract etanol
Rendemen (%)	2,12	2,85	4,15
Alkaloid	-	-	-
Flavonoid	-	+	++
Polifenol	-	+	++
Tanin	-	+	++
Saponin	-	-	-

Boldness : Result of Chemical Laboratory Analysis, FMIPA UNTAD (2016)

- : negative reaction

+ : positive reaction

++: strong positive reaction

Tables 1 shows that several compound acts as antioksidan and antimicrobials such as flavonoid, polifenol and tannin. This matter in line with finding from Prasetyo A.D and, Hadi S (2014 at kersen leaf (*Muntingia Calabura L.*) about existence of compound flavonoid, polifenol, saponin and tanin which can pursue the growth of bacterium of *Bacillus subtilis* and *Shigella dysenteriae* at concentration 3,125%. Hereinafter Mulyatni et al., (2012) also find the existence of compound polifenol at husk of cocoa fruit which can pursue the growth of bacterium of *Bacillus subtilis*, *Staphylococcus Aureus* and *Escherichia coli*. For a while Miryanti et al., (2011) finding the existence of component bioactive from extract of mangosteene husk in the form of flavonoid, polifenol, and saponin which personating antioxidant with the acquirement assess the EC50 equal to 11.048 ppm which its meaning to weaken the free radical equal to 50% required by 11.0825 ppm antioxidant.

Testing Antioxidant

The test used DPPH antioxidant activity as free radicals that have a maximum wavelength of 517 nm and is often used to evaluate the antioxidant activity of several compounds extracted natural materials (Rakesh et al., 2010). In extracts of cocoa leaves, both extracts of ethanol and ethyl acetate extracts showed antioxidant activity while in hexane did not show their antioxidant activity, as mention at Tables 2.

Tabel 2. IC 50 ($\mu\text{g}/\text{mL}$) cocoa leaves in various types of solvants

Solvents	IC 50 ($\mu\text{g}/\text{mL}$)			Total	Mean SD
	1	2	3		
Hexane	-	-	-	-	-
Ethyl acetate	77.55	74.75	76.94	229.24	76.41 \pm 1.47
Ethanol	66.423	67.17	69.89	203.48	67.83 \pm 1.82

Table 2 showed that the ethanol extract has antioxidant activity that is best with IC50 value of 67.83 $\mu\text{g} / \text{mL}$ in extracts of leaves, while the IC 50 of the ethyl acetate extract obtained a value of 76.41 mg / mL . The high antioxidant activity of the extract of ethanol in this study suspected because the compounds contained in the ethanol extract more polar so that the amount of bioactive components such as flavonoids, polivenol and tannins in ethanol extract is quite high and result in high antioxidant activity shown by the acquisition of IC 50 is low. According to Cheng and Prusoff (1973) found that a low IC50 value indicates the effectiveness of the extract as a catcher of free radicals are better for ethanol extract of cocoa leaf has a strong ability to capture free radicals DPPH. According to Huang et al., (2005) antioxidant activity is proportional to the total phenol, the higher the content of phenols in a compound the higher the antioxidant activity. Extract containing flavonoids definitely also contains phenolic compounds because flavonoid compound is one of the great natural phenols (Santi and Sukadana, 2015).

Antimicrobial Activity Testing

The test results showed that the antibacterial activity of the hexane extract cocoa leaf does not provide antibacterial activity. While the ethyl acetate extract of cocoa leaves provide antibacterial activity seen from a concentration of 100 mg/mL , 1000 mg/ml , 10000 mg/ml and 100 000 mg/ml is the case with ethanol extract is able to inhibit the same konstrasi. The Statistical analysis showed that the type of solvent showed highly significant effect ($p < 0.01$) in the growth of the test bacteria *E.coli* and *Staphylococcus aureus* where ethanol gives a greater influence than the solvent ethyl acetate. It can be seen from the amount of inhibition

showed higher ethanol extract of the ethyl acetate extract even in the same concentration (102-105 mg). While the concentration of cocoa leaf extract in ethanol and ethyl acetate are also very significant ($p < 0.01$) in which the higher the concentration of the extract the larger the diameter of the inhibition of bacterial test. Ethanol extract of the cocoa leaf inhibition of *E.coli* obtained diameter of 16.67 mm in the highest concentration (105 mg / ml), while the lowest concentration (102 mg / ml) obtained the greatest inhibition diameter 6.65 mm, while against *Staphylococcus aureus* in the highest concentration (105 mg / ml) obtained inhibition of 18:01 mm diameter and at the lowest concentration (102 mg / ml) at 8:32 mm. Diameter of inhibition was also seen in the ethyl acetate extract of cocoa leaf against *E.coli* where the The highest concentration (105 mg / ml) obtained inhibition of 7:16 mm diameter and at the lowest concentration (102 mg / ml) was obtained at 3:25 mm diameter inhibition. The inhibitory activity of the ethyl acetate extract of cocoa leaf against *Staphylococcus aureus* in the highest concentration (105 mg / ml) obtained inhibition diameter of 11.93 mm and at the lowest concentration (102 mg / ml) of 3.97 mm.

Conclusion

Extraction of bioactive components from the waste leaves cocoa and as an antioxidant and antimicrobial activity, it can be concluded that ethanol and ethyl acetate extract of cocoa leaves in the form of compounds containing bioactive components flavonoid, polyphenols and tannins were found to have antioxidant and antimicrobial activity.

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In Vitro Antibacterial Activity of Black Soldier Fly (*Hermetia illucens*) Larvae Extracts Against Gram-negative Bacteria

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Abstract

Larvae of Black soldier fly/BSF (*Hermetia illucens*) has known to possess unique properties that may be utilized for various defense purposes. These properties contain various antimicrobial peptides (AMPs) as effective inhibitory substances against diverse pathogens. It has been proven that the extracted larvae of BSF have an antibacterial activity against gram negative bacteria that was important to human health. However, the antibacterial activity of BSF larvae against pathogens bacterial in poultry has not been reported yet. Therefore, the aim of this study was to investigate the antibacterial effects of BSF larvae extracts using agar diffusion method (zone growth inhibition) against two strain bacteria, *Salmonella* sp. and *Escherichia coli*. Based on the diameter of the inhibition zone, the BSF larvae extract has a strong ($p < 0.05$) antibacterial activity against *Salmonella* sp. and *E. coli* when the concentration used 320 mg/mL.

Keywords: *black soldier fly, hermetia illucens, antibacterial, salmonella sp., Escherichia coli*

Introduction

The development of poultry industry in Indonesia facing many challenges. One of them, is the issue about the banning of in feed use of antibiotic growth promoters (AGPs). In many countries, AGPs are still continually included in animal diets in sub-therapeutic concentrations in order to achieve better feed conversion and higher growth rates by reducing the activity of the harmful microorganism in the digestive tract (Steiner and Syed 2015). However, the routine use of AGPs in animal diets was associated with the development of bacterial resistance towards several antibiotic substances (Marshall and Levy 2011). Therefore, a number of alternatives of AGPs have been proposed.

It has been reported that various insects possess antimicrobial properties and substances which are produced on the surface or within their digestive tract to prevent microbial infection. Until recently, the larvae of Black soldier fly/BSF (*Hermetia illucens*) have been applied in various fields, such as a replacement of conventional protein sources in aquatic and monogastric animal feed (Makkar *et al.* 2014, Maurer *et al.* 2015), the bioconversion of livestock manure, conversion of organic materials (Myers *et al.* 2008, Diener *et al.* 2009) and in forensic science, for determining human postmortem duration (Diener *et al.* 2009). In addition, BSF larvae also known to possess unique properties that may be utilized for various defense purposes, which contain various antimicrobial peptides (AMPs) as effective inhibitory substances against diverse pathogens (Brown *et al.* 2008). The antimicrobial agents derived from the larvae may be among the substances that are produced in the body for their survival (Choi *et al.* 2012).

Choi *et al.* (2012) has been proven that the extracted larvae of BSF have an antibacterial activity against gram negative bacteria that is important to human health e.g. *Klebsiella pneumoniae*, *Shigella sonnei* and *Neisseria gonorrhoeae*. However, the antibacterial activity of BSF larvae against pathogens bacterial in poultry have not been reported yet. Therefore, the aim of this study is to investigate the antibacterial effects of BSF larvae extracts against two important bacteria in poultry, *Salmonella* sp. and *Escherichia coli*.

Methodology

The study was conducted in the laboratory of Bacteriology, Faculty of Veterinary Medicine, Bogor Agricultural University, Bogor, Indonesia. Larvae of BSF were supplied from Sidoarjo, East Java. After harvested at the end of larval stage, the larvae were half dried in 105°C for 24 hours and the half dry larvae was sent to Bogor. After that, the larva were dried in 60°C for 48-36 hours. After dry, the larva were ground. The BSF larva extraction were prepared according to Choi *et al.* (2012) with a little modification. The larvae were extracted using methanol (1:10 b/v) in room temperature for 24 hours. After filtering the extracts using filter paper and vacuum pump, they were evaporated under reduced pressure using a rotary evaporator at 40°C and stored in refrigerator at -4°C until use.

The antibacterial effects of BSF larvae extracts was investigated with agar diffusion method (zone growth inhibition) against two strain of bacteria, *Salmonella* sp. and *Escherichia coli*. The respective bacteria were sub-cultured and incubated in Tryptic Soya Agar (TSA) at 35±1°C for 24 hours. After that, the sub-cultured bacteria were adjust to a density of 10⁷ cfu/mL and 0.1 mL were add to the surface of Muller Hilton Agar (MHA) medium. The medium were then keep in room temperature for 15 minutes. After 15 minutes, seven wells were made in the MHA medium, one for each tested concentration. Before use, the BSF larvae extracts was dissolved using dimethyl sulfoxide (DMSO) solvent according to the respective concentration (10 mg/mL, 20 mg/mL, 40 mg/mL, 80 mg/mL, 160 mg/mL, and 320 mg/mL). Antibiotic chloramphenicol also use as positive control. Then, 20 µL of the BSF larvae extracts from each concentration were add to the wells and incubated at 35±1°C for 24 hours. The data were subjected to analysis using t-test method.

Result and Discussion

Table 1. In vitro antibacterial activity of BSF larvae extracts against *Escherichia coli* and *Salmonella* sp. after 24 h incubation at 35±1°C

Treatments	Inhibition zone (mm)	
	<i>Escherichia coli</i>	<i>Salmonella</i> sp.
10mg/mL	0	0
20mg/mL	0	0
40mg/mL	0	0
80mg/mL	0	0
160 mg/mL	4.67 ± 0.58	4.33 ± 0.58
320 mg/mL	6.00 ± 1.00	6.33 ± 2.08

Diameter of inhibition zone (Pan *et al.* 2009) : >6 mm (strong), 3-6 mm (intermediate), <3 mm (weak) and 0 (no activity)

In the present study, the BSF larvae extracts showed antibacterial activity against *E. coli* and *Salmonella* sp. which was belong to gram-negative group. According to the previous study, similar results has been reported that methanol extracts of BSF larvae showed more susceptibility to gram-negative bacteria than gram-positive bacteria. This difference in susceptibility between the extracts and bacteria may be due to the differences of the

interaction between bacterial ribosome or bacterial cell wall and the active substance (Choi *et al.* 2012).

In particular, the result of the present study showing that the antibacterial activity of BSF larva extracts was concentration-dependent. The antibacterial activity first showed at concentration 160 mg/mL and the activity became stronger when the concentration was increased to 320 mg/mL ($p < 0.05$) for both bacteria that was tested. According to Pan *et al.* (2009), the antibacterial activity of BSF larvae extract for both *E. coli* and *Salmonella* sp. was strong because the diameter of inhibition zone was larger than 6 mm.

The larvae of BSF are scavengers that can live in extremely harsh environments. These biological characteristics suggest that the BSF larvae may be rich in generation of AMPs and other substances possessing activity against particular bacteria. According to Park *et al.* (2014) BSF larvae secrete dark-brown colored substances due to melanization or biosynthesis of melanin, a phenolic biopolymer involved in insect immunity. The cytotoxic phenols have already been investigated intensively (Sugumaran 2002) and are well established as compounds displaying broad-spectrum antibacterial effect. Therefore, the presence of these antibacterial compound in the methanol extracts of BSF larvae is possible.

Conclusion

The BSF larvae extracts showed strong antibacterial activity against *E. coli* and *Salmonella* sp., therefore these result indicated that the methanol extracts of BSF larvae can be used as a candidate for antimicrobial substance. Further study need to do for the evaluation and characterization of the substances that may contribute as the antibacterial agent.

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Isolation and Characterization of *Oviduct Specific Glycoprotein* at Goats *Oviductal fluid* as Candidate Isolate Supplementation of Goats Frozen Semen

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Abstract

The aim of this study are to increase number of in vitro fertilitation and increase efficiency of artificial insemination on goat used frozen semen supplemented by Oviduct Specific Glycoprotein. Frozen semen supplemented by Oviduct Specific Glycoprotein is a new way to solve the decrease of in vitro fertility on goats caused by polysperm and increase efficiency of artificial insemination on goats. The methods that used in this study are 1. Collected Oviduct Specific Glycoprotein from oviductal liquid of goats. 2. Selected molecul weight of Oviduct Specific Glycoprotein (the method that used is SDS PAGE confirmed by dot blot and western blot methode). The result of this study shows the weight of molecul of Oviduct Specific Glycoprotein as which has been collected from oviductal liquid was amount of 60-9-0kDa, after being confirmed using western blotting the weight of the molecule that can be detected is 68 kDa.

Keywords: *Goat oviductal fluid, Oviduct Specific Glycoprotein, frozen semen*

Antibacterial Activity of *Muntingia Calabura* Lam. Against Some Selected Bacteria Causes Mastitis

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Abstract

The aim of this study was to determine the effectiveness of extract *Muntingia Calabura L* at different storage (refrigerator vs. room temperature) and time duration (0,2,4,6,8 days) againsts *Staphylococcus aureus* and *Streptococcus agalactiae* for the antibacterial activity. The activity was analyzed using paper disc diffusion method. The study revealed that extracts *Muntingia Calabura L* in different storage and duration time inhibited growth of the test bacteria to varying degrees ($P < 0.05$). *Muntingia Calabura L* stored at refrigerator temperature gives higher diameter zone of inhibition than room temperature ($P < 0.05$). On *S. aureus* bacteria, the diameter of inhibition zone produced at refrigerator temperature and room temperature with storage time 0, 2, 4, 6 and 8 days were (22.46 mm vs. 21.41 mm); (20.26 mm vs. 18.86 mm); (18.44 mm vs. 15.42 mm); (16.21 mm vs. 10.46 mm); (13.46 mm vs. 6.68 mm) respectively. While, on *S. agalactiae* bacteria were (18.28 mm vs. 17.22 mm) ; (14.45 mm vs. 16.72 mm); (14.22 mm vs. 11.56 mm); (12.48 mm vs. 8.83 mm); (11.34 mm vs. 5.24 mm). From these results it appears that, *Muntingia Calabura L* stored at refrigerator temperature and 0 days provides better results in inhibiting the activity of bacteria that cause mastitis.

Keywords: *Muntingia Calabura L.*, mastitis, *Staphylococcus*, *Streptococcus*

GST Fusion Assisted Overexpression and Purification of Recombinant Parasite Lactate Dehydrogenase Enzyme in *Escherichia coli*

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Abstract

Recently, *Escherichia coli* is one of the well-established and most popular organisms for the production of recombinant proteins. However, expression levels and solubility issue, since some proteins are generated in low amount and aggregate in inclusion body. Fusion proteins have become essential for the overexpression and solubility improvement of recombinant proteins in *E. coli*. In this study, parasite Lactate dehydrogenase-encoding gene was fused in the C-terminal of glutathione-s-transferase gene and subsequently expressed in *E. coli* BL21. Expression levels and purification results of the fused protein were determined by SDS-PAGE. The SDS-PAGE result shows that the 58 kDa band corresponding to the GST-pLDH protein was successfully overexpressed and purified using GStrap column. Our results are not only useful for robust production of parasite Lactate dehydrogenase, but also helpful for the enzyme purification.

Keywords: *parasite Lactate Dehydrogenase (pLDH), Glutathione-s-Transferase (GST), Fusion Protein, Escherichia coli, GStrap column*

Oral Presentation 4 Focus Session:

Feed and Nutrition (1)

Friday, 21 October 09:45-11:05

Room: Panderman 1

Profile of Corn Silage Juice in Different Ages and Its Shelf Life

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Abstract

Silage juice has been shown to have antibiotic properties especially in terms of inhibiting *Salmonella* sp, and *E.coli* *in vitro*. The objectives of this study was to compare the effect of adding silage juice and Tetrachlor (antibiotic) in diets on performance of dairy calves. Twelves male calves age 1–2 weeks were randomly assigned to one of the three dietary treatments i.e: Control diet comprising of milk replacer and starter ration (R1); Control diet+antibiotic (R2); and Control diet+silage juice. Milk replacer was given at the rate of 10% of body weight at the start of the trial, and gradually decreased with increasing starter ration intake. Giving milk replacer was stopped after dry matter intake of starter ration reached 3% of body weight. Feed intake and daily weight gain of calves fed diets containing silage juice and antibiotic were higher compared to those fed control diet. However, no significant difference on the parameters measured was found between calves fed silage juice and antibiotics. Feed efficiency was also better for calves fed antibiotics and juice silage compared to that of calves fed control diet. Diarrhea cases were relatively higher in calves fed control diet compared with those on the other treatments. It was concluded that silage juice was comparable with Tetrachlor in terms of improving performance of calves.

Keywords: Antibiotic, silage juice, dairy calves, diarrhea

Effect of Formic Acid on Intestinal Truly Absorbed Protein of Alfalfa Silage

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Abstract

Second-cut of alfalfa hay at half blooming stage with 320 mg/kg DM was ensiled for 28 days as untreated (control) or treated with 4 ml formic acid per kg DM. The silages were evaluated for truly absorbed protein in the small intestine using new Dutch System (DVE/OEB). In addition, all samples were studied for chemical composition. Results showed that the inclusion of formic acid caused a significant decrease in silage extract pH compared with that of control ($P < 0.05$). Crude protein concentration was higher in silage treated with formic acid than those of the control (201 vs. 198 g/kg). pH (3.53 vs. 5.16) and N-NH₃ (0.2 vs. 0.47) concentration was lower in silage treated with formic acid than those of the control. Formic acid caused an increase in intestinal truly absorbed protein by 35 percent compared with those untreated silages (89 vs. 120 g/kg). Data obtained in this study indicate that the addition of formic acid to alfalfa silage prevent ruminal protein degradation and consequently improve nutritional value by altering the digestion site of protein from rumen to small intestine.

Keywords: *Alfalfa, formic acid, protein, silage, DVE/OEB*

***In Vitro* Dry Matter Degradation Kinetics of Some Ruminant Feeds**

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Abstract

This study aimed to observe degradation kinetics of some ruminant feeds. A total of five feedstuffs were tested, namely, napiergrass, concentrate, tofu by-product, cassava peel and soybean meal. Parameters measured were feed soluble fraction (a), insoluble but degradable fraction (b), degradation rate of fraction b (c) and effective degradability (ED) *in vitro*. The experiment was conducted using a randomized complete block design with 5 treatments and 3 replicates based on different batches of rumen fluid. Results showed that soybean meal had the highest value in the percentage of dry matter degradation, the degradation rate of potentially degradable fraction, effective degradability, ammonia concentration and dry matter digestibility than the other feeds.

Keywords: *ruminant feed, dry matter degradation kinetics, effective degradability, in vitro.*

Introduction

Most of agro-industrial byproducts used as feed materials have different fiber contents and therefore their degradation kinetics in the digestive tract of ruminants are also different (Pangestu, 2005). Not the entire fiber can be degraded by microbes in the rumen, depending on the fraction of the constituent fiber and its attachment to lignin. Evaluation on degradation kinetics of various feeds is typically assessed by using *in sacco* technique, but seldomly performed *in vitro*. Since facility to perform *in sacco* experiment in Indonesia is limited, it is necessary to develop an *in vitro* degradation kinetics as an alternative to the *in sacco* technique. This study aimed to evaluate feed soluble fraction (a), insoluble but degradable fraction (b), degradation rate of fraction b (c) and effective degradability (ED) *in vitro* of five different feeds that commonly used for ruminants in Indonesia.

Methodology

The *in vitro* procedure was performed according to Tilley and Terry (1963). Rumen fluid was obtained from three fistulated Ongole crossbred cattle. Fermentor tube was initially filled with 0.5 g, added with 40 mL of McDougall's buffer and then 10 mL of rumen fluid. Each tube was covered with ventilated rubber, put into a water bath maintained at 39 °C, and fermented for 2, 4, 8, 12, 24 and 48 h. After each incubation period, rubber cap of the tube was opened and the content was centrifuged at 4,000 rpm for 10 min. The precipitate was analyzed for dry matter degradability, while the supernatant was subjected to NH₃ measurement using Conway microdiffusion technique (General Laboratory Procedure, 1966). For measurement of dry matter digestibility, the residue obtained after centrifugation was added with 50 mL of 0.2% pepsin-HCl and incubated for another 48 h.

The experimental design used was a randomized complete block design with 5 types of feeds, i.e. napiergrass, concentrate, tofu by-product, cassava peel and soybean meal, and three replicates based on different batches of rumen fluid. Parameters measured were degradation kinetics of dry matter, effective degradability (ED), ammonia concentration and dry matter digestibility. Dry matter degradation kinetics was approximated by an exponential equation of Orskov and McDonald (1979) as follow: $D = a + b(1 - e^{-ct})$, while ED was calculated using the equation $ED = a + (b \times [c/(k + c)])$, assuming that the rate of passage (k) is constant at 0.05. Data were analyzed by analysis of variance and a post-hoc test namely Duncan's multiple range test when the effect was significant at $p < 0.05$.

Results and Discussions

Tabel 1. Chemical composition of feeds (% dry matter)

Feed	Composition										
	DM	Ash	CP	CF	EE	NFE	GE	TDN	NDF	ADF	Lignin
SBM	94.61	7.35	44.68	2.31	3.07	37.20	3708	91.10	18.78	8.34	na
NG	87.82	9.69	14.57	19.39	0.79	43.38	4389	79.11	65.55	24.10	na
C	80.31	16.3	10.28	33.71	0.74	19.27	2833	64.93	48.40	41.80	12.58
TB	53.18	1.63	8.64	17.00	2.62	23.29	2421	54.83	5.54	3.98	0.36
CV	47.11	4.84	4.31	5.81	1.29	30.86	1850	43.88	4.12	3.22	1.00

DM=dry matter; CP=crude protein; CF=crude fiber; EE=ester extract; NFE=nitrogen free extract; GE=gross energy; TDN=Total digestible nutrients; NDF=neutral detergent fiber; ADF=acid detergent fiber; SBM=soybean meal; NG=napier grass; C=concentrate; TB=tofu by-product; CV=cassava peel; na=not analysed

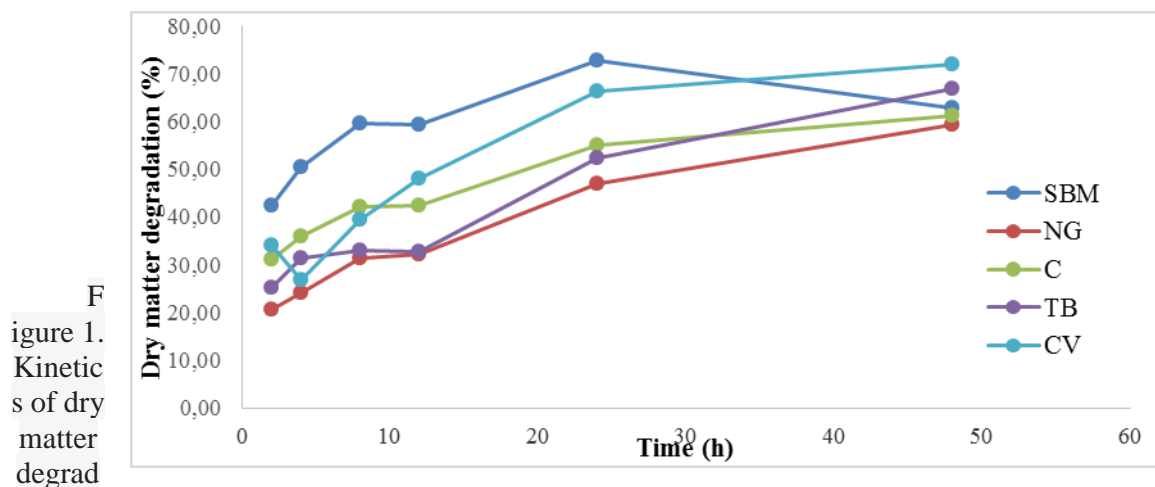


Figure 1. Kinetics of dry matter degradation

ability of soybean meal, elephant grass, concentrates, pulp and peel cassava.

Chemical composition of feeds used is presented in Table 1. Soybean meal had the highest percentage of degradation of dry matter and followed cassava peel, concentrates, tofu by-product and napier grass (Figure 1). The high percentage of dry matter degradation is affected by the constituent cell contents are easily digested and readily soluble such as starch, protein, fat and minerals are soluble, crude fiber and ADF were lower (Table 1.) Organic materials soluble helpful in increasing rumen microbial activity so feed can be degraded properly. Orskov (1992) states that the degradation of the feed in the rumen is influenced by rumen microbes and feed composition.

Table 2 shows that soybean meal has the highest effective degradability value (59.27%) than the other feeds. The high value of effective degradability due to the high soluble fraction (a) in soybean meal and degradation rate of fraction b (c). In accordance with the opinion of

Orskov et al. (1982), that the high value of a fraction degradation (soluble or easily degradable) and the fraction b (or potentially degraded insoluble) causes a high degree of degradability of feed material. Van Soest (1994) adds that the nutrients which include crude protein (CP), crude fiber (CF), nitrogen free extract (NFE) and minerals (ash) can affect the degradability of a feed material.

Table 2. Mean dry matter degradation, effective degradability, ammonia concentration dry matter digestibility of soybean meal, napier grass, concentrates, tofu by-product and cassava peel

Treatment	a (%)	B (%)	a+b (%)	u (%)	c (%/jam)	ED (%)	NH ₃ (mM)	DMD (%)
SBM	31.63 ^b	35.29 ^a	66.92	33.08	0.183 ^b	59.27 ^d	75.58 ^c	93.09 ^e
NG	17.45 ^a	58.36 ^c	75.81	24.19	0.033 ^a	39.44 ^a	24.95 ^{ab}	61.50 ^b
C	28.58 ^b	38.14 ^{ab}	66.72	33.28	0.043 ^a	45.12 ^b	11.34 ^{ab}	55.28 ^a
TB	24.85 ^{ab}	53.43 ^{bc}	78.23	21.72	0.030 ^a	43.91 ^b	31.65 ^b	81.13 ^d
CV	22.48 ^{ab}	55.95 ^c	78.43	21.57	0.053 ^a	51.37 ^c	9.10 ^a	74.02 ^c
<i>P</i> -value	0.048	0.035	0.262	0.262	0.000	0.000	0.000	0.000

Description: different superscripts in the same column indicate significant differences ($P < 0.05$); a=soluble fraction; b=insoluble but degradable fraction; c=degradation rate of fraction b; u=undegradable; ED=effective degradability; NH₃=NH₃concentration; DMD=dry matter digestibility; SBM=soybean meal; NG=napier grass; C=concentrate; TB=tofu by-product; CV=cassava peel

NH₃ is a major product overhaul the result of feed protein in the rumen by rumen microbes into microbial protein. The results showed that the highest NH₃ generated by soybean meal amounted to 75.58%. This is because the soybean meal had the highest protein content of 44.68% (table 1) and highest degradation value. According to Haryanto & Djajanegara (1993) NH₃ concentration is affected by the protein content, rate of protein degradation and protein solubility feeds.

Table 2 also showed that the highest dry matter digestibility of soybean meal. Dry matter digestibility in soybean meal is very high because of the chemical composition, soybean meal had a crude fiber and ADF were low, resulting in soybean meal is easily digested by rumen microbes. Factors affecting dry matter includes the chemical composition, speed of travel of feed in the digestive tract and the nutrients in the feed material. Based on the digestibility results obtained in this study can be seen that the digestibility value is higher than the value of degradation. This is due to the incubation time required to obtain a dry matter digestibility value longer than the incubation time required to obtain the value of the dry matter degradation so that the residue obtained less on digestibility parameters but high-value materials.

Conclusions

The highest dry matter digestibility with the highest value of dry matter degradability was owned by soybean meal.

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The Effects of Phenolic Compounds in Brown Propolis Extracts on Rumen Methane Production (*in vitro*)

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Abstract

The aim of this study is to determine the chemical composition of brown propolis (BP) extracts and to show flavonoids and phenol effects on rumen methane production (*in vitro*). To this study one diet with concentrate: forage ratio as 80:20 (HC: high concentrate) with different BP extracts were used. The treatments were HC(control), HC+BP 25%, HC+BP 50% and HC+BP 75%. The results of this study showed that in HC ration adding BP 25% did not reduce ($p>0.05$) CH₄ production in comparison with the control, while BP 50% significantly reduced ($p<0.05$) it. Furthermore, BP 75% statistically decreased ($p<0.05$) CH₄ production compared to the other treatments.

Keywords: *Brown propolis, rumen methane production, phenolic compounds.*

Introduction

Nutritional strategies to improve the production of ruminants have attracted the attention of nutritionists for several years. Making use of some additives such as antibiotics and probiotics in the diet signifies a remarkable reduction of methane production in the ruminants (McGuffey et al., 2001) Because of the using chemical substances the risk of residue transmission into milk and meat (on the one hand and the prohibition of utilizing antibiotics by European Union in 2006 on the other hand made the researchers exploit natural products to manipulate rumen fermentation (Nisbet et al., 2009). Propolis is pasty and sticky and can be found in yellow, green, and red or brown (FERNANDES et al., 2007). Bee workers, over three weeks of age collect the plant cell sap from leaves, buds and plants and mixed it with Beta-glucosidase enzyme secreted by them (Castaldo and Capasso., 2002; El-Bassuony et al., 2009; Zia et al., 2009). The existence of phenol and flavonoid composition in propolis extract caused the improvement of rumen fermentation, reduction of NH₃-N (Ozturk et al., 2010) and methane (Oskoueian et al., 2013). The objective of this study is to determine the chemical compounds of brown propolis (BP) extracts and to show phenolic compounds in brown propolis extracts on rumen methane production (*in vitro*).

Methodology

Origin of Propolis

The brown propolis (BP) was collected from north east Iran (37° 37' 31.07" N, 58° 43' 49.74" E), a mountainous region with relatively warm weather (3°C and 27% humidity) in Khorasan Razavi, from Ehtesham Apiary in October 2014.

Preparation of propolis extracts

For this study three extracts of BP (25%, 50% and 75%) were provided. Propolis extraction was performed according to Sforcin et al (2000). The ethanol was removed in a rotary evaporator (Heidolph laborota 4000, Germany) at 42 °C for 30 min.

Total phenolic compounds of Brown Iranian Propolis

Total phenolic compounds of Brown Iranian Propolis were measured by Swain et al (1959).

Experimental diets and Treatments

Experimental samples were including one diet with different concentrate: forage ratio (80:20 with four treatments and eight repeats as control diet 80:20 without BIP, 80:20 diet with 25% BIP, 80:20 diet with 50% BIP and 80:20 diet with 75% BIP. Ingredients and chemical composition of the experimental diets are showed in table 1.

Table 1. Ingredients and chemical composition of the experimental diet.

Ingredients (% DM)	Diet 80:20 (concentrate: forage)
Alfalfa	5
Corn silage	15
Wheat straw	0
Barley	27.2
Corn	24
Soybean meal	6.4
Sugar pulp meal	4
Cotton seed	9.6
Wheat bran	8
Calcium carbonate	0.24
Salt	0.16
Chemical Composition (%)	
Dry Matter	88
Crude Protein	15.28
Ether Extract	14.80
Neutral detergent fiber	35.10
Acid detergent fiber	16.42
Organic Matter	92.24
Ash	7.76

Chemical analysis

Dry matter content of feeds samples was determined by drying the oven-dried samples at 65 °C to a constant weight (AOAC 2005, method 934.01). Ether extract (EE) (AOAC 2005, method 920.39) and ash content was determined after 3 h of incineration at 550°C in a muffle furnace (AOAC 2005, method 942.05). Crude protein (CP) (Kjeldahl N ×6.25) was measured by the block digestion method using copper catalyst and steam distillation into boric acid solution (AOAC 2005, method 2001.11) on a 2100 Kjeltac distillation unit. Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were analyzed by the Fibertec System (1010 Heat Extractor, Tecator, Sweden) according to Van Soest et al. (1991) and were corrected for ash. Sodium sulfite and heat-stable α -amylase (Sigma A3306; Sigma-Aldrich, Steinheim, Germany) were used during NDF analysis.

Statistical analysis

The trial was analyzed considering a completely randomized design by the GLM procedure of SAS 9.1. Means among treatment were compared by Tukey test.

Results and Discussions

Total phenol and flavonoids of (BP) are showed in table 2 and In vitro rumen methane production is showed in table 3. The results of this study showed that in HC ration adding BP 25% did not reduce ($p>0.05$) CH₄ production in comparison with the control, while BP 50% significantly reduced ($p<0.05$) it. Furthermore, BP 75% statistically decreased ($p<0.05$) CH₄ production compared to the other treatments. The research concluded that the BP existing in ratio led to the significant decrease of CH₄ compared with that in control group. The higher decrease of gram positive bacteria in proportion to gram negative bacteria (Mirzoeva et al., 1997; Padmavati et al., 1997) can be the possible cause of adding BP to the ratio. Furthermore there is a possibility that the antiprotozoal effect of BP (Rispoli et al., 2009; Kreuzer et al., 1986) causes the decrease of protozoa population and subsequently hinders the production of CH₄ by changing the reducing equivalents of CH₄ to propionate synthesis in the rumen. The above mentioned conclusions verified the findings by (Patra et al., 2006; Tavendale et al., 2005).

Table 3. Effect of different concentration of BP on rumen methane production.

Items	Treatments
	HC diet
	CH ₄ (mg)
Control	21.26 ^a ±0.57
BP 25%	20.89 ^{ab} ±0.57
BP 50%	18.65 ^b ±0.57
BP 75%	14.99 ^c ±0.57
SEM	0.99
P value	<0.0001

SEM: Standard Error of the Mean.

CH₄: methane gas

a-c means in the same row followed by different superscripts differ ($P<0.05$).

Values are means ± SD, n=8

BP: brown propolis

HC: high concentrate

Conclusions

The BP makes rumen methane production decrease. This may help the improve environment.

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Effect of Corn Grain Physical Processing on in Vitro Rumen Microbial Protein Production and Gas Production Parameters

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Abstract

The objective of this study was to evaluate the effect of physical processing on fermentation parameters and microbial protein production of glucogenic diets. Isonitrogenous and isocaloric diets were provided containing 1- ground corn grain (GCG) and xylose protected soybean meal (XSBM), 2- steam flake corn (SFCG) a XSBM, 3- GCG and soybean meal. Samples of particle size of 2 mm were oven dried at 65 °C for 48 h. Then 250 mg of each were weighed and placed in four replicates into 125-ml capacity serum bottles. The gas production was continuously measured by incubating samples in buffered-rumen fluid for 96 h. Cumulative gas production was recorded at 2,4,6,8,12,24,48,72 and 96 h of the incubation periods. Half time of gas production was determined and second incubation was carried out to calculate microbial protein production. The results showed that gas production from fermentable part (88.58 ml) and half time of gas production was the highest in diet 1 ($P < 0.05$). Microbial protein production (3.48 mg/250 mg DM) was the highest in diet 2 ($P < 0.05$). Present results prove that steam flaking of corn grain cause an improvement in rumen microbial protein production.

Keywords: *corn grain, processing, microbial production*

Effect of Peppermint Essential Oil Versus a Mixture of Formic and Propionic Acids on Corn Silage VFA Score

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Abstract

To compare peppermint essential oil versus a mixture of formic and propionic acids a study was conducted to evaluate their effects on volatile fatty acid proportion and VFA score of corn silage. Chopped whole crop corn (control) was treated with peppermint essential oil (240 mg kg⁻¹ DM) or a mixture of formic and propionic acids (2:1) at 0.4% of fresh forage weight, and ensiled for 30 days. Then, silage extract was provided and the concentration of each VFA was determined using gas chromatography. The VFA score was calculated according to the patented formula proposed by Dairy One Scientific Committee. This score weighs the positive impact of lactic and acetic acids against the negative impact of butyric acid to arrive at a single value for evaluating silage quality. The essential oil declined pH and increased the concentration of lactic and acetic acids in the silage extract. All corn silages evaluated in this study had a VFA score between 6 through 8. However, silage with peppermint essential oils had lower volatile fatty acids score than those of the other treatments. Both of applied additives caused a significant improvement in silage aerobic stability. Results indicate the poten

Key words: *Peppermint, essential oil, corn silage.*

Introduction

Essential oils (EO) are compounds which were extracted from different plant tissue by distillation methods (danesh Mesgaran et al., 2010). They may alter fermentation process in rumen or silo through stimulation or inhibition of their microbial populations (Fraser et al. 2007). Moreover, EO may influence on volatile fatty acid (VFA) proportions. Inclusion of a specific blend of EO in dual flow continuous culture system increased total VFA concentration, acetate proportion and acetate to propionate ratio (Castillejos et al. 2007). This experiment was conducted to determine the effect of peppermint essential oil or mixture of formic and propionic acids on fermentation characteristics and VFA score of corn silage.

Methodology

Whole crop corn (about 29% DM) was harvested and chopped at 20 mm length. The forage evaluated as non-treated (control), treated with peppermint essential oil at rate of 240 mg kg⁻¹ DM (Mint) or a mixture of formic and propionic acids (2:1) at the rate of 4 ml kg⁻¹ fresh forage (F+P) in 4 replicates. The forages then were ensiled in trench silos for at least 45 days. Dried silage samples were ground to pass through a 1 mm-screen for later analysis. Aqueous silage extract were prepared from ensiled samples by mixing 50 g of forage with 450 ml of deionized water and homogenizing this mix for 1 min (Kung et al. 2000). Then,

silage pH was determined using a portable pH meter. A portion of aqueous extracts were filtered through four layers of cheesecloth and acidified with 0.2 N HCl (1:1). Ammonia nitrogen (NH₃-N) concentration of acidified silage extracts were determined using distillation method. Volatile fatty acids (VFA) were measured using gas chromatography as described by Ottenstein and Bartley (1971). The VFA score was calculated according to the formula proposed by Dairy One (Personal communication). This score weighs the positive impact of lactic and acetic acids against the negative impact of butyric acid to arrive at a single value for evaluating silage quality. Data were analyzed as completely randomized designs by using GLM procedure of SAS. The model used for each of the analysis was $Y_{ij} = \mu + T_i + e_{ij}$, where Y_{ij} was the dependent variable; μ was the population mean for the variable; T_i was the effect of treatment i ; e_{ij} was the random error associated with the observation ij . When the overall F-test was significant, differences between means were declared significant at $P < 0.05$ using the Tukey's test.

Results and Discussions

Silage fermentation characteristics of the experimental silages are presented in Table 1. Lower pH value in silage treated with mint EO is consistent with higher lactic acid concentration in this silage. When silage treated with F+P, NH₃-N concentration decreased indicating restriction of deamination. The chemically processing had no effect on lactic acid and VFA proportions of corn silage compared with the untreated silage. Lower VFA score in silage treated with mint EO are consistent with the lower lactic acid to acetic acid ratio in this treatment. Indeed, VFA score weighs the positive impact of lactic and acetic acids against the negative impact of butyric acid. However, all of the treatments had a score between 6-8 indicating their satisfactory quality based on Dairy One suggestion.

Table 1. Fermentation characteristics and VFA score of the experimental silages

Item	Treatments ¹			SEM	P-value
	Control	Mint	F+P		
pH	3.63 ^b	3.57 ^a	3.70 ^c	0.01	0.002
NH ₃ -N (mg dL ⁻¹)	1.10 ^b	1.05 ^b	0.93 ^a	0.03	0.006
Lactic acid (% of DM)	2.50 ^a	2.63 ^b	2.55 ^a	0.06	0.008
Acetic acid (% of DM)	0.41 ^a	0.85 ^b	0.47 ^a	0.14	0.04
Propionic acid (% of DM)	0.023	0.016	0.020	0.008	0.81
Butyric acid (% of DM)	0.020	0.026	0.020	0.007	0.76
VFA score	7.02 ^b	6.38 ^a	6.87 ^b	0.084	0.001
Aerobic stability (h)	27 ^a	83 ^b	78 ^b	10.62	0.02

¹ Control: corn silage with no additive, Mint: corn silage treated with mint essential oil at rate of 240 mg kg⁻¹ DM, F+P: corn silage treated mixture of formic and propionic acids (2:1) at the rate of 4 ml kg⁻¹ fresh forage

^{a,b} Means within rows with unlike superscripts differ ($P < 0.05$).

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Forage Production and Nutritive Value of *Clitoria ternatea* Grown Under Different Maize Plant Density

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Abstract

The purpose of this experiment was to investigate herbage production and nutritive value of *C. Ternatea* intercropped with maize differing in plant density. The legume was planted in a completely randomized designed (CRD) in ten replicate 3 x 3 m² plots for each treatment at 40 x 20 cm² on July 1st 2015. After *C. ternatea* was germinating, maize was planted in different row distances i.e. 40, 80, 120 and 160 cm apart as treatments. Variables measured included forage production, nutrient content and in vitro dry matter and organic matter digestibility. Herbage production at 60 d after planting was comparable ($P>0.05$) between monoculture and intercropping. There was no difference in DM forage production with increasing maize plant density. Leaf : stem ratio was comparable between monoculture and intercropping as well as within maize plant density. Sharp declines leaf:stem ratio, however, occurred with advancing harvest time indicating reduction in forage quality. Crude protein content was significantly lower ($P<0.05$) in monoculture compared to intercropping. Maize plant density did not affect ($P>0.05$) crude protein as well as other nutrient content. In vitro DM and OM digestibility were over 70% and no treatment effect was observed. It can be concluded that *C. ternatea* can produce sufficient amount of high quality forage to be utilized as calf supplement when grown under high maize plant density provided the forage is harvested at 60 d after planting.

Keywords: *Clitoria ternatea*, monoculture, intercropping, forage production

Introduction

High calf mortality and slow growth rate have been considered as the major factors contributing to the low cattle productivity in dry land areas in Indonesia. Supplementation of Bali calves during the dry season before weaning has proved to be a promising option to substantially improve beef cattle production in the Province of East Nusa Tenggara, i.e. one of the driest area in Indonesia (Copland et al., 2011). *Clitoria ternatea* was proven as the most prospective forage legume to be utilized as calf supplement. Our previous experiment showed that *C. ternatea* grown monoculture produced the highest amount of good quality forage compared to other forage legumes (Jelantik et al., 2015). Its acceptability by traditional farmer, however, apparently depends on the ability of this legume to produce sufficient herbage when grown as intercrop to maize which is the staple food for the community in the area. The experiment was conducted to evaluate herbage production and

nutritive value of *C. ternatea* grown monoculture as compared to intercropping to maize differing in plant density.

Methodology

The experiment was carried out at Noelbaki, Kupang District, The Province of East Nusa Tenggara (ENT), Indonesia, from July to November 2015. Seeds of *Clitoria ternatea* was planted into the respective plots at 40 x 20 cm². Two weeks later, i.e. after the legume has been germinating, maize was planted in deferent raw distances i.e. 40, 80, 120 and 160 cm as treatments in 3 x 3 m² plots. A control *C. ternatea* monoculture was provided in similar size of plots. Each treatment was replicated in 10 plots, therefore there were 50 plots altogether. Maize was fertilized using urea at 300 kg/ha. Weed control was achieved by regular hand weeding. The land was irrigated once a week.

Forage production was measured twice at 60 d and 90 d after planting. Harvest was done in 5 plots of each treatment at every harvest time. Herbage samples were determined for their nutritional content including crude protein, crude fiber, crude fat, and nitrogen free extract following the proximate analyses. The procedure proposed by Tilley and Terry (1963) was followed to estimate in vitro dry matter (IVDMD) and organic matter digestibility (IVOMD).

The experimental data were subjected to analysis based on a Randomized Complete Design using a GLM procedure according to the SPSS18 program. Means were compared using LSDs.

Results and Discussions

Tabel 1. Forage production of *C. ternatea* grown monoculture or intercropped with maize differing in plant density

Variable	Treatment					SEM	Prob.
	J0	J160	J120	J80	J40		
Harvested at 60 d :							
Total biomass production (tons DM/ha)	5.186b	4.445ab	3.657a	4.090ab	3.505a	0.440	0.081
Leaf (%)	64.07b	65.72b	63.04b	62.34b	51.04a	2.278	0.001
Stem (%)	35.93b	34.28b	36.97b	37.61b	48.96a	2.278	0.001
Leaf Stem Ratio	1.790b	1.787b	1.720b	1.683b	1.104a	0.110	<0.001
Harvested at 90 d:							
Total biomass production (Ton DM/ha)	7.781a	4.248b	3.986b	3.597b	2.828c	0.681	<0.001
Clitoria (ton DM/ha)	7.781a	3.956b	3.650b	3.183c	2.270d	0.690	<0.001
Leaf (%)	41.58	35.13	46.23	39.94	42.39	3.296	0.228
Stem (%)	38.73	39.92	42.03	41.91	44.99	3.408	0.743
Beans (%)	19.69	24.95	11.67	18.16	12.62	4.132	0.174
Leaf Stem Ratio	1.101	0.924	1.239	0.989	0.949	0.158	0.613
Corn tops (ton DM/ha)	-	0.291a	0.336a	0.414ab	0.558b	0.064	<0.001

In general, chemical composition other than crude protein was comparable between *C. ternatea* grown monoculture and intercropped with maize (Table 2). Crude protein content on the other hand was significantly improved in herbage produced when *C. ternatea* was planted under high maize density. Nevertheless, all herbage produced had crude protein content above 16% which is considered to be sufficient as calf supplement (Copland *et. al.*, 2011). Forage IVOMD were comparable among treatments and relatively high i.e. over 70% for all treatments. This indicated that *C. ternatea* either grown monoculture or intercropped with maize has a high potency to be utilised as the base of calf supplement. To be used as calf supplement, feeds have to be highly digestible (Davis dan Drackely, 1998) and with high ME utilisation over than 86% (Gerrit *et al.*, 1996).

Table 2. Chemical composition of *C. ternatea* grown monoculture or intercropped with maize differing in plant density

Variabel	Treatment					SEM	Prob.
	J0	J160	J120	J80	J40		
Dry matter	18.72	19.31	18.77	16.82	20.42	2.380	0.653
Organic matter	91.24	90.61	86.59	91.09	90.94	2.719	0.401
Crude Protein	16.92a	18.97b	19.93b	19.27b	19.59b	0.799	0.008
Crude fat	6.08	6.18	5.24	5.17	6.00	0.700	0.443
Crude fibre	27.24	25.58	26.42	27.39	27.21	0.805	0.162
Carbohydrate	68.24	65.46	61.43	66.65	65.37	2.933	0.240
Nitrogen free extract	41.00	39.87	35.01	39.26	38.16	2.901	0.320
Gross Energy (MJ/kg)	17.98	18.03	17.24	17.97	18.10	0.513	0.463
IVDMD	71.17	72.22	69.59	69.34	70.16	1.366	0.223
IVOMD	76.73	76.99	75.80	76.26	75.95	0.981	0.716

IVDMD : in vitro dry matter digestibility

IVOMD : in vitro organic matter digestibility

Conclusion

Herbage production *C. ternatea* declined when grown under high maize density, but it produced higher quality herbage. To be utilized as calf supplement it may be better to harvest at 60 d after sowing particularly that grown intercropped with maize. It can be concluded that *C. ternatea* can be intercropped with maize under normal plant density.

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Prediction of feed metabolizable energy and metabolizable protein contents from their chemical constituents

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Abstract

This research aimed to predict feed ME and MP contents by their chemical composition. A total of 134 feeds from various categories (dry forage, fresh forage, silage, energetic concentrate, proteic concentrate and by-product) from BR-CORTE Brazil were integrated into a database. Values of TDN and CP were regressed against ME and MP, respectively. The value of ME was predicted from NDF, NFC, EE and CP whereas MP was predicted from RDP and RUP. The RDP to RUP ratio was regressed to MP in order to obtain optimum value of the ratio. Results showed that TDN and CP could predict quite accurately ME and MP by explaining 78.2% and 92.7% of their total variations, respectively. ME was accurately predicted by NFC, NDF, EE and CP, whereas MP was accurately predicted by RDP and RUP. Lower RDP/RUP led to a higher MP percentage to CP.

Key words: *metabolizable energy, metabolizable protein, total digestible nutrient*

Introduction

Current feed formulation system for ruminant livestock in developed countries such as USA (NRC), UK (AFRC), Australia (CSIRO), France (INRA), Netherland (VEM-DVE) and Brazil (BR-CORTE) is based on metabolizable energy (ME) and metabolizable protein (MP) supply. In Indonesia, however, our feed formulation is still based on an old system, i.e. total digestible nutrient (TDN) and crude protein (CP) to represent feed energy and protein supply, respectively (Riswandi et al., 2015; Yantika et al., 2016). This system has to be evaluated against the current system to decide whether we need to improve our system or we keep the old one. An approach to evaluate the system is through predicting ME and MP by feed chemical constituent, i.e. TDN and CP, respectively. The accuracy of prediction may provide important information to make such decision. This research therefore aimed to predict feed ME and MP contents by their chemical composition.

Methodology

Data used in the present study were originated from the Brazil system BR-CORTE (Filho et al., 2010). A total of 134 feeds from various categories (dry forage, fresh forage, silage, energetic concentrate, proteic concentrate and by-product) were integrated into a database. The chemical constituents recorded were dry matter (DM), ash, organic matter (OM), lignin, neutral detergent fiber (NDF), ether extract (EE), non-fiber carbohydrate

(NFC), TDN, ME, CP, rumen degradable protein (RDP), rumen undegradable protein (RUP) and MP.

Values of TDN and CP were regressed against ME and MP, respectively. Regression equations, P-values and coefficient of determinations (R²) were recorded for both relationships. Root mean square prediction error (RMSPE) was calculated between the observed and predicted values according to Jayanegara et al. (2015). The value of ME was predicted from NFC, NFC, EE and CP whereas MP was predicted from RDP and RUP. Additionally, RDP to RUP ratio was regressed to MP in order to obtain optimum value of the ratio.

Results and Discussions

It was observed that TDN and CP could predict quite accurately ME and MP; 78.2% and 92.7% total variations in ME and MP could be explained by TDN and CP, respectively (Figure 1). The RMSE between observed and predicted values of ME and MP were 0.31 and 2.83%, respectively. It may suggest that our old feed formulation system is sufficient and can be continued especially in the case of CP. However, it has to be noted that our TDN values are usually obtained by estimation from chemical composition (e.g. Zahera et al., 2015), and not by experimentation. This may create bias since to date such estimation has never been validated regarding its accuracy. Development towards a more sophisticated feed formulation system is advisable when adequate resources are available.

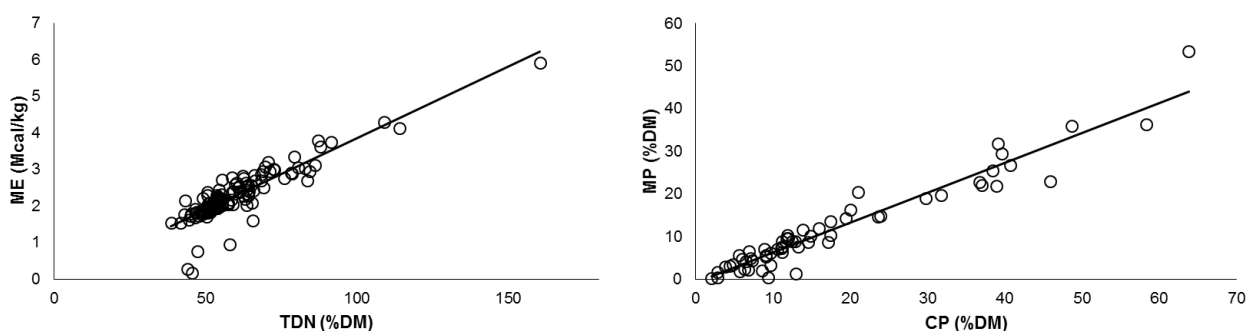


Figure 1. Relationships between total digestible nutrient (TDN) and metabolizable energy (ME) and between crude protein (CP) and metabolizable protein (MP).

$$ME = -0.057 (\pm 0.111) + 0.039 (\pm 0.002) \text{ TDN (P} < 0.001; R^2 = 0.782)$$

$$MP = -0.711 (\pm 0.589) + 0.701 (\pm 0.026) \text{ CP (P} < 0.001; R^2 = 0.927)$$

Both ME and MP are accurately predicted by feed chemical constituents (Table 1). Carbohydrate, both structural (represented by NDF) and non-structural (represented by NFC), EE and CP contribute to energy supply for livestock. The MP is originated from microbial protein that use RDP and by-pass protein. Microbial protein and by-pass protein that can be digested and absorbed in the small intestine is regarded as MP (Pfeffer et al., 2016). Therefore RDP and RUP are very accurate predictors of MP.

Table 1. Regression equation of ME and MP prediction

Dependent	Equation	P-value	R ²
ME	$-0.296 + 0.032 \text{ NFC} + 0.018 \text{ NDF} + 0.068 \text{ EE} + 0.044 \text{ CP}$	<0.001	0.914
MP	$-0.001 + 0.577 \text{ RDP} + 0.880 \text{ RUP}$	<0.001	0.999

ME, metabolizable energy (Mcal/kg); NFC, non-fiber carbohydrate (%DM); NDF, neutral detergent fiber (%DM); EE, ether extract (%DM); CP, crude protein (%DM); MP,

metabolizable protein (%DM); RDP, rumen degradable protein (%DM); RUP, rumen undegradable protein (%DM)

Relationship between RDP to RUP ratio and MP is presented in Figure 2. Lower RDP/RUP led to a higher MP percentage to CP. It is apparent that $RDP/RUP \leq 4.0$ is important to maintain $MP \geq 60\%$ CP, which is equal to maximum 80% RDP (or minimum 20% RUP).

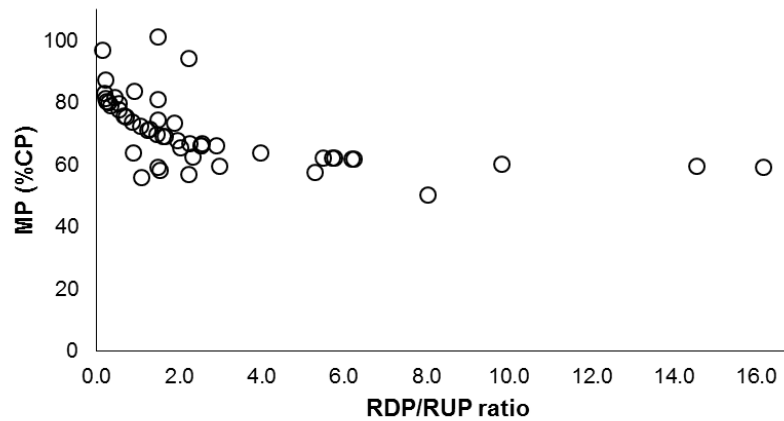


Figure 2. Relationship between rumen degradable protein (RDP) to rumen undegradable protein (RUP) ratio and metabolizable protein (MP).

Conclusion

The TDN and CP and other feed chemical constituents could predict quite accurately ME and MP. Lower RDP/RUP led to a higher MP percentage to CP..

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Oral Presentation 4 Focus Session:

Feed and Nutrition (2)

Friday, 21 October 09:45-11:35

Room: Panderman 2

Nutritional Responses on the Hypothalamic-Pituitary-Ovarian Axis on Female Goats

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Abstract

Livestock production efficiency depends greatly on nutritional management for reproductive efficiency ('focus feeding'), as embodied in the concept of 'clean, green and ethical management'. As reported in sheep studies, changes in the levels of nutrition primarily affect a range of blood-borne metabolic factors that appear to exert direct and indirect effects on reproductive performance through actions on the hypothalamic-pituitary-ovarian axis. The similarities between sheep and goats in their basic reproductive biology suggest that the same responses would be seen in female goats. However, there has been little experimentation in goats compared to sheep, so we know almost nothing for goats about the effects of nutritional supplements on the feed-forward-feedback loops in either the reproductive axis or the metabolic homeostatic systems. Thus, it is important to understand the fundamental of reproductive physiology that could alter the reproductive performances in goats.

Keywords: *goat, nutrition, reproduction*

Introduction

Several environmental factors such as photoperiod, stress and dietary intakes, could alter the reproductive system of female goats. These factors primarily affect follicular development, ovulation rate and successful pregnancy. In small ruminants, the potential to improve reproductive performance through nutritional supplementation is well known on sheep but sparse in goats (Scaramuzzi et al., 2011; ShikhMaidin, 2011). Focus feeding known as "flushing" is short-term high nutrient intake that is focused to increase prolificacy of sheep and this refined system embodiment with concept of 'clean, green and ethical' management (Martin et al., 2004).

In small ruminants, nutrition appears to reproductive performance via metabolic hormones and hypothalamic-pituitary-ovarian axis. For example, in sheep overfed ewe could have negative embryo-maternal communication, thus predominantly affect the establishment of pregnancy but this was not seen in goats (Parr, 1992; ShikhMaidin, et al. 2014). There are several factors linked with sustainability of pregnancy, including, energy balance from feed intake and reproductive hormones. Thus it is important to understand physiological mechanisms underlying those responses so that it could improve reproductive performances of goat industry, particularly in Malaysia.

Endocrine regulation on ovarian activity

Female reproductive activity in goats, as in other animals, is regulated primarily by complex hormonal interactions among the hypothalamus, pituitary gland and ovary. The primary driver of the process is the hormones in the hypothalamic-pituitary system:

gonadotrophin-releasing hormone (GnRH), follicle-stimulating hormone (FSH) and luteinizing hormone (LH). The primary contributions from the ovary are progesterone, inhibin and oestradiol. These hormones are linked by feed-forward processes (hypothalamus to pituitary gland to ovary) and feedback processes (ovary to hypothalamus and pituitary gland), as demonstrated in Figure 1.

During follicular phase, recruitment of growth and development of follicles is initiated by frequency of LH and FSH concentrations. These gonadotrophin hormones are linked closely with intensity of oestradiol. Ultimately, the Graafian follicles that appear during the follicular phase determines ovulation rate (Scaramuzzi et al., 2011). Luteal phase begins from the time of ovulation. In sheep, the intensity of GnRH pulses could affect the number of corpus luteum. Progesterone reflects the secretory activity of the corpus luteum.

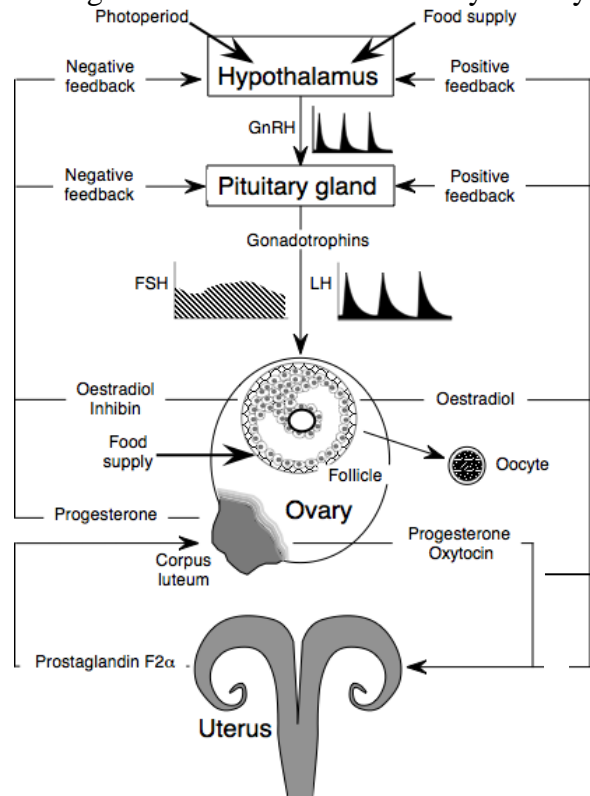


Figure 1: The oestrous cycle is regulated by the inter-relationships between hypothalamic (GnRH), pituitary (LH and FSH), follicular (oestradiol and inhibin), luteal (progesterone and oxytocin) and uterine (prostaglandin F2 α) hormones. Nutritional inputs, the focus of this thesis, are thought to affect these systems by acting on sites in the central nervous system and the ovary. These endocrine relationships are thought to be similar in goats and sheep, although very little is known about inhibin in goats. Redrawn after Scaramuzzi et al. (1993).

Feed intake and reproductive performance in female goats

The responses of supplementation vary on reproductive performance, mainly in ovulation rate, pregnancy, embryo survival and kidding rate. Decades have been reported in sheep; high protein and energy supplementation increase number of follicles to ovulate but continued feeding increase embryo mortality. Changes in ovarian activity in response to changes in nutrition and this response could be explained by the actions metabolic hormones and clearance of progesterone concentrations. Insulin directly stimulate folliculogenesis and increase ovulation rate and this seem apply to goats (Haruna et al. 2009; Meza-Harrera et al., 2008; Vinales et al., 2005). In addition, metabolic factors are also initiated by changes in expression of secretion at brain and pituitary.

As mentioned earlier, in sheep, embryo mortality increased in overfed ewes, which led to the reduction of progesterone concentrations during luteal phase (Parr et al., 1982; 1993). There are many possible reasons to progesterone clearance during early pregnancy; 1) feed-forward-feedback loop between ovarian secretion and pituitary stimulation, 2) metabolic factors and 3) stress. Supplements and restricted feeding are able to suppress GnRH secretions and responsiveness of luteal cells.

It is important to understand the differences between species in their reproductive responses to nutrition because the outcomes strongly influence the rate of production of offspring and may help avoid reproductive failure. This is particularly important in countries such as Malaysia where the goat industries contribute heavily to the domestic economy

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Effects of Long Transportation Preceded by Short Periods of Deprivation on the Intake and Nutrient Digestibility of *Bos sondaicus* bulls

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Abstract

The long duration transportation with short periods of feed and water deprivation were studied using four *Bos sondaicus* bulls where two of the animals were fistulated. The animals were assigned in a 2 x 4 cross-over design with two treatments: first treated group offered feed and water ad libitum (control) then transported for 8 hours (the longest land transportation time in West Timor, Indonesia) and second treated group offered no feed and water for 12 hours followed by offering feed and water ad libitum for 4 hours (farmers custom before selling their cattle) then transported for 8 hours. Intake, rumen pH and nutrient digestibility were recorded during the study. Data were compared between groups using T-test method in SPSS software. Animals having long duration transportation preceded by short period of feed and water deprivation have higher DM intake (2.65 v 2.07 ; P=0,001) compared to bulls offered feed and water ad libitum before long transportation. Whereas, the control bull tends to have higher DM intake (3.99 v 3.54; P=0,01) compared to another group. However, both groups did not differ in DM digestibility pre (2.39 v 2.29) and post (1.06 v 1.41) long transportation with short periods of feed and water deprivation. Also rumen pH did not differ between groups pre and post transport. These results indicate that long duration transportation preceded by short period of feed and water deprivation did not have a negative effect on the DM intake and digestibility of *Bos indicus* bulls.

Key words: *Cattle, Short periods of deprivation, Long transportation, Rumen pH*

Introduction

It is wellknown that Nusa Tenggara Timur (NTT) province is one of the Bali cattle producer to fulfil demands of live cattle from the highest consumption areas of Jakarta and West Java, Indonesia. The distance between the island of Timor and Jakarta as the consumption centre is great. The cattle must endure land and sea transportation that can take greater than or equal to 5 days in transit. These activities result in many stressors on cattle which lead most commonly to appetite and body weight loss (McVeigh et al., 1982). The average amount of body weight loss from cattle transported from West Timor to Jakarta has been reported to be 12.60% (Leo-Penu et al., 2010). Unfortunately, this loss is passed back to farmers in the form of a reduced price paid for live cattle.

It common to farmers in West Timor to deprive their cattle from feed and water for 24 hours before let the cattle back to access to feed and water for at least few hours before they selling the cattle. They believe that the practical activities can help to increase the live weight of the cattle. Consequently, they can geerate more money from selling the cattle. The research was conducted to investigate the effect of the practical activies on DM intake and digestibility of the cattle.

Methodology

Experimental Design

Four fistulated *Bos sondaicus* bulls or Bali cattle (201.5 ± 4.5 kg BW; mean \pm SEM) were used in this study. Throughout the study, the bulls were allocated to one of two treatment groups: 1) control bulls (T1) offered *Sorghum plumosum* var. *Timorensis* hay *ad libitum* without deprivation before transport and deprived bulls (T2) offered no feed and water for 24 hours followed by offering *Sorghum plumosum* var. *Timorensis* hay for four hours before transport. The treatment was mimicked the cattle transportation and practical activities of farmers before selling their animals in West Timor, Indonesia. Experimental animals were transported for 8 hours as the longest practical cattle land transportation in West Timor. Both animal groups were then offered feed ration *ad libitum* once arrived in pens after transportation.

Table 1. The chemical composition of experimental feed offered to *Bos sondaicus* bulls before and after transport.

	Feed Ration	<i>Sorghum plumosum</i> var. <i>Timorensis</i> hay
Dry Matter (DM), %	89,61	90.54
Ash, %	22.89	6.67
Organic Matter (OM), %	83.87	66.72
Crude Protein (CP), %	20.18	5.44
Gross energi, cal/g	3264	3908

Statistical Analysis

The student's t test was undertaken to compare DM intake and digestibility means between treatments on specific days. SPSS version 22 (IBM Corp., US, 2013).

Results and Discussion

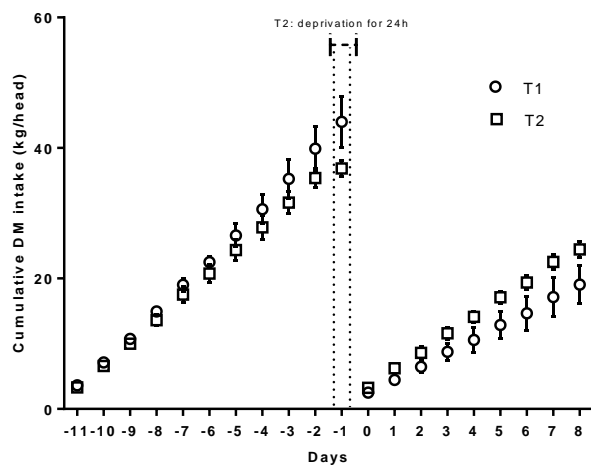


Figure 1. Cumulative DM intake (means \pm SEM kg/head) of animals treated: (T1) control bulls offered *Sorghum plumosum* var. *Timorensis* hay *ad libitum* without deprivation before 8 h transportation and deprived bulls (T2) offered no feed and water for 24 hours followed by offering *Sorghum plumosum* var. *Timorensis* hay for four hours before 8 h transportation on day 0.

During pre deprivation, there were no differences between the deprived group (T2) and the control group (T1) for DM intake. After transport on day 0, the intake of the deprived cattle was the same as the control group. However, the deprived group had a higher ($P=0.005$) DM intake on the morning of day 1 (3.00 ± 0.15 kg) and day 2 (2.37 ± 0.28 kg) compared to the control group (1.95 ± 0.35 kg; 2.00 ± 0.31 kg, respectively).

This higher intake contributed then to the cumulative DMI of the deprived cattle being higher than the control group for the remainder of the re-feeding period. This results is different compared to the longer period of feed and water deprivation in previous studies (Cole and Hutcheson, 1985a, Fluharty *et al.* 1996). They reported that the depression in DMI often extends to the first 7 to 10 days after feed and water deprivation. Fluharty *et al.* (1996) stated that the DMI of calves deprived of feed and water for 48 or 72 hours was less than their control calves at day 1. The cattle used in the present study demonstrated a similar DMI to the control animals on day 0 after transport. However, the deprived group subsequently increased their DMI on day 1 and 2 then showed a similar DMI to the controls for the rest of the study. Our study also found that the DM digestibility did not differ between both groups of the animals during pre-deprivation (2.39 kg/head v 2.29 kg/head) and post-transport (1.06 kg/head v 1.41 kg/head). It is likely that the practical activities of farmers depriving their animals for short period of time before selling their cattle in West Timor tends to have a positive impact on DM intake.

Conclusions

These results indicate that long duration transportation preceded by short period of feed and water deprivation did not have a negative effect on the DM intake and digestibility of *Bos indicus* bulls.

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Addition of different species of forages legumes on physical, chemical characteristics and in vitro digestibility of dairy cattle feed pellet

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Abstract

This study aims were to determine the effect of various species of forage legumes (*Calopogonium mucunoides*/Kalopo, *Centrosema pubescens*/Sentro and *Pueraria phaseoloides*/Kudzu) on durability, crude fiber content, in vitro digestibility of dry matter (IVDMD), in vitro digestibility of organic dry matter (IVDOMD), ammonia content (NH₃) and volatil fatty acid (VFA) of pellets for dairy cattle. Research has been conducted experimentally with 6 treatments, R1 = 20% Kalopo + 80% concentrate, R2 = 30% Kalopo + 70% concentrate, R3 = 20% Sentro + 80% concentrate, R4 = 30% Sentro + 70% concentrate, R5 = 20% Kudzu + 80% concentrate, R6 = 30% Kudzu+ 70% concentrate. Each treatment was replicated 4 times. The experimental designs were complete randomized block design and tested by Duncan's Multiple Range Test. The results showed that the addition of various species of legumes affect crude fiber content, IVDMD, IVDOMD, NH₃, and VFA content, but no significant effect on durability of dairy cattle feed pellet. The most obvious finding to emerge from this study is that the addition of 30% kudzu showed the optimum results i.e. 95.6% durability, 19.26% crude fiber content, 69.19% IVDMD, 63.68% IVDOMD, 6.33 mM NH₃ content and 174 mM VFA content.

Keywords: *sentro, kalopo, kudzu, pellets, durability, concentrate of dairy cattle*

Introduction

The main limitation in every dry season is that forage supply, which very abundant in the rainy season. Drying and pellet-making is one method to solve the problems. The advantage of making pellet are easy to storage and easy to handle for transportation. Availability of forages should be produce from superior forage in order to obtain the high yield and quality as well.

High quality of pellet is determined by the composition of the constituent materials. Forage legume is one of feedstuffs which use in the manufacture of pellets because of protein content higher than forage grasses. There are many species of legume in Indonesia. Legume widely used as forages and have high production and high quality among others i.e. Sentro (*Centrosema pubescens*), Kalopo (*Calopogonium mucunoides*) and Kudzu (*Pueraria phaseoloides*) which have crude protein content 23.60%, 22.01% and 19.20% respectively. Pellet is a form of preserving feed materials which ensure the availability and quality of feed (Retnani, 2011).

Methodology

Research has been conducted experimentally with 6 treatments, R1 = 20% Kalopo + 80% concentrate, R2 = 30% Kalopo + 70% concentrate, R3 = 20% Sentro + 80% concentrate, R4 = 30% Sentro + 70% concentrate, R5 = 20% Kudzu + 80% concentrate, R6 = 30% Kudzu + 70% concentrate. Each treatment was replicated 4 times. The experimental designs were complete randomized block design and tested by Duncan's Multiple Range Test. Concentrates have a 16% crude protein content. The ingredients of the ration are cassava, pollard, rice bran, peanut meal, molasses, and mineral

Parameter measured: 1. durability. The measurement of durability is using tumbling box with a speed of 50 rpm for 10 minutes, then filtering with German sieve number 8. The pellets left in the sieve are weighed and compared to the weight of the pellets before using the tumbling box. 2. Analysis of the crude fiber content (AOAC, 2015) 3. Analysis of dry matter (IVDMD) and organic matter in vitro (IVDOMD) 4. The content of NH₃ results in vitro 5. The content of VFA results in vitro (Tilley and Terry, 1963)

Results and Discussions

All treatments gave durability over 80% which qualify as good pellets. Pellets with high durability, would easy to handling both in storage and transport time. Pellets with high durability will be stable and not fragile, so the integrity of the pellets will still be awake. High durability is obtained because of the arrangement of the building blocks of pellets in part as a source of energy that has high starch content, i.e. cassava, pollard and molasses. The starch serves as a binder in the form of pellets. Starch would be gelatinized due to heating at the time of making pellets that will affect durability (Iin, et.al. 2015).

The content of crude fiber of pellet increased with increasing doses of forage legumes. Forage legume is a source of fiber for ruminants. IVDMD content obtained from the pellets with the addition of legumes 30% kudzu and 20% Sentro: 69.20% and 65.20% respectively. Generally, materials with high fiber content have lower digestibility. For ruminants, crude fiber contents determine the digestibility, because ruminants can digest cellulose and hemicellulose, except lignin. The addition of 30% kudzu showed the highest content of NH₃ and VFA in vitro because of legumes kudzu has the highest IVDMD and IVDOMD. These factors may explain the content of NH₃ and VFA are high too. This study has found that a dose of 30% forage legume kudzu + 70% concentrate followed by Sentro 20% + 80% concentrate, showed the optimum dose. These finding can be applied in the field to measure the direct effect on productivity of livestock dairy cows, ie the milk production and quality.

Table 1. In vitro degistibility, ammonia concentration (NH₃), crude fiber content, VFA, and durability on pellet mixed between legume and concentrate.

	IVDMD (%)	IVDOMD (%)	NH ₃ (mM)	Crude fiber (%)	VFA (mM)	Durability (%)
T1	53.43 ^f ±0.81	51.00 ^c ±0.41	4.51 ^{cd} ±0.09	19.06 ^a ±0.29	122.00 ^d ±3.34	94,6 ^{ns} ±1.61
T2	58.20 ^d ±1.38	53.33 ^d ±0.72	5.51 ^b ±0.23	17.35 ^b ±0.44	134.63 ^c ±10.04	96,05±0.68
T3	65.20 ^b ±0.36	61.03 ^b ±0.75	5.06 ^{bc} ±0.06	15.14 ^c ±1.11	154.63 ^b ±1.93	93,75±0.5
T4	55.61 ^e ±1.64	51.86 ^{de} ±0.76	3.94 ^d ±0.37	17.05 ^b ±0.47	132.38 ^{cd} ±6.38	95,7±1.24
T5	61.25 ^c ±0.52	56.51 ^c ±0.91	4.71 ^c ±0.20	17.99 ^{ab} ±0.39	161.38 ^b ±5.56	95,25±1.55
T6	69.19 ^a ±0.83	63.68 ^a ±1.09	6.33 ^a ±0.49	19.26 ^a ±0.97	174.00 ^a ±2.74	95,6±1.35
Sign.	**	**	**	**	**	ns

IVDMD= In vitro digestibility of dry matter, IVDOMD= In vitro digestibility of organic dry matter, NH₃= Ammonia, VFA= Volatile Fatty Acid, T1 = 20% Kalopo + 80% concentrate, T2 = 30% Kalopo + 70% concentrate, T3 = 20% Sentro + 80% concentrate, T4 = 30% Sentro + 70% concentrate, T5 = 20% Kudzu + 80% concentrate, T6 = 30% Kudzu + 70% concentrate, ns : not significantly different, **: significant different

Conclusion

The results of this investigation show that the addition of various species of legumes affects crude fiber content, IVDMD, IVDOMD, NH₃, and VFA content, but no significant effect on durability of dairy cattle feed pellet. These findings enhance our understanding of 30% kudzu mixed with concentrate showed the optimum results i.e. 95.6% durability, 19.26% crude fiber content, 69.19% IVDMD, 63.68% IVDOMD, 6.33 mM NH₃ content and 174 mM VFA content.

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Supplementing *Saccharomyces cerevisiae* Into Low Quality Local-Based Feeds Improves Performance and Nutrient Digestibility Of Starter Local Pigs

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Abstract

The study aimed at evaluating the effect of supplementing *Saccharomyces cerevisiae* into low quality based-diet on performance and nutrient digestibility of starter pigs. 12 starter local pigs were fed 4 treatment feeds based on block design of 4 treatments with 3 blocks design procedure. The 4 treatment feeds offered consisted of: R0 (commercial diet/551); R1 (basal feed + 2% yeast of daily feeds requirement); R2 (basal feed + 4% yeast of daily feeds requirement); and R3 (basal feed + 6% yeast of daily feeds requirement). Feed intake, daily weight gain, feeds conversion efficiency, protein and crude fiber digestibility were evaluated in the study. Statistical analysis show that effect treatment is not significant ($P > 0.05$) on all variables studied. Supplementation yeast of 6% is the best treatment performing the highest performance and nutrients digestibility values. The conclusion drawn is that supplementing yeast up to 6% could improve performances of starter local pigs fed low quality feed and perform the similar result with feeding commercial feeds (551). It is suggested to use yeast up to 6% in the diet and further research including widen range and high level of yeast supplementation could be done.

Keywords: yeast, *Saccharomyces*, local feeds, pigs protein digestibility

Introduction

Mostly home scale pig farmers in Nusa Tenggara Timur (NTT) regions are prefer using local and house hold waste pigs than commercial feeds, because is cheaper (Ly *et al.*, 2010). The consequence, however, pigs productivity in this region are low because feeds composed of local feedstuffs, indeedly are deficiency in some required nutrients (Johns *et al.*, 2009). Low in protein and high in crude fiber are the most deficient nutrients in the local-based feeds. Therefore, solving methods to improve protein content and at the same time can increase the fiber digestibility of the feeds by pigs are needed. The method should be technical easy and acceptable as the farmers in general have low skills in feeds processing and low interest in complicated ways. Supplementing pigs with an additional essential nutrient or compound containing essential nutrients with fibre-fermenting capability into local-based feeds is one of the helpful way.

Brewers yeast –most familiar as *Saccharomyces cerevisiae*- for it contains 85% *Saccharomyces cerevisiae* microbes is a riching-protein compound and known as a single protein (Evans, 1985; Waterworth, 1990); playing role as probiotic and used a feed additive for pigs (Jacela, *et al*, 2010). The such advantages of using *Saccharomyces cerevisiae* for pigs are improving protein content, creating healthy digestive tract by increasing benefit microbes population and supporting immunity formation in in digestive tracts and increasing

fiber digestibility by fermentative role in pigs (Price, *et al.*, (2009). These advantages are useful to prepare young pigs for their old nutrient digestion. Study on using for pigs *Saccharomyces cerevisiae* is rarely, but supplementing 2-6% *Rhizopus oligosporus* in growing pigs' feeds has been successful reported by Se'u (2005).

The study was carried to provide information of supplementing *Saccharomyces cerevisiae* into local-based feeds of stater pigs.

Methodology

The study was carried out carried out *in vivo* by feeding trial using 12 stater (2 months) local pigs. Block design of 3 treatments with 4 replicates procedures were applied in the study. The 4 treatments offered consisted of : commercial feeds ⁽¹⁾ (F₀), local-based feed⁽²⁾ + 2% yeast (F₁); local-based feeds + 4% yeast (F₂) and local-based feeds + 6% yeast (F₃). ⁽¹⁾ starter feeds Charoen Pokphand 552; ⁽²⁾Local-based feeds (16% CP) was composed of: 50% corn meal + 31.1% rice bran + 7.8 fishmeal + 11% bean curd extract. Yeast levels were copied of *Rhizopus oligosporus* levels used by Se'u, 2005). Yeast was added into the feeds based on dialy intake. Variables studied consisted of: daily intake, daily weight gain, feed conversion (FC), crude protein (CP) and fiber (CF) digestibility values. Data were analyzed using analysis of variances followed with Duncan's multiple range test (Steel, *et al.*, 1997).

Results and Discussions

The average collected data of all variables studied are shown in Tabel 1.

Table 1. Nutrient composition and average data of variable studied

Variable	F0	F1	F2	F3
CP % ³	19.34	16.91	17.87	18.82
Fat % ³	3.99	3.18	3.37	3.42
CF % ³	6.08	7.04	7.06	7.07
NFE% ³	70.60	72.45	72.55	71.44
Ca % ⁴	0.90	0.53 ⁽²⁾	0.61 ⁽²⁾	0.63 ⁽²⁾
P % ⁴	0.70	1.12 ⁽²⁾	1.14 ⁽²⁾	1.16 ⁽²⁾
GE (Kcal)	4348.51	4216.80	4293.64	4306.57
Feed intake (g)	935.20 ^a	1.030.33 ^a	1.043.13 ^a	1.108.93 ^a
Weight gain	275.52 ^a	281.28 ^a	276.48 ^a	291.84 ^a
FC	29.46 ^a	27.30 ^a	26.50 ^a	26.32 ^a
CP digestibility %	78.92 ^a	81.86 ^a	82.31 ^a	82.91 ^a
CF digestibility %	74.28 ^a	78.33 ^a	79.62 ^a	79.43

³Proximate analysis of The Chemical and Nutrition Laboratory of Faculty of Animal Husbandry-Nusa Cendana University-Kupang Indonesia; ⁴Analysis of Soil laboratory of Agriculture Faculty-Nusa Cendana University-Kupang Indonesia.

Table 1 shows that supplementing *Saccharomyces cerevisiae* improving CP, fat, CF and energy of local-based feeds. CP, fat, energy and minerals contents of supplied feeds were lower, while CF content was higher than in F0. These shows that supplementing *Saccharomyces cerevisiae* could improve nutrient contents but increased mineral contents in the local-based feeds.

Feeds intake, daily weight gain, FC, CP and CF digestibility also increased but FC reduced as the *Saccharomyces cerevisiae* levels increased. These mean that supplementing *Saccharomyces cerevisiae* improved feeds palatability resulting in higher feeds intake followed feeds conversion efficiency and therefore resulting higher daily weight gain of the pigs.

Conclusion

The conclusions drawn are: supplementing 2-6% *Saccharomyces cerevisiae* into local based-feeds with 16%CP improved performances and crude protein and fiber digestibility values of starter local pigs. The higher the *Saccharomyces cerevisiae* supplementation up to 6% the higher the performances and digestibility values performed.

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Effect of Poultry by Product Meal Based Diet on Performances of Weaning and Growing Pigs

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Abstracts

The major constraint for pork production is high feed costs. Poultry by-product meal (PBM) is a cheap, locally produced animal protein source available in Sri Lanka which is high protein feed ingredient potentially suitable for swine diet. This study was conducted to determine the effect of low cost standard diet and low cost high protein diet formulated with PBM on performances of weaning and growing pigs. Landrace weaner piglets (n=36) with live weight of 7-8 kg were assigned to three dietary groups of T1: standard diet without PBM: (control), T2: standard diet with PBM, and T3: high protein diet with PBM. The body weight, length, heart girth and height were measured for 90 days. Average daily feed intake, average daily gain, FCR and feed costs were calculated. Two sample t-tests were carried out using SAS 9.2 to analyse data. There was a significant difference ($p < 0.05$) between treatment and control group of pigs for body weight gain, heart girth gain, height gain from 65 days to 130 days of age with high protein PBM based diet. No significant difference was recorded for length ($p > 0.05$). Higher FCR was observed in piglets fed with diets containing higher levels of PBM. High protein swine diets with over 15% PBM give better performance with relatively low cost. The experiment concludes that High protein swine diet containing 10% - 26% of poultry by-product meal can be used without negative effect in growth performances of pigs.

Keywords: *performance, growing pigs, poultry by-product meal*

Introduction

Swine sector is one of the main livestock sub-sector which places next to the poultry and dairy in Sri Lanka. Livestock producers are facing problems because of price escalations of grains, oil cakes and fishmeal. Poultry byproduct meal is one of the alternative sources of animal protein that can be used to feed domestic animals, along with meat and bone meal, blood meal, feather meal and fish meal (Meeker et al., 2006, Orozco-Hernandez, 2003). This study was conducted to test poultry byproduct meal as the major protein source in pig diets and the study was designed to investigate the effect of poultry byproduct feeding on feed intake, growth performances of weaned pigs and to evaluate the economics of feeds formulated incorporating poultry byproduct meal.

Materials and Methods

This study was carried out at Wayamba University of Sri Lanka. Landrace weaner piglets (n=36) of both sexes with live weight of 7-8 kg, weaned at 30 days were selected from six litters for the experiment and assigned to three treatment groups; T1 (control): standard diet without PBM, T2: standard diet with PBM and T3 high protein diet with 6% more protein

supplemented with PBM. The experimental diets were formulated using maize, rice polish, broken rice, soybean meal, fish meal, PBM, copra meal, animal fat, premix, Mineral supplements, common salt and with toxic binders and enzymes as additives. Feeding trials were conducted for 90 days and data were collected on growth performance: body weight, total length, total height and heart girth. Feed Conversion Ratio (FCR) and growth rate (weight gain) was calculated. Cost of production per respective treatment was calculated based on feed cost per unit gain. Gross margin was calculated taking the market price of live weight/kg and total variable cost into account.

Results and Discussion

The experimental area experiences average ambient temperature of 89.9⁰ F during day and 80.6⁰ F. The temperature in the experimental area is within the thermos-neutral zone of pig (Jensen *et al.*, 1969). Experimental diets were uniform in relation to all main nutrients other than the variation intended by the treatments. However, treatments with high PBM levels were high in calcium, phosphorus, lysine and energy:protein ratio was also high because of high protein content in diets. There was no significant difference between body weight of treatment groups until 65 days of age and thereafter, significant difference ($P < 0.05$) of body weight between T2 compared to T1 and T3 was observed. The highest final body weight was recorded in T3. There was no significant difference of the average final body weights or gain of male and female with the treatments at any stage of the experiment. All three dietary groups exhibited relatively uniform growth pattern after 85 days of age up to the end. Average body length gain of T1, T2, and T3 were not significantly different (Table 1). However, the final height, heart girth and body weight, were significantly different in T2 compared to T1 and T3 separately, but the difference was not significant between T1 and T3.

Table 1: Body measurements and Average gain of animal throughout the experiment period

Character	T1	T2	T3
Initial body length (cm)	46.5±0.70 ^a	50.5±0.32 ^a	49.5±0.14 ^a
Final body length (cm)	77.5±2.82 ^a	78.5±0.70 ^a	82.5±0.70 ^a
Initial height (cm)	28.5±1.40 ^a	30.5±1.00 ^a	30.5±0.35 ^a
Final height (cm)	53.3±1.70 ^a	50.5±1.40 ^b	57.2±.34 ^a
Initial heart girth (cm)	43.5±0.35 ^a	46.0±0.51 ^a	45.5±0.70 ^a
Final heart girth (cm)	80.3±1.70 ^a	74.6±2.72 ^b	86.0±1.00 ^a
Initial body weight (kg)	7.6±0.14 ^a	7.9±0.35 ^a	7.5±0.42 ^a
Final body weight (kg)	51.7±2.89 ^a	41.6±0.91 ^b	55.7±1.69 ^a
Weekly body length gain (cm)	2.4±0.1 ^a	2.2±0.1 ^a	2.5±0.1 ^a

* Values are presented as mean ± SD, Values sharing different superscript letters within the row indicate the significant difference at $p < 0.05$.

The pigs fed standard diet supplemented with PBM (T2) have recorded poor growth rate compared to other two groups during experimental period after the 60 days. Ration in Treatment 2 (T2) has been formulated replacing fishmeal and soymeal by 7% to 15% of PBM. According to the results, replacing fishmeal and soymeal by PBM at 7% to 15% does not show the expected performance though the protein and energy levels are met. When compared to standard diet with or without PBM (T1 and T2), high protein diet with PBM (treatment T3) reported highest growth performances. The crude protein level of diets in treatment 3 were 24%, 22% and 20% at three growing stages. Zier, (2004) has reported

that there was no difference in performance of piglets fed PBM in place of the other ingredients such as fishmeal and blood meal. Previous studies have revealed that, diet formulated with PBM up to 7.5% for pigs in growing stage from weaning to slaughter, can be used with no adverse effect on growth performances (Kannan, *et al.*, 2008). According to Zier, (2004) feed intakes were higher ($P < 0.01$) for pigs fed the conventional diet than for pigs fed the 20% PBM diet during post weaning Phase. However in this study, PBM has been used comparatively higher inclusion rates of 26%, 21% and 15.5% with no negative effect of feed intake and animal performances. Lysine level in diet has a positive relationship to growth and maximum yields including average daily gain, gain:feed ratio, carcass weight and grade can be achieved by administrating finishing pigs with an ideal Lysine: digestible energy ratio, Lys 2.1 g/DE Mcal (Cho, 2012). All the diets in the experiment had more than 2.1g of lysine/DE Mcal and T3 diets had over 3.5g of lysine/DE Mcal.

According to the performance analysis based on body weight, length, heart girth and height as body parameters and calculated performance characters such as average feed intake, average daily gain and FCR, higher protein diets with high PBM contents have resulted better growth rate in relation to body weight and FCR (Table 2)

Table 2: Performance characters of pigs during stage G3 (35- 60kg)

Performance characteristics	Treatment 1 (Control)	Treatment 1 (T2)	Treatment 2 (T3)
Average Initial Live Weight (kg)	33.25	29	37
Average Live Weight (kg) at 130 days	51.75	42.5	57
Average Weight Gain (kg) in stage G3	18.5	13.5	20
Average Total Feed Intake (kg/pig)	52.425	37.125	55.25
Feed Conversion Ratio (FCR)	2.83	2.75	2.77
Survival Rate (%)	100	100	100
Average Daily Gain (g/pig)	620	450	670

Inclusion of PBM reduces the cost of feed and higher protein diets can be prepared at a low cost compared to the standard diet. High protein diet used in T3 were always economical compared to control diet (T1) in this experiment. Diet in T2 was the least cost formula used in the experiment. Therefore, T2 would be the most profitable dietary treatment and would have been even better if higher carcass weight could have been achieved. According to the data, treatment diets were cheaper than control diet and also treatment diet were very economical compared with some commercial feeds

Conclusion

The poultry by-product meal (hypromeal) has an effect to enhance the growth performances of pigs. High protein swine diet with contain 10%-26% of poultry by-product meal can be used without negative effect of growth performances of pigs and high protein swine diet with poultry by-product meal gives better performance with relatively low cost. Poultry by-product meal can be applied as economically beneficial alternative feed ingredient to produce high quality, low cost swine diet.

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Growth Performance and Carcass Composition of Lambs Consumed Complete Feed with Increasing Poly Unsaturated Fatty Acids of Sunflower Oil

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Abstract

The objectives were to investigate effects of rich poly unsaturated fatty acid (pufa) complete feed to performance and carcass composition of lamb. 18 lambs, 2 months of age and body weight of 10.21 ± 2.29 kg were used in a randomized block design with 3 blocks, 3 treatments and 2 replications. The sources of pufa is sunflower oil. The treatments are complete feed without the addition of sunflower oil (SF0), the addition 4% sunflower oil (SF4), and the addition 6% sunflower oil (SF6). Variables measured were nutrients and water intake, body weight gain, slaughtering weight, feed efficiency and composition of carcass. Treatments decreased dry matter intake, nutrients (Crude Protein, Crude Fiber, Calcium) and water consumption ($P < 0.05$). The treatments were increased fat consumption and meat persentation of breast and bone of loin ($P < 0.05$). Body weight gain, slaughtering weight, carcass composition and feed efficiency ratio were not affected by treatments. Complete feed with increasing pufa was a good approach to improve growth performance of feedlot lambs.

Keywords: *complete feed, lambs, carcass, sunflower oil, pufa*

Blood Properties of Broiler Fed Ration Containing Different Level of Pearl Grass (*Hedyotis corymbosa* (L) Lamk)

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Abstracts

This study was done to ensure blood properties of broiler chicken fed diet different level of pearl grass (*Hedyotis corymbosa* (L) Lamk) where their litter was sprayed by *Escherichia coli*. A hundred 2 days chicken in $47,69 \pm 3,79$ gram of body weight average were used in this study and designed into Completely Randomized Design with 5 treatments and 4 replicates. The treatments were the level of pearl grass added into the ration; 0,80, 160, 240 and 320 g/kg ration. Chicken were kept for 6 weeks and fed 2 kinds of ration; starter (0 – 4 weeks, 24% CP and 3100 kcal/kg EM) and finisher (4 – 6 weeks, 22% CP and 3000 kcal/kg EM). At 3 weeks of age litters were sprayed with 106 CFU/100 ml liquid agar of *Escherichia coli* bacteria. Parameters in this study were blood properties (glucose, cholesterol, triglyceride and HDL). Results of this study showed that there was no significant ($P > 0,05$) effect between the control group and other treatments on blood properties except blood cholesterol, it increased significantly ($P < 0,05$) with increase level of pearl grass. It is concluded that pearl grass could be used as natural feed additive source to inhibit *Escherichia coli* growth in broiler chicken and no adverse effect to the chicken even though their litter was sprayed by *e-coli*.

Keywords: broiler chicken, blood properties, *Escherichia coli*, pearl grass

Introduction

Colibacillosis is one of many diseases that attack broilers. It was due to the presence of *Escherichia coli* bacteria (Sainsbury, 2000). This bacteria can be inhibited by using drug such as nitrofurantoin (Kumar et al., 1994). Mumtaz et al. (2000) reported that drug residue was detected in meat of poultry a few days after consume the drug. Donoghue (2003) stated that antibiotic residue in poultry product decreased after antibiotic withdrawal. The current condition, our farmers start to reduce using drugs to their livestock, include broilers and is still looking for the kind of safe drug, safe to the animals and safe to the human who consume the products. One alternative is herbs or medicinal plants such as pearl grass (*Hedyotis corymbosa* (L) Lamk). Pearl grass is one of medicinal weed and has several active compounds to inhibit 5 types of bacteria and 1 fungi namely *Staphylococcus aureus*, *Salmonella* sp, *Escherichia coli*, *Candida albicans*, *Pseudomonas aeruginosa*, and *Shigella dysenteriae* (Nurhayati et al., 2006). There were 3 active compounds in pearl grass when it was extracted by hexane and acetic ethyl and the most active compound to inhibit *E. Coli* was a group of ketone (tertiary butyl isopropyl ketone) (Nurhayati and Latief, 2009). Besides, result analysis of pearl grass in Integrated Laboratory of Animal Science Faculty, University of

Jambi reported that Pearl grass contained 9,72 % moisture, 14.93% crude protein, and 556.81 kcal/kg gross energy. Due to its active compound and nutrition content, pearl grass has a potency to use as poultry feedstuff and natural feed additive. However, research on this herbis still lack; the information about its effect to the animal is limited. The present study was done to determine the broiler performance and blood properties. Therefore, this paper published the blood properties of broiler chicken fed diet different level of pearl grass (*Hedyotis corymbosa* (L) Lamk) where their litter was sprayed by *Escherichia coli*.

Materials and Methods

A hundred 2 days chicken in $47,69 \pm 3,79$ gram of body weight average were used in this study and designed into Completely Randomized Design with 5 treatments and 4 replicates. The treatments were the level of pearl grass added into the ration; 0, 80, 160, 240 and 320 g/kg ration. Chicken were kept for 6 weeks and fed 2 kinds of ration; starter (0 – 4 weeks, 24% CP and 3100 kcal/kg EM) and finisher (4 – 6 weeks, 22% CP and 3000 kcal/kg EM). The ration and nutrient composition that was offered to the broiler during this study was shown on Table 1 and 2.

Table 1. Basal Ration Composition (%)

Feedstuff	Starter Phase (0 – 3 wk)	Finisher Phase (3 – 6 wk)
Yellow Maize	40,3	45,3
Rice Polish	10,0	15,0
Soybean Meal	30,0	25,0
Fish Meal	15,0	10,0
Dicalciumphosphate	1,2	1,2
Palm oil	2,0	2,0
Vitamin mineral mix (Premix)	1,0	1,0
Methionin	0,5	0,5
Total	100,0	100,0

Table 2. Nutrient Composition of Basal Ration and Pearl Grass

Nutrient	Starter Phase (0 – 3 wk)	Finisher Phase (3 – 6 wk)	Pearl grass
Dry matter (%)	85.64	86,06	90,28
Crude protein (%)	24.12	23,26	14,93
Crude fibre (%)	3.76	3,70	30,29
Lipid (%)	7.15	5,71	3,56
Ash (%)	6.04	5,22	10,82
Nitrogen Free Extract (%)	44.57	48,16	30,67
Gross Energy (kcal/kg)	4281.74	4269,89	556,81

When chicken were 3 weeks of age, litter was sprayed by *E.coli* bacteria as much as 10^6 CFU/100 ml liquid agar. Life chicken were kept until 6 weeks old and thereafter 2 chicken of each treatment were slaughtered. Blood was collected in test tubecontaining 2 mg EDTA individually for each treatment group and tested for glucose, cholesterol, triglyceride and HDL with spectrophotometric analysis.

This study was design into Completely Randomized Design with 5 treatments and 4 replications. The treatments were level of pearl grass in the ration;

R0 :Basal ration without added pearl grass

R1 :Basal ration + 80 g/kg

R2 :Basal ration + 160 g/kg

R3 :Basal ration + 240 g/kg

R4 :Basal ration + 320 g/kg

Data was analysed using analysis of variance and the significant effect among the treatment group was analysed by contrast orthogonal (Steel and Torrie, 1980).

Results and Discussion

Blood properties in the current study were shown on Table 3 in mean \pm standard error means.

Table 3. Blood properties Among the Treatment Diets

Treatments	Glucose (mg/dL)	Cholesterol (mg/dL)	Triglyceride (mg/dL)	HDL (mg/dL)
R0	198.75 \pm 14.95	158.50 \pm 2.11 ^b	25.99 \pm 0.17	27.76 \pm 6.23
R1	185.25 \pm 18.65	154.75 \pm 1.53 ^b	32.76 \pm 0.18	22.52 \pm 4.78
R2	207.25 \pm 17.86	159.25 \pm 0.29 ^b	33.49 \pm 0.23	25.89 \pm 3.11
R3	175.75 \pm 4.71	164.50 \pm 3.57 ^b	37.49 \pm 0.40	24.76 \pm 3.54
R4	195.25 \pm 20.01	182.00 \pm 3.06 ^a	34.43 \pm 0.17	28.73 \pm 5.82
Sign.	ns	**	ns	ns

ns : not significantly different, **: significant different

Blood properties (glucose and cholesterol) are the reliable health chicken indicator. The present study showed that there was not significantly ($P > 0.05$) effect of pearl grass in the diet on the blood profiles except for blood cholesterol of chicken; it increased significantly when chicken fed ration contained 320 g/kg of pearl grass. The blood profiles of this study was similar to Abdi-Hachesoo et al. (2011) however the cholesterol content was higher and triglyceride and HDL were lower than that of Polat et al. (2011) and Moslehi et al. (2015) reports. Both the previous authors found that the cholesterol content in blood serum was lower than 170 mg/dL.

Conclusion

Pearl grass could be used as natural feed additive to inhibit *Escherichia coli* growth in broiler chicken and no adverse effect to the chicken even though their litter was sprayed by *e-coli*.

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Effect of Supplementation Multi-Nutrient Feed Supplement or Urea Multi-Nutrient Molasses Block in Diet on Performance of Dairy Cattle.

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Abstract

The study was conducted to evaluate the effect of multi-nutrient feed supplement (MFS) or urea multi-nutrient molasses block (UMMB) on the performance of lactating dairy cattle. Eighteen lactating dairy cows were fed with basal diet of fresh chopped elephant grass and concentrate and were allocated into three groups of experimental diets, namely: Control group; addition of 500 g MFS (MFS group) or addition of 500 g UMMB (UMMB group). The basal diet offered was 30 kg of grass and 8 kg concentrate/head/day. Parameters observed were feed consumption and digestibility, milk production and quality and enteric methane (CH₄) emission. Results show that OM, CP, CF and energy intake increased by 1.97% and 1.10%; 4.48% and 4.04%; 1.6% and 1.2%; 2.52% and 2.85% when MFS or UMMB were added at 2.44% and 2.62% DM of the daily ration, respectively ($P < 0.05$). Addition of MFS or UMMB has no effect on daily milk production but increase milk fat content by 13.04% and 18.03% when MFS and UMMB was added ($P < 0.05$). There was no significant effect of MFS or UMMB addition on enteric CH₄ production (L/day and g/L milk yield). It is concluded that addition of MFS or UMMB on daily ration of lactating dairy tend to improve milk fat content but had no effect on daily milk yield and enteric methane produced per liter of milk yield.

Keywords: Multi-Nutrient Feed Supplement, Urea Multi-Nutrient Molasses Block, dairy cattle, enteric methane

Introduction

Cattle generally lose about 6% of their ingested energy as ruminant CH₄. Many research focus on find methods to reduce CH₄ emissions due to its inefficiency and also the role of CH₄ in global warming (Preston and Leng, 2008). Improving the feed efficiency by which cattle convert feed to meat or milk will ultimately reduce enteric CH₄ emissions and the cost per kilogram of milk or meat produced. Reduction in enteric CH₄ emissions from dairy cows can be achieved by reducing the conversion of feed to CH₄ in the rumen. One of strategies to reduce enteric CH₄ from dairy cows by using feed ingredients and supplemental feed additives (Beauchemin et al. 2008). Hendratno et al. (1991) reported that the feed supplement of urea molasses multi nutrient block (UMMB) increased daily weight gain, milk production and reproductive performance of cattle. This is supported by Makkar, (2007) who mentioned that lack of nutrients in ruminant feed such as nitrogen and mineral could be overcome by UMMB supplementation because it contains nitrogen, mineral and vitamins. Thus, it has been promoted over the last years in several countries in Asia and Africa (Makkar, 2007). Some ingredients in the UMMB composition were rarely found in

some areas. New composition of feed supplement (multi-nutrient feed supplement/MFS) was investigated by replacing a part of molasses and soy bean meal with local feed resources. This feed supplement have been tested on beef and dairy cattle, goat and sheep and was able to increase daily weight gain and milk production (Suharyono, 2010). However, there is no information available on the effect of MFS addition to dairy cattle on enteric CH₄ production. Therefore, a study was conducted to compare the effect of MFS or UMMB addition to farmer's ration on milk production and enteric CH₄ emitted by dairy cow.

Methodology

The experiment used 18 lactating cows of Friesian Holstein. The animals were divided into 3 groups consisting of 6 heads in each group following the Randomized Block Design. The animals in each group were fed by 1) Basal diet (Control group); 2) basal diet + MFS (MFS group); 3) basal diet + UMMB (UMMB group). The basal diet consisted of fresh chopped elephant grass (*EG/Pennisetum purpureum*) and concentrate. Daily ration was divided into three equal parts, each was offered at 5.30 am, 13.00 pm and 17.00 pm. Proportion of each feed in DM base are: Control Group (EG 55.56% and Concentrate 44.44%); MFS group (EG 54.20%, Concentrate 43.365 and MFS 2.44%); UMMB group (EG 54.10%, Concentrate 43.28% and UMMB 2.62%). The CP and gross energy content of grass, concentrate, MFS and UMMB was 12.93%, 3295 Kcal/kg; 17.38%, 3556 Kcal/kg; 28.8%, 4132 Kcal/kg; and 24.5%, 4467 Kcal/kg respectively.

Measurements were undertaken on daily feed intake, feed digestibility, milk yield and quality, and enteric CH₄ produced by the animals. The daily feed intake was measured during the 180 days of experiment. Milk quality was analyzed before and after the feed treatment was applied. Enteric CH₄ gas produced by each animal was measured by using respiratory headbox method (Suharyono *et al.* 2008; Suzuki *et al.* 2007). The gas produced from enteric fermentation was analyzed by using CH₄ analyzer (Seable system MA10). Data obtained during measurement period were analyzed by using ANOVA (IBM SPSS version 20). A significant difference between means was determined by using Duncan's test.

Results and Discussion

The proportion of MFS or UMMB added to the daily ration was below 3% of total DM offered to the animals. Addition of MFS or UMMB increased the dietary DM offered to the animals up to 2.5% and 2.7%, respectively. In consequence, since the two feed supplements are rich in CP and energy, the nutrients offered to the animals in particular CP and energy also increased.

Table 1. Intake and digestibility of experimental diets by the animals in each treatment group during the experimental period.

Parameters	Control Group	MFS Group	UMMB Group
Intake (kg/day)			
DM	14.76±0.03 ^a	15.04±0.03 ^b	15.04±0.03 ^b
OM	12.72±0.03 ^a	12.97±0.03 ^b	12.86±0.02 ^b
CP	2.23 ±0.01 ^a	2.33 ±0.01 ^b	2.32±0.01 ^b
CF	2.50 ±0.03 ^a	2.54±0.03	2.53 ±0.02
GE (Kcal/day)	50537±79.10 ^a	51809± 95.00 ^b	51975±87.16 ^c
Digestibility (%)			
DM	78.73 ± 1.34 ^a	82.45± 1.45 ^b	83.80± 0.53 ^b
OM	79.36± 1.15 ^a	85.52 ± 1.14 ^b	84.09 ± 0.43 ^b

Within rows, mean values with different superscript differ significantly (P < 0.05)

The amount of DM and CP intake of the current study was above the DM and CP intake required for small breed lactating dairy cows (live weight 454 kg) according to NRC (2001) being of 12.4 - 12.7 kg/day and 1.4 – 1.7 kg/day, respectively. The intake of OM, CP, CF and energy was increased by 1.97%, 4.48%, 1.6% and 2.52% when MFS was added up to 2.44% DM to the daily ration ($P < 0.05$). While the increasing was recorded up to 1.10%, 4.04%, 1.2%, 2.85% for addition of UMMB in the daily ration up to 2.62% DM ($P < 0.05$). The animals in group MFS and UMMB consumed similar amount of OM, CP, CF and energy ($P > 0.05$). There DM and OM digestibility were higher 4.73%; 6.44% and 7.76%; 5.96% respectively in MFS and UMMB group compared to those of animals in control feed. This indicated that there were an improvement in the rumen microbial activity when protein and energy intake by animals in MFS and UMMB groups were increased (Tabel 1). Upreti (2008) reported that supplementation of UMMB on cattle resulted in increasing in feed intake by 25 - 30%, digestibility and microbial protein in the rumen.

There were no differences statistically in daily milk production in Control, MFS and UMMB group either before 14.56 ± 0.61 ; 14.28 ± 0.08 and 12.80 ± 0.21 and after MFS and UMMB application 14.99 ± 0.59 , 13.93 ± 1.39 , 13.03 ± 0.45 L/day, respectively ($P > 0.05$). However, addition of MFS and UMMB increased fat content of milk from 3.76% in control group to 4.25% and 4.44% in MFS and UMBB Group ($P < 0.05$). Increasing milk fat when UMMB was supplemented to daily feed was reported by Weerasinghet *et al.* (2010).

There was no significant effect neither on total enteric CH_4 production nor when the enteric CH_4 produced was presented per unit of OM intake (18.88 vs 21.31 vs 17.89 L/kg OMI) or per unit of milk produced (146.75, 208.23, 186.98 g/kg milk) ($P > 0.05$).

Conclusion

Addition of MFS or UMMB on daily ration of lactating improve milk fat content but had no effect on daily milk yield and enteric methane produced per liter of milk yield.

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Oral Presentation 4 Focus Session:

Reproduction

Friday, 21 October 09:45-11:15

Room: Semeru

Cleavage Rate of Sheep Oocytes In Vitro Fertilized by Post-Thawed Epididymal Spermatozoa after Storage of Epididymis at 4 °C

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Abstract

This study was conducted to examine the cleavage rate of sheep oocytes in vitro fertilized by post-thawed epididymal spermatozoa after storage of epididymis at 4° C for 48 hours. Epididymis were stored at 4°C for 0,24 or 48 hours, afterward semen were collected and frozen. Matured oocytes were incubated with post-thawed epididymal spermatozoa for 12-14 hours. Ejaculated semen was used as control group. Zygotes cleaved to at least the 2-cell stage were classified as normal. At 72 h after co-incubation with sperm, all cleaved embryos were stained with acetic-orcein. After in vitro fertilization by frozen-thawed spermatozoa, 41 -60 % of oocytes were cleaved, and no significant differences were observed between control group (59.2%), 0 h group (57.9%), and 24 h group (60%) (P>0.05). However, the cleavage rates of oocytes was significantly decreased after storage off or 48 h (41.9%) (P<0.05). These results indicate, cleavage rate of embryos produced using epididymal sperm decreased after 48 h of epididymal storage.

Keywords: *epididymis, storage, culture in vitro*

Introduction

The unexpected death of animals of high genetic value or zoological interest, as well as the difficulty in collecting semen from wild species, is a handicap to the application of assisted reproduction techniques for the preservation of biodiversity (Martins et al., 2007). The recovery and freezing of viable sperm from the epididymis of dead animals (post-mortem recovery) is an interesting option for preserving male gametes and thus for maintaining germplasm banks. Epididymal spermatozoa from many species such as bulls (Martins et al., 2007), boars (Kikuchi et al., 1998; Ikeda et al., 2002), stallions (Lubbe et al., 2000), canine (Yu and Leibo, 2002), cat (Bogliolo et al., 2004) and deer (Soler et al., 2003) can be cooled to and maintained at 5 °C for time periods up to 24 h, depending on species, prior to cryopreservation and still have acceptable post-thaw sperm quality and fertility. Our previous studies have indicated that ram epididymal spermatozoa survive in storage at 5°C for up to 96 h (Karja et al., 2013). Although, the motility and the fertilizing ability of post-thawed epididymal spermatozoa gradually decreased as the storage period was prolonged, those collected spermatozoa were able to fertilize 16-65% of oocytes in vitro (Karja et al.,

2013). Therefore, storage of ram epididymis at 5 °C could be a suitable way of preserving sperm motility and fertilizing ability for several days. In this study, we evaluated the in vitro culture potential of zygotes produce by epididymal spermatozoa after storage of epididymis at 4°C.

Methodology

Collection and freezing of spermatozoa

Testis were collected from local slaughterhouse and transported to laboratorium within 1 hour. In the laboratory, testes were put into plastic bag and stored in refrigerator of around 4 °C for 0 h (CE-0), 24 h (CE-CE-48). At the end of storage period, cauda epididymis of each group was dissected free and spermatozoa were recovered from it in a culture dish containing Niwa and Sasaki Freezing (NSF-I) extender. Only semen samples with an initial sperm motility > 70% were used for freezing. Freezing of spermatozoa was performed according to the method described by Karjaet *al.* (2002;2013). Frozen ejaculated spermatozoa was used as control group.

In vitro maturation, fertilization and embryo culture.

Ovaries m were collected at local slaughterhouse. Each ovary was sliced repeatedly with a scalpel blade to release cumulus-oocyte complexes (COCs) in a 60 mm culture dish containing m-PBS. Selected COC were washed and transferred to a 100 L drop maturation medium under silicone oil and incubated for 24h at 38.5 °C in 5% of CO₂ in air (Pamungkas *et al.*, 2012; Karjaet *al.* 2013). Matured COC were then randomly and transferred to a 100 L drop of fertilization medium containing post-thawed spermatozoa in 5×10^6 of concentraion/mL. Spermatozoa and oocytes were co-incubated for 12–14 h at 39 °C with 5% CO₂ in air. Presumptive zygotes, from each group were then culture medium and transfer to the culture drops in SOFaaci media supplemented with, 0.4% BSA. Embryos were evaluated on day 3 post-insemination for cleavage a rates.

Results and Discussions

Successfully IVF requires appropriate preparation of spermatzoa and oocytes as well as culture conditions. The source of spermatozoa is an important in fertilization and to support the further embryos development.

Table. Cleavage (day 3) of embryos produced in vitro using frozen spermatozoa recovery from epididymis stored at 4° C for 0, 24, and, 48 h

Group	Cleaved embryos				
	2 cell	4 cell	6 cell	8 cell	Total
Ejakulated	16,7 ^a	35,4	31,1	16,7	58,3 ^a
CE H-O	19,6 ^a	37,3	29,4	13,7	58,0 ^a
CE H-1	23,8 ^a	45,2	21,4	9,5	60,0 ^a
CE H-2	30,8 ^b	38,5	15,4	15,4	41,9 ^b

^{a,b}Within a column, percentages with different letters differ significantly, P< 0.05. Epididymides were stored 4 °C for 0 h (CE-0), 24 h (CE-CE-48)

Data presented in Table short that the percentage of embryos cleaved after 3 days of culture were statistically similar (P>0.05) for oocytes inseminated with ejaculated spermatozoa (59.2%) and epididymal spermatozoa stored at 4° C for 0 (57.9%) and 24 h (60%) (P>0.05). However, the percentage significantly reduced for oocytes inseminated with epididymal spermatozoa stored at 4° C for 48 h (41.9%) (P<0.05). Although the percentage of the cleavage embryo reduce after 48 h of epididymis storage, the results of this study data indicated that storing ram epididymal spermatozoa up to 48 h at 4 ° C could preserve its

fertilizing ability. The reducing of the number of embryos cleaved in CE-2 may due to the reducing of motility of the spermatozoa that the reduce their ability to fertilize mature oocytes (Karja et al., 2013). Further study was needed to evaluate developmental competence to blastocyst stage of embryos produce in vitro with epididymal spermatozoa after storage of epididymis at 4 ° C.

Conclusion

Cleavage rate of embryos produced using epididymal sperm decreased after 48 h of epididymal storage. However, it was possible to use this techniques to produce embryos using post thaw epididymal spermatozoa collected after storage of epididymis at 4° C for several days.

Acknowledgements

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Effect of Carnitine on Quality of Post Thawed Goat Sperm

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Abstract

The study was conducted to determine the Carnitine supplementation on motility and viability of goat semen after thawing process. Semen was collected twice a week using artificial vagina from buck aged 2-2.5 years in normal reproduction. Fresh semen which had motility more than 70% and normal morphology more than 80% were used in this research. Each ejaculated splitted into five equal groups and diluted in Tris based extender containing Carnitine 0; 1.5; 3; 4.5; 6 mL was cooled to 5°C and then frozen in 0.25 mL straws contained 75×10^6 sperm. Frozen straw were thawed at 37 °C for 30 s in a waterbath for evaluation. The research applied randomized block design with 10 replications. Data were analyzed by analysis of variance (ANOVA). The results showed that supplementation 4.5 mM Carnitine had the highest percentage of motility and viability ($P < 0.05$). Our findings suggest that Carnitine 4.5 mM is an acceptable concentration of supplementation to maintain motility and viability of post thawed goat sperm.

Keywords: *carnitine, sperm, motility, viability, tris extender*

Introduction

It has been widely acknowledged that the quality of frozen semen is one of the determinant factors that influence the successful of artificial insemination application. Although buck spermatozoa had 40-60% of motile sperms during the thawing process, but only 10-30% of them did not have biological damage (Agarwal et al., 2005). Freezing and thawing processes of sperms will increase thereactive oxygen species (ROS), produce DNA damage, cytoskeleton alterations, inhibition of the sperm-oocyte fusion and affect the sperm axoneme that is associated with the loss of motility. The high content of polyunsaturated fatty acids (PUFA) in the phospholipids of the plasma membrane and the relatively low antioxidant capacity of seminal plasma cause goat spermatozoa sensitive to peroxidative damage (Vallorani et al., 2010). Oxidative stress significantly damage sperm function due to lipid peroxidation (LPO) induced by ROS.

Antioxidants have been used successfully to minimize lipid peroxidation due to its ability to reduce, extinguish or suppress free radical reactions (Dorado et al., 2010). Carnitine is biosynthesized from two essential amino acid lysin and methionin. L-Carnitine is highly found in mammalian epididymis and spermatozoa. It plays a role in generating metabolic energy by facilitating transportation of fatty acid into the mitochondria. Epididymal cells and spermatozoa derive energy from carnitine that is present in epididymal fluid. As one of antioxidants, the supplementation of Carnitine in Tris extender was expected to prevent free radicals before freezing and post thawing processes of frozen semen so that its quality remains well maintained.

Methodology

Semencollection

Fresh semen was collected twice a week from Etawah crossed bucks aged 2-2.5 year using artificial vagina. The sperm which had individual motility more than 70% and had normal morphology more than 80% were used in this research. Carnitine was then supplemented in Tris based extender (Tris 254 mM, citric acid 78 mM, fructose 70 mM, egg yolk 15 % (v/v), glycerol 6 % (v/v), pH 6.8) was used as base extender. Each ejaculated splitted into five equal groups and diluted in Tris based Extender containing Carnitine 0; 1.5; 3; 4.5 mL, 6 mL was cooled to 5°C and then frozen in 0.25 mL straws contained 75×10^6 sperm.

Semen processing

Semen was cooled for 2 h at 5°C, frozen was done by putting straw in liquid nitrogen steam (N₂) for 10 min, and then stored for 24 h. Frozen straws were thawed at 37 °C for 30 s in a waterbath for evaluation.

Assessments of sperm motility and viability

Percentage of sperm motility was determined by dropping semen in a glass object covered with a cover glass, and observed by a light microscope at 400 x magnification. Motile spermatozoa were indicated by progressive spermatozoa that moved forward. The percentage of sperm viability was conducted individually, on a drop of semen placed in a glass object, mixed with a drop of eosin-negrosin and observed by a light microscope at 400 x magnification. Live sperm had colorless (did not absorb the color), while dead sperm were indicated by pink color.

Data analysis

The research applied a randomized block design. Each treatment was replicated 10 times. Data were analyzed by ANOVA. If there were any differences among the treatments, a Duncan test will be used for further analysis. For all statistical analyses, the level of significance was $P < 0.05$.

Results and Discussions

As shown in Table 1, supplementation 4.5 mM provided the highest percentage of motile sperm and of viable sperm ($P < 0.05$) among the treatments.

Table 1: Percentage of sperm motility and viability with different doses of Carnitine

Variable	Concentration of carnitine (mM)				
	0.0	1.5	3.0	4.5	6.0
Motility (%)	34.58±4.33 ^a	35.34±6.23 ^a	40.5±7.53 ^b	52.2±5.53 ^c	41.5±4.54 ^b
Viability (%)	45.11±5.12 ^a	47.12±5.14 ^a	51.3±5.55 ^b	62.34±4.35 ^c	52.2±3.21 ^b

Different superscripts within the same row demonstrated significant differences ($P < 0.05$)

The high percentage of motility in the diluter were given Carnitine 4.5 mM dose associated with the ability to cut off the chain reaction of lipid peroxidation process. Lipid peroxidation could cause permanent loss of sperm motility caused by damage to the plasma membrane. Sperm membrane damage causes stalled the process of metabolism to produce energy for exit and release of the enzymes required for the metabolism (Abdullah et al 2015).

During sperm process, damage of spermatozoa generally occur due to cellular dehydration or the formation of ice crystals intra cellular at the time drop in temperature from 15 to 4 °C, thus losing potential progressive motility and membrane integrity. The formation of ice crystals cause an increase in electrolyte concentration inside the cell that will dissolve the sheath cell wall lipoproteins spermatozoa. Moreover, the study found that the

supplementation with Carnitine up to 4.5mM did not improve the percentage of viable sperm. During freezing and storage of semen imbalance membranes of cells are motile, thus lowering the resistance of spermatozoa and lowered the sperm quality after thawing process. Freezing and thawing causes metabolic function and reduced sperm plasma membrane damage resulting in decreased ability to spermatozoa function. This is because there is damage ultrastructure, biochemistry and functional spermatozoa which led to the decrease in motility and viability, plasma membrane damage and acrosome reaction and fertilization failure (Tuncer et al., 2010; Bucak et al., 2010).

Conclusions

Different concentration of Carnitine in Tris diluter will affect motility and viability sperm. Our findings suggest that Carnitine supplementation with 4.5 mM concentration is most well maintain motility and viability sperm.

Acknowledgements

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Hormone Progesterone Concentration at The Time of Artificial Insemination (AI/ On Conception Rate of Beef Cows in Rural Farm In West Sumatera

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Abstract

The objective of this study was to know the correlation between progesterone concentration on conception rate of beef cows on local cows 62 heads of and 100 heads of crossbreed cow of nulliparous and multiparous. Blood samples were collected at the time of AI, day 11 after AI and day 22 after AI and progesterone concentration was measured using RIA techniques and conception rate was diagnosis by rectal palpation on 60 after AI. The result of this research showed the concentration of progesterone at the time of AI, day – 11 and days – 22 were low (<1ng/ml). The averages conception rate in local cows (59.67 %) was lower ($P>0.05$) than crossbred cows (62.00 %). The correlation between progesterone, breed and parity. It can be concluded that progesterone hormone ten to increased after AI but in low level on progesterone and conception rate in rural farm in West Sumatera.

Keywords: *progesterone, rectal palpation*

Different Ratio of Omega-3 and Omega-6 in Total Mix Ration on Blood Metabolites, Characteristic of Estrous and Pregnancy Rate of Ewes

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Abstract

This study was conducted to compare the effect of different ratio of omega-3:omega-6 in diet local ewes to blood metabolites, Characteristic of Estrous and Pregnancy rate of ewes. A total of 20 young ewes were randomly assigned to five experimental groups: R0-Control (without omega-3 and omega-6 supplementation), R1 (Omega-3:Omega-6 1:8.50), R2 (Omega-3: Omega-6 1:6.01), R3 (Omega-3:Omega-6 1:3.14), and R4 (Omega-3:Omega-6 1:1.95). Feeding period was started from 45 days before mating. The stage of the estrous cycle of all ewes was synchronized by injection of Luteolysis® intramuscular as much as two times with 11 days interval. The characteristic estrous cycle of all ewes was monitored within seven days mating period. Results showed that ewes fed omega-3:omega-6 ratio of 1:1.95 (R4) had lower ($P<0.05$) plasma glucose compared with control groups. Ewes fed omega-3:omega-6 ratio of 1:1.95 had greater plasma cholesterol compared with other groups. Supplementation of omega-3 had longer ($P<0.05$) of onset estrous compared with other groups. Ratios omega-3: omega-6 of 1:1.95 had greater pregnancy rate compared with others groups.

Keywords: ewes, ratio of omega-3:omega-6, blood metabolites, estrous characteristic

Introduction

Supplementation of fatty acid in ration get to improve performance reproduction. Fatty acid will be stimulated follicle development and thyroid hormone production (Leroy *et al.* 2013), also to improve the concentration of progesterone hormone (Tangavelu *et al.* 2009). Unsaturated fatty acid as omega-6 already able to improve ovulation, rate of embryo survive, lambing rate, twin-born lambs and male lamb amount (Khotijah *et al.* 2014a; 2014b), but then supplementation of omega-6 in ration not yet able to improve the rate of lamb survive. Abayasekara *et al.* (1999) ratio of omega-3:omega-6 is important for health, production and reproduction of animal. Unsaturated fatty acid like omega-3 can to improve weight birth and for survival of twin-born lambs (Nowak *et al.* 2006). The second unsaturated fatty acids have different functions of the reproductive system of ewes therefore it is necessary to study the influence of the ratio of omega-3:omega-6 to blood metabolites, estrous characteristic and pregnancy rate of local ewes.

Methodology

A total of 20 young ewes were randomly assigned to five experimental groups: R0-Control (without omega-3 and omega-6 supplementation), R1 (Omega-3:Omega-6 1:8.56), R2 (Omega-3:Omega-6 1:6.05), R3 (Omega-3:Omega-6 1:3.12), and R4 (Omega-3:Omega-6 1:1.98). Rations used compiled isoenergi and isoprotein with total digestible nutrient content of 70% and 14% crude protein. Feeding ration flushing carried out for 45 days. Blood sampling performed before the mating period. Blood samples were taken at the jugular vein using a 5 mL sterile syringe and inserted a tube containing anticoagulant. Centrifuge blood sample performed at a speed of 3000 rpm for 15 minutes to obtain plasma. Synchronization estrous carried 2 times with an interval of 11 days i.e by injecting a hormone preparation prostaglandin (PGF2 α) Luteolysis® with a dose of 1.0 ml of tail-first intramuscular (Nasirin et al. 2014). Observation of estrous characteristics by combining young ewes and rams with a ratio of 5: 1 in 7 days.

Results and Discussion

Blood Glucose and Cholesterol

Mean (\pm SEM) blood glucose on R4 were lower than other groups ($P < 0.05$). Blood cholesterol on R4 were greater than other groups ($P < 0.05$; Table 1).

Table 1. Glucose and cholesterol plasma before mating period

Parameter	Treatments				
	R0	R1	R2	R3	R4
Glucose (mg/dl)	46.15 \pm 5.52 ^{ab}	55.50 \pm 6.49 ^a	53.71 \pm 3.19 ^a	51.35 \pm 14.85 ^a b	39.71 \pm 5.63 ^b
Cholesterol (mg/dl)	79.79 \pm 18.04 ^a b	79.09 \pm 4.33 ^a b	55.71 \pm 3.52 ^a	67.82 \pm 11.46 ^a b	86.94 \pm 2.74 ^b

Values within columns with different superscript letters are different ($P < 0.05$); R0 = ration without omega-3 and omega-6 supplementation; R1 = ratio of omega-3:omega-6 1:8.56; R2 = ratio of omega-3:omega-6 1:6.05; R3 = ratio of omega-3:omega-6 1:3.12; R4 = ratio of omega-3:omega-6 1:1.98.

It is indicated as a result of glycolysis is the conversion of glucose to pyruvic acid and then into acetyl-CoA. Acetyl-CoA generated is used for the process of lipogenesis therefore low glucose levels followed by high cholesterol levels in the same treatment. Cholesterol levels were higher in the treatment of the balance of omega-3 and omega-6 1:1.98 ($P < 0.05$) in accordance with Akbarinejad *et al.* (2012) which states that supplementation of omega-3 fats such as flaxseed origin increases plasma cholesterol levels. High cholesterol levels in this treatment required as a precursor forming steroid hormones such as progesterone, testosterone and estrogen.

Onset Estrous, Estrous Response, Pregnancy Rate and Number of Fetus

The Different ratio of omega-3:omega-6 in ewes ration was affected to onset estrous ($P < 0.05$; Table 2). Decrease in the synthesis of arachidonic acid as a precursor hormones PGF2 α indicated the cause of delays in the onset of estrus. The synthesis of arachidonic acid from linoleic fatty acid hampered by the use of the same enzyme with the metabolism of unsaturated fatty acids omega-3 flaxseed origin in the form of α -linolenic acid.

Table 2 Onset estrous, estrous response, pregnancy rate and number of fetus

Parameter	Treatments				
	R0	R1	R2	R3	R4
Onset	21.14 \pm 0.19 ^a	46.94 \pm 26.03 ^a	53.64 \pm 12.70 ^a	126.95 \pm 30.11 ^b	132.61 \pm 36.75 ^b

estrous (h)					
Estrous response (%)	80	100	100	80	100
Rate pregnancy (%)	75	75	75	75	100
Number of fetus	2.25±0.5	2.25±0.5	2.00±1.0	2.33±0.6	2.50±0.6

*Values within columns with different superscript letters are different ($P < 0.05$); R0 = ration without omega-3 and omega-6 supplementation; R1 = ratio of omega-3:omega-6 1:8.56; R2 = ratio of omega-3:omega-6 1:6.05; R3 = ratio of omega-3:omega-6 1:3.12; R4 = ratio of omega-3:omega-6 1:1.98.

Unsaturated fatty acid α -linolenic acid in the body will be elongase by the enzyme $\Delta 6$ -desaturase elongase into fatty acids eicosatetraenoic which will then be the addition of the double bond by the enzyme $\Delta 5$ -desaturase into fatty acids eicosapentaenoic (EPA) (Clayton *et al.*, 2007; Gulliver *et al.* 2012). Unsaturated fatty acids such as EPA is a precursor of prostaglandins PGE3 α (Dozier *et al.*, 2008)

Estrous responses in this study reaches 80-100%. The addition of oil in the ration ewes has a positive influence on the development of the follicles so the prospective ewes are ready to mate. Delay the onset of estrus estrus did not affect the response or the rate of pregnancy. The rate of pregnancy by treatment with different ratio of omega-3:omega-6 to that about 75-100%. Akbarinejad *et al.* (2012) addition of sunflower seed oil (omega-6) results in pregnancy rate of 73.91%, while the flaxseed oil supplementation resulted in the pregnancy percentage of 59.57%. This shows with a combination of omega-3 and omega-6 with proper counterweight can increase the rate of pregnancy. In addition, the ratio of omega-3 and omega-6 right can increase the number of fetuses. The highest number of fetuses obtained in the treatment of the ratio of omega-3:omega-6 1: 1.98 is 2:50, on a similar study Akbarinejad *et al.* (2012) addition of sunflower seed oil and flaxseed oil to produce the number of fetuses around 1:12 and 1:11. The addition of omega-3 and omega-6 with proper counterweight to optimize the potential of the prolific local sheep Indonesia.

Conclusion

The Ratio of omega-3 and omega-6 1: 1.98 to lower plasma glucose levels and increase levels of plasma cholesterol. The addition of omega-3 in the diet delays the onset of estrus ewes. Ratio of omega-3 and omega-6 1: 1.98 to produce a response estrous, pregnancy rate and the number of fetuses is better than the other groups.

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The Comparison of Estrus between Natural and Synchronized PGF₂ α Based on Clinical Sign and Vaginal Cytology in Ettawa Grade

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Abstract

The objective of this study was to determine mating time based on natural estrus (NE) clinical symptom compared after PGF₂ α injection with vaginal cytology pictures. Twenty does divided into two group, ten each for natural estrus observation and PGF₂ α injection. Vaginal cytology profile analyzed based on epithelial cells picture in estrus phase. The result showed that the estrus sign such as swollen, redness, mucous of vulva after PGF₂ α were significantly intense compared with natural estrus. The redness and swollen vulva showed moderate intensity in two group, while vulva mucous was higher in PGF₂ α treatment. The epithelial cells composition after PGF₂ α injection were superficial and cornified cells highest in PGF₂ α (52.8%) compared to 46% in NE. It was concluded that in Ettawa grade had a moderate vulva sign. The vulva mucous significantly clear after PGF₂ α treatment and vaginal cytology can be used for additional estrus detection, by the large number of superficial and cornified cells.

Keywords: *natural estrus, pgf₂ α , estrus sign, vaginal cytology*

Introduction

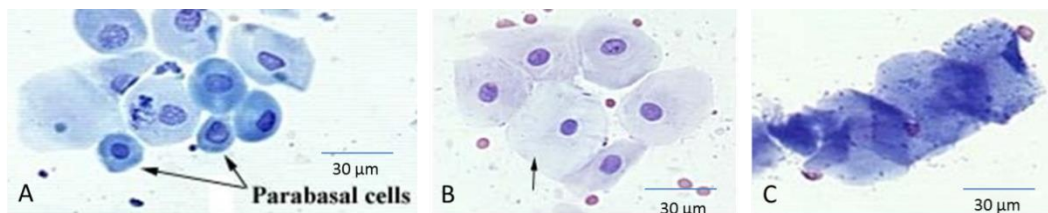
Ettawa grade is an important goat in Indonesia because it has good capability to adapt with the tropical environments, such as to the variety quality of grass. The population of goat in Indonesia is still low, there was only a slight increase (1.97%) reach 16.95 million from 16.62 million (Ditjenak, 2013). In fact, goat is important to farm animals owned by small farmers in Indonesia, but very limited attention has been given in its breeding management, especially in the reproduction aspect. Artificial insemination in goat is not well developed, due to the low results of pregnancy. For breeding the goat, the farmers usually used to natural mating. The clinical signs of estrus of doe is not clear compared with cattle, it cause the low conception rate. PGF₂ α is a hormone commonly used for estrus sychronization through its luteolysis in ovary. Some researcher showed that PGF₂ α injection in cattle can elucidate the sign of estrus compared to the natural sign of estrus (Yusuf, 1990).

Clinical sign of estrus, such as standing heat, vulva sign (redness, swelling and mucous discharge) has been observed in this research and related it with vaginal cytology in estrus phase for determination of optimal mating time. Analyses of epithelial cell is based on comparison number between para basal, intermediate and superficial cells in estrus phase will

be calculated. In some other species, the superficial and cornified cells are the most cells found in vaginal mucous smear using Giemsa stain. In this research, the result suggested that the detection of standing heat, and vulva sign in estrus phase added with the biggest number of superficial and cornified cells can be used for determined of optimal mating time. So, the farmers and inseminators can be more exact detected for insemination time.

Methodology

Twenty does with normal estrus cycle, aged 2-3 years old was used in this research. The animals were divided into two group (10 individual each), treatment group and control group. Treatment group was injected with 7.5 mg PGF₂α im/doe, while control group was untreated (natural estrus). After PGF₂α injection, clinical estrus sign, such as standing heat, vulva sign (redness, swelling, mucous discharge) are observed in both groups, followed with analysis of vaginal smear cytology using Giemsa stain to evaluate the composition vaginal epithelial (para basal, intermediate and superficial cells; picture ..). (1) onset of estrus (days) (2) estrus period (days) (3) standing heat (days) (4) vulva sign (redness, swelling, mucous discharge – (+/+/+/+)), following with the evaluate of vaginal cytology to determine the composition of parabasal , intermediate and superficial /cornified cell epithel (Picture 1) This result will be compared with natural estrus sign. Vaginal cytology will analyzed daily along estrus sign has been showed. The optimal mating time determination will be calculated from standing heat, the strength of vulva sign added with the superficial cells (superficial and cornified cells number).



Picture 1. Type of vaginal epithelial cells (Bowen, 2006) A. Parabasal, B.intermediate,C.superficial/cornified cells

Result and Discussion

The farmers is usually mate their goat when standing heat has been observed. The pregnancy rates of does is higher in natural estrus than Artificial Insemination (AI). The owner has never think to make genetic increase, so the offspring is become smaller. The application of AI technique utilizing semen from good quality of buck is important to increase the genetic quality of the offspring. To optimize this technique, the does should showed good intensity of estrus and the optimal mating time has to be determined. The use of PGF₂α injection is well known to initiate and increase the intensity of the clinical estrus sign, thus helping the farmer to determine the optimal time for AI (Wildeus, 2000).

The average of estrus cycle in 10 goats with natural estrus (no treatment) was 19,2 days (19 – 23 days) with variation among individual, but the highest in 19-20 days long (60%), 21-23 days (30%) and one goat have short cycle (18 days) (Table 1). These results was shorter than the cycle in PE goat from Sutama (2011), which the average of 29 days long

(18-22 days). Some factors, like environment, nutrition and management can influence the length of estrus cycle (Tambing *et al.*, 2001).

Table 1 Natural Estrus cycle in goat

Estrus cycle (days)	Number of Individual	Percentage (%)
< 18	1	10
19 – 20	6	60
21-23	3	30

Following the sign of standing heat sign, the vulva has started become more reddish with a slight mucous discharge. The onset of estrus after PGF₂α injection in the treatment group (after the standing heat is observed) were 72 hours (60%) and 84 hours (40%). The period of estrus was different between control and treatment group. In the control group the length of natural estrus was ranged between 24-72 hours, with the highest percentage in 48 hours (4 does, 40%) followed by 36 hours in 2 does (20%), 60 hours in 2 does (20%) and 2 others have 72 hours long (20%). Compared with control group, treatment group displayed longer estrus durations with more clear estrus. After PGF₂α injection in treatment group, the highest estrus period was in 4 does have 48 hours (40%), 72 hours in 4 does (40%), and 1 doe has 60 hours and 1 doe has 36 hours (Table 2).

Table 2. Length of Estrus in natural and after PGF₂α injection

Estrus Period (hours)	Control Group (natural cycle)	Treatment Group (After PGF ₂ α)
	-----Individual (%)-----	
36	2 (20)	1 (10)
48	4 (40)	4 (40)
60	2 (20)	1 (10)
72	2 (20)	4 (40)
	10 (100)	10 (100)

The different length of estrus time might be caused by the luteolytic activities of PGF₂α on corpus luteum (CL), causing sudden decrease of progesterone followed by initiation of stimulation of FSH and LH secretion from anterior hypophyse. FSH and LH will induce maturation of follicle that will increase estrogen production thus displayed as clinical estrus sign (Yusuf, 1990). The intensity of these clinical estrus sign (e.g. the redness and mucous discharge of vulva) will be stronger after PGF₂α injection (Wildeus, 2000). In general, in this experiment, clinical estrus sign in both groups (control and treatment) didn't showed clear redness and vulva swelling. Only one doe (10%) in control group and two (20%) in treatment group (PGF₂α) showed a good intensity of clear mucous discharge. Other vulva signs such as swelling and redness has been observed in all does, but the majority of does didn't have much clear discharge.

Table 3. Type of Epithelial vaginal cells in estrus and diestrus phase

Phase	Parabasal cells	Intermediate cells	Superficial and cornified cells
Estrus			
Natural	8	42	50

PGF2 α	5	43	52
An estrus/ Diestrus	47	44	9

Cytology vaginal analysis, showed that in natural estrus, the superficial cells were the highest percentage (50%) and intermediate cells were 42% with only some para basal cells (8 %). The same result is observed in treatment group after PGF2 injection, the superficial cells were 52%, intermediate 43%, and para basal cells 5%. During anestrus phase, the majority cells were para basal (47%) and intermediate cells 44 % with the superficial cells were 9% some (4%). The intermediate cells in in both group were displaying the same percentage. This situation can be seen along the duration of estrus sign (standing heat). This is mean that the vaginal cytology result can be used as an additional data for estimating the optimal mating time. If the superficial cells were low number in number during estrus phase, predicting the end of the matting time. This result were in line with the decreased of vulva clinical sign. The result of this study showed that there were variation of matting time among individual, but it can be determined from the sign of standing heat combined with the presence of vaginal swelling and redness, and supported by the appearance of superficial cells in vaginal cytology.

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The Oocyte and Sperms Cryopreservation of Local Sheep and Goat for Gene Bank in Native Indonesian Animal

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Abstract

This research goals were to trudy the oocyte and sperms cryopreservation of some specific breeds, superior and potential for conservation of animal genetic resources of Indonesia.. This frozen cells have the potential to trade at a national, regional and international levels. The study focused on the nation's local goats and sheep sperms/oocytes of some local animals breeds that have been selected. Genetic analysis of goats was performed in the district of Senduro, Lumajang East Java has performed through chromosome and DNA analysis. Meanwhile, research also was conducted to test cell freezing and post-thawing viability stock storage in liquid nitrogen (-196 °C). Test fertility studies have been conducted in vitro testing of sperm quality, while the oocytes cryopreservation test was done in vitro, base on IVM rate (%). Genetic analysis has been completed and indicates that the goat Senduro is categorized have normal chromosome. IVM rate of goat oocyte is considered lower, and need to be improved.

Keywords : *cryoconservation, genetic , frozen sperm, oocytes, Indonesia*

Motility Spermatozoa of Bali Cattle After Given Crude Tanin Supplement

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Abstract

The research was conducted to increase motility of Bali cattle's sperm. The research used 15 Bali cattles's sperm from Lombok Barat regency in West Nusa Tenggara (NTB) on the average 3 years old. For normal sperm divided into five (5) treatment of crude tannin (cT), which are : P0 = Sperm + tris yolk (control); P1 = P0+2,5% cT/ml sperm; P2 = P0 + 5% cT/ml sperm; P3 = P0 + 10% cT/ml sperm and P4 = P0 + 20% cT/ml sperm. Treatment of the sperm stored at 15° C and observed for 14 days (\pm 10% motil). Variables observed: Sperm motility in upper and lower layer of crude tanin diluent. The data from observation out put on semen motility were analyzed qualitatively with comparing between treatment. The out put of this research showed : The highest sperm motility was shown by treatment of P2 (P0 + 5 % cT/ ml sperm) on the lower layer of diluent (%) is 65.23 ± 15.21 with 7 days storage and upper layer of diluent (%) is 54.28 ± 18.95 with 14 days storage. The conclusion of this research : giving treatment of P2 (P0 + 5 % cT/ml sperm) can effect to maintain sperm motility with storage 14 days.

Keywords: *motility spermatozoa, Bali cattle and crude tannin*

Introduction

Bali cattle is one of livestock commodities which has important roles as the producer of service and product that are useful for the purpose of human life; it is a national assets in agriculture sector so that its existence need to be conserved, develop and increased its population and productivity .

The Government has conducted various attempts to increase domestic beef production, such as by *grading up* toward the local beef cows with the overseas ones, through Artificial Insemination (AI) technology even through genetic quality of livestock improvement.

The domestic production of beef has not been able to cover country's need of beef. In fact, since 2011, Indonesia constantly imported alive cows and frozen beef in number 23,670 of cows which was priced at US \$ 16,714,000 and US \$ 14,345,000 for 2,844 tons of beef (Anonim, 2011a). Since 2012 until now the target was increasing up to 282,000 of cows at cost US \$ 199,114,000 and beef up to 34,000 tons at cost US \$ 171,525,000 (Anonim, 2011b). The effort of raising domestic cattle population to increase the slaughtered cows

supply as the source of beef production was expected to be able to reduce the number of either beef or alive cows import.

There are some efforts that can be done to increase Bali cattle population, one of them is by improving its cattle productivity through the selection of cattle that will be a stud (Ismaya. 2003; Ismaya. 2008). General criteria commonly used in the selection of stud candidate is quality of sperm that is also included motility of sperm as the criteria of assessment on the cattle contest (Kastelic.*et al.*, 2001 ; Underwood. *et al.*, 2009).

Another effort done in increasing cattle productivity and reproductivity is that through Artificial Insemination (AI) programme (Salisbury dan VanDemark. 1985 ; Sarder, 2005). The success of AI is determined by the quality of spermatozoa especially motility of spermatozoa. But today, AI implementation is frequently failed and the local government's in ability in finding a correct and effective solution to overcome this problem, cause the need of strategic steps to implement the effort of productivity and cattle population improvement, that is by increasing Bali cattle productivity based on Sperm quality and the cattle's feed quality.

Methodology

The research used 15 Bulls / Bali cattles's sperm from Lombok Barat regency in West Nusa Tenggara (NTB) on the average 3 years old. Sperm analyzed macroscopically and microscopically in the Laboratory Immunobiology, Faculty of Science, Mataram University. For normal sperm divided into five (5) treatment of crude tannin (cT), which are : P0 = Sperm + tris yolk (control); P1 = P0+2,5% cT/ml sperm; P2 = P0 + 5% cT/ml sperm; P3 = P0 + 10% cT/ml sperm and P4 = P0 + 20% cT/ml sperm. Treatment of the sperm stored at 15°C and observed for 14 days (\pm 10% motil). Parameters measured were sperm motility (after given supplement from crude tanin). The data from observation out put on semen motility were analyzed qualitatively with comparing between treatments.

Results and Discussions

Data of motility spermatozoa of Bali cattles after given crude tanin supplement were presented in Table 1, 2 and 3.

Table 1. The average of motility spermatozoa in lower layer of diluent after given crude tannin supplement

Storage (day)	TREATMENT				
	P0	P1	P2	P3	P4
0.	60.00 \pm 13.23	65.00 \pm 13.23	66.67 \pm 5.77	66.67 \pm 5.77	65.00 \pm 5.00
1.	63.33 \pm 2.89	65.00 \pm 5.00	70.00 \pm 5.00	60.00 \pm 10.00	58.33 \pm 12.58
2.	60.00 \pm 0.00	60.00 \pm 10.00	63.33 \pm 12.58	51.67 \pm 18.93	43.33 \pm 20.82
3.	56.67 \pm 5.77	58.34 \pm 7.81	60.83 \pm 10.11	50.00 \pm 10.55	41.67 \pm 18.07
4.	53.33 \pm 11.55	56.67 \pm 5.77	58.33 \pm 7.64	48.33 \pm 16.07	40.00 \pm 17.32
5.	33.33 \pm 14.14	35.00 \pm 3.53	40.00 \pm 0.00	36.67 \pm 7.07	33.33 \pm 0.00
6.	30.00 \pm 14.14	30.00 \pm	35.00	31,67 \pm 10.61	31.67 \pm

		7.07	±10.61		3.54
7.	25.00 ± 24.75	26.67	31.67	28.33 ± 17.68	21.67
		±14.14	±17.68		±10.61
8-14	0	0	0	0	0
Average	47.71 ± 15.51	49.59	65.23	46.67 ± 13.51	41.88
		±16.18	±15.21		±14.13

In Table 1 and 2, the highest sperm motility was shown by treatment of P2 (P0 + 5 % cT) in lower layer of diluent (%) is 65.23 ± 15.21 with 7 days storage and upper layer of diluent (%) is 54.28 ± 18.95 with 14 days storage. The lowest motility was shown by treatment of P4 (P0 + 20% cT) not significant different from control. This means, the formula tris yolk with 5 % crude tannin is suitable as a medium for spermatozoa to survive or motil until 14 days .

Table 2. The average of motility spermatozoa in upper layer of diluent after given crude tanin supplement

Storage (day)	TREATMENT				
	P0	P1	P2	P3	P4
0.	61.67 ± 10.41	60.00 ± 25.98	68.33 ± 7.64	66.67 ± 5.77	63.33 ± 2.89
1.	61.67 ± 10.41	55.00 ± 21.79	68.33 ± 7.64	61.67 ± 2.89	60.00 ± 0.00
2.	56.67 ± 10.41	55.00 ± 21.79	65.00 ± 8.66	51.67 ± 12.58	53.33 ± 5.77
3.	53.34 ± 9.54	51.67 ± 19.68	64.17 ± 8.15	50.84 ± 11.29	49.17 ± 5.39
4.	50.00 ± 8.66	48.33 ± 17.56	63.33 ± 7.64	50.00 ± 10.00	45.00 ± 5.00
5.	45.00 ± 15.00	48.33 ± 17.56	56.67 ± 14.43	46.67 ± 11.55	35.00 ± 13.23
6.	43.33 ± 15.28	43.33 ± 11.55	55.00 ± 17.32	43.33 ± 15.28	31.67 ± 18.93
7.	26.67 ± 23.09	28.33 ± 24.66	38.33 ± 24.66	33.33 ± 20.82	23.33 ± 20.82
8.	25.00 ± 3.54	26.67 ± 0.00	33.33 ± 0.00	30.00 ± 7.07	20.00 ± 0.00
9.	21.67 ± 3.54	25.00 ± 3.54	30.00 ± 7.07	26.67 ± 0.00	20.00 ± 0.00
10.	19.17 ± 5.31	23.34 ± 3.50	28.34 ± 7.00	25.00 ± 3.00	18.34 ± 3.50
11.	16.67 ± 7.07	21.67 ± 3.54	26.67 ± 7.07	23.33 ± 7.07	16.67 ± 7.07
12.	10.00 ± 7.07	20.00 ± 7.07	26.67 ± 7.07	23.33 ± 7.07	16.67 ± 7.07
13.	6.67 ± 0.00	13.33 ± 0.00	20.00 ± 0.00	16.67 ± 7.07	16.67 ± 7.07
14.	5.00 ± 354	10.00 ± 7.07	20.00 ± 0.00	13.33 ± 0.00	16.67 ± 7.07
Average	33.50 ± 20.44	35.33 ± 16.85	54.28 ± 18.95	37.50 ± 16.59	32.39 ± 17.28

Conclusion

The highest sperm motility was shown by treatment of P2 (P0 + 5 % cT/ml sperm) untill 14 days storage. This means, the motility of spermatozoa can be maintain untill 14 days storage after given formula tris yolk + 5% crude tanin.

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Reproductive Performance of Female Po and Po X Limousin Crossbred Cattle in Kepanjen District of Malang Regency

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Abstract

The unstructurally crossing between Peranakan Ongole (PO) with European breeds cattle conducted by the farmers in fast overall areas in Indonesia especially in Java over past two decades has occurred. This study was to evaluate the reproductive performances of the PO cows and PO xLimousin crossbred cattle in KepanjenDistrict of Malang Regency. A total of 100 mature cows including 50 pure breed PO- and 50 POxLimousin crossbred cattle. The results showed that variables observed were service per conception, S/C (1.2 ± 0.2 vs. 1.22 ± 0.21); days open, DO (115.44 ± 12.39 vs. $127.62 \pm 20.93^*$); conception rate, CR (82% vs. 80%); calving interval, CI (412.00 ± 13.27 vs. $421.84 \pm 24.05^*$); and fertility index, FI (74.82 v. 68.01), for the respective PO and PO x Limousincattle (Note: * sign was significantly different). In conclusion, the reproductive performance between PO cattle and PO x Limousin crossbred cattle was principally no widely different, although practically calving interval in PO cattle is more profitable to be considered than those for PO x Limousin cattle.

Keywords: *days open, calving interval, fertility index*

Estrus Emerging Following Laserpuncture Induction in Goats

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Abstract

Estrus emerging is one of the most important phase and phenomena in reproduction management due to the crucial short time period for accurate artificial insemination success to allow fertilization and produce pregnancy. However, most animal do not show estrus for more than 60 days after partum causes the long interval time of days open and kidding interval in does, and therefore, reduce the income benefit of the farmers. This study was conducted to evaluate the effect of laserpuncture induction on the emerging of estrus in does that showing some problem with anestrus post-partum symptom. Thirtyeight mature does of Boer goat with parity of 0 (juvenile) to 5 were induced to estrus by inducing laserpuncture with very low electric power on the 17 reproductive accupoints of unknown estrus cycle. The results showed that 29 of 38 treated animals (76.3%) emerged estrus following laserpunctured with large varieties in the interval on the end of laser induction to the onset of estrus ranging 2.0 – 13.33 days. The optimal respons of estrus showed by the does in parity 2 (90.9%) and this was reduced by increasing of age the animals. The onset of estrus following the end of treatment were 2.00 ± 0.00 , 3.38 ± 2.72 , 6.60 ± 4.30 , 13.33 ± 12.86 , 11.67 ± 7.51 and 6.00 ± 5.66 days, for parities 0 to 5, respectively. It was concluded that laserpuncture was effective for stimulating estrus in Boer goats. Increasing the parity tended to decrease slightly the percentage of does emerging estrus.

Keywords: *reproductive accupoint, laserpuncture, parity, boer goat.*

Oral Presentation 4 Focus Session:
Livestock Production System
Friday, 21 October 09:45-11:05
Room: Anjasmoro

Correlations between Crude Protein/Total Digestible Nutrients Ratio and Commercial Cuts Weight and Percentage of Thin Tailed Lambs

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Abstract

This study was conducted to study the relationship between crude protein and total digestible nutrients (CP/TDN) ratio and shoulder, leg, and loin weight and percentage of thin tailed lambs. Twenty four heads of three months old male thin tailed lambs with initial body weight (BW) 14.19 ± 0.17 kg were fattened by feda complete feed contained three levels of crude protein (CP; 12, 14 and 16%) and two levels of total digestible nutrients (TDN; 60, 70%) to give six ratios of CP/TDN. After 3 months fattening period, the lamb was slaughtered and commercially cut into 8 parts including shoulder, leg, and loin, and then weighed. The data was analyzed by correlation regression to determine the correlation between CP/TDN ratio and shoulder, leg, and loin weight and percentage of weaning lambs carcass. The results showed that the CP/TDN ratio in feed has a medium correlation value with the shoulder weight ($r=0.57$), shoulder percentage ($r = 0.42$), and leg weight ($r = 0.43$), while low correlation was found in loin weight ($r = 0.25$), and negatively low correlated with leg and loin percentage, being -0.28 and -0.15 , respectively. Based on the results of this study, it can be concluded that the weight and percentage of shoulder, and leg and loin weight could be influenced by CP/TDN ratio in feed, but has no effect on the percentage of leg and loin.

Keywords: *thin tailed lamb, CP and TDN ratio, weight and percentage commercial cuts*

Introduction

The effort to improve lambs production in Indonesia is taking by increasing nutrient content in the diet, mainly based on the content of crude protein (CP) and total digestible nutrients (TDN). These CP and TDN as well as CP/TDN ratios are required for the muscle formation and growth rate. Purbowati *et al.* (2013) reported that the increasing protein levels up to 11.7% and TDN 58.6% could increase meat production of goat. The balance of CP/TDN ratio will effect to optimum the rumen fermentation efficiency as well as feed utilization (Ginting, 2005).

The big portion of meat in carcass is contained mainly in leg, shoulder, and loin which are different in their growth rate. The leg and shoulder are earlier developed than of the loin (Owens *et al.*, 1993). This different of growth rate of these carcass portions may lead to vary the amount of the leg, shoulder, and loin portions as well as in the percentage. Therefore, to evaluate the suitable level of CP and TDN as well as CP/TDN ratio in feed, this study was carried out.

Methodology

Experimental animals, feed, and equipments

Twenty four heads of male thin tailed lambs (± 3 months old) with initial body weight (BW) 14.17 ± 0.17 kg (CV= 2.41%) were used in this study. They were grouped into six, each consisted of 4 lambs and fed a complete feed contained three levels of crude protein (CP; 12, 14 and 16%) and two levels of total digestible nutrients (TDN; 60, 70%) to give six ratios of CP/TDN, i.e. 12/60; 12/70; 14/60; 14/70; 16/60 and 16/70, respectively. The complete feed was composed of rice bran, cassava meal, sugar cane top, cassava peel, soybean meal, fish meal, molasses and mineral and was given in pelleted form. All lambs were housed in individual pen and given freely access to feed and water throughout the experimental period.

Slaughter procedure

All lambs were slaughtered randomly after 3 months of feeding. Lambs were fasted for 6 hours before slaughtered. The slaughter method was done follow halal and standard slaughtering methods. The carcass was kept in a cold room at 18°C for 10 hours. Carcass were cut into 8 parts as described by Forrest *et al.* (1975) after removing the kidney fat. Each part of shoulder, leg, and loin were weighed.

Parameters

Parameters measured were CP/TDN ratio of feed given to the lamb and weight and percentage of shoulder, leg, and loin. The CP and TDN ratio was calculated by dividing percentage of CP and TDN of the feed given and was expressed in decimal.

Data analysis

The relationship between CP/TDN ratio with weight and percentage of shoulder, leg, and loin were analyzed by correlation regression analysis. The strength of correlation coefficient was evaluated by the value described by Sugiyono (2008), i.e. 0.00 - 0.19 (very low), 0.20 - 0.39 (low), 0.40 - 0.59 (medium), 0.60 - 0.79 (strong), and 0.80 - 1.00 (very strong).

Results and Discussions

The relationship between CP/TDN ratio on the weight and percentage of leg, shoulder, and loin

The correlation between CP/TDN ratio and weight and percentage of leg, shoulder and loin are shown in Figure 1 and 2. The correlation of CP/TDN ratio was found positive on weight of leg, shoulder and loin, but on percentage, there were weak and negative correlation found on leg and loin, but medium and positive was found on shoulder.

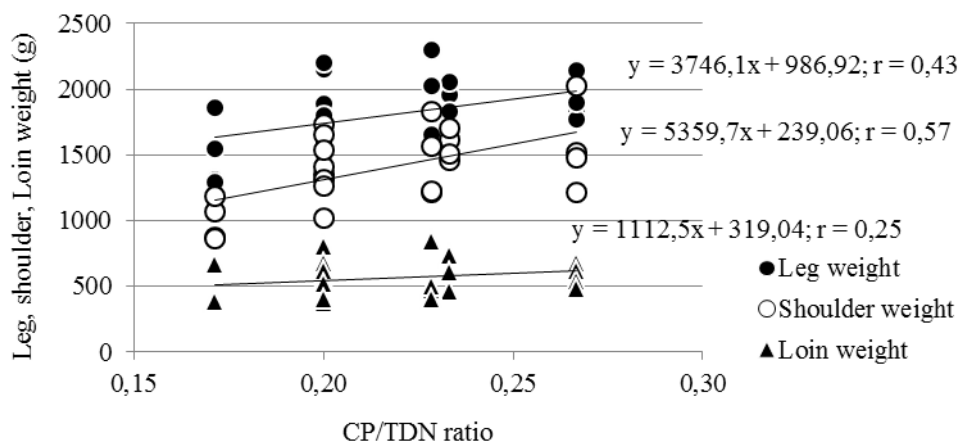


Figure 1. The relations between CP/TDN ratio on weight of leg, shoulder and loin

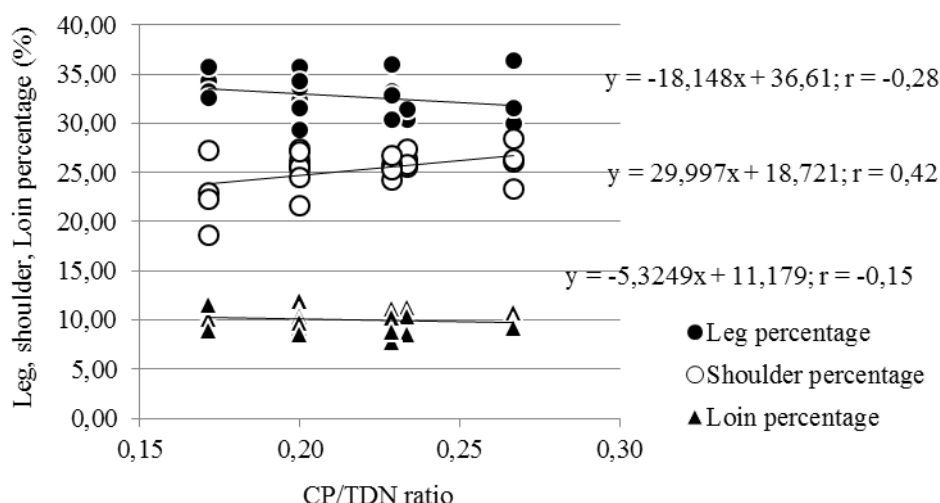


Figure 2. The correlations between CP/TDN ratio on percentage of leg, shoulder and loin

Correlation value between CP/TDN ratio to the weight of leg, shoulder and loin was 0.43, 0.57, and 0.25, while to the percentage of leg, and loin was negative (-0.28 and -0.15, respectively) while for shoulder 0.42. These results indicated the CP/TDN ratio is able to accelerate the growth of muscle tissues in lambs, but at this stage the acceleration only reach shoulder as the earlier develop than leg and loin agreed to body components growth rate described by Owens *et al.* (1993) that in general muscle development start from head and backward to tail and from extremities to the core towards the loin. The higher CP/TDN ratio resulted a considerable increasing in the amount of weight and percentage of shoulder. Shoulder is one of the moving parts, it has faster growth rate than other part does. The amount of deposition of protein and energy intake will speed up the tissues growth, and leg grows after the shoulder. According to Mawati *et al.* (2004) legs needed to walk and move, so it has fast growth rate in life and loin is more extensive later in life. Therefore, the correlation between loin and CP and TDN ratio is lower than the other. Forrest *et al.* (1975) reported that rack and loin have slow growth rate and late maturity.

There is a negative correlation between the percentages of leg and loin with CP and TDN ratio. Protein in the diet has a corresponding formation of lamb's tissues, so that the higher protein levels can increase the carcass weight. According to Rianto *et al.* (2006) the amount of protein deposition will be used for growth that will improve the carcass weight. Energy also has a function in the synthesis of fat, so the higher energy in feed, the more fat is formed. This is confirmed the results of study by Prakoso *et al.* (2009), that the higher TDN levels of feeding deposited more fat in carcass production. Therefore, the balance of protein and energy should be appropriated to produce optimal growth.

Conclusion

It can be inferred that there is a strong relations between the ratio of CP and TDN with the weight and percentage of leg, shoulder, and loin. CP and TDN ratio in the feed is able to optimize the growth rate of animals.

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Eating Time and Ruminating of Lambs Fed at Different Total Digestible Nutrients Content of Feed

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Abstract

A study has been carried out to assess the effect of feeding with different TDN (Total Digestible Nutrients) content to the length of eating time and ruminating on thin tailed lamb. The materials used were 10 head of thin lamb aged less than 3 month with an average body weight of 13.26 ± 0.70 kg (CV = 5,27%). The lambs were fed complete feed (pelleted) containing TDN 60% (T1) and TDN 70% (T2), both has the same protein level (12%). The result showed that eating time of T1 (10,09 times/min) was longer ($P > 0.01$) than of T2 (7.2 times/min). Ruminating of T1 (10.65 times/min) was longer ($P < 0.01$) than of than T2 (6.88 times/min). Based on the result, it can be concluded that high TDN level resulted is lower eating and ruminating time on this tailed lamb.

Keywords : *eating, ruminating, lambs, TDN*

Growth Performance of Pelung Sentul Kampung Meat Type Chicken Crossing on Age 0-10 Weeks

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Abstract

Local chickens have potential to produce egg and meat but that growth slow. Growth performance of local chicken can be increased by crossing local chicken with the meat type chicken. PSKR and PSRK were result from crossbreed pelung sentul x kampung meat type chicken and pelung sentul x meat type kampung chicken. This research purposed to observed growth performance of PSKR and PSRK. The number of chicken in this researches were 16 PSKR male and 26 PSKR female, 11 PSRK male and 11 PSRK female. T test used for knowing difference average body weight, body weight gain, feed consumption, feed conversion rate, and mortality of PSKR and PSRK. Growth rate, feed intake and feed conversion ratio of PSKR and PSBK were not significantly. PSKR chicken PSRK chicken already could reach slaughter weight 1.0 ± 0.1 kg kg at the age of 10 weeks. Crossing had been increased genetic quality of kampung chicken.

Keywords: *crossbreed, growth performance, local chicken, meat type chicken*

Introduction

One of animal protein source is local chicken. The local chickens have advantages which have high adaptability to the environment (Sulandari *et al.* 2007), but the local chicken has the disadvantage of low productivity. Improving productivity can be done through improved feeding and management, otherwise productivity improvement can be done through the improvement of genetic quality. The genetic quality of local chicken can be increased by crossing local chickens with other chickens which have better productivity among meat type chicken, pelung chicken, and sentul chicken.

Meat type chicken (broiler) is a commercial chicken that is used to meet the needs of chicken meat in the country because of broiler has tender meat, large body size, high efficiency of the feed, most of the feed is converted into meat and body weight gain very quickly. According Sulandari *et al.* (2007) pelung chicken is one of Cianjur local chickens, West Java, which has potential as a songster type and meat type chickens. Sentul chicken is one of 32 groves of local chickens in Indonesia (Nataamijaya 2000). In the spawning period (20-35 days) are able to produce 12-30 eggs. That hatchability can reach 90% (Sulandari *et al.* 2007).

Crossing between Local chicken (K) and Broiler chicken (R) are able to produce a good productivity. This has been done in previous studies that at the age of 8 weeks the average body weight of KR roosters around 1412 g, KR hens 1138 g, RK roosters 1545 g and RK hens 1343 g (Darwati *et al.* (2015). Other researchers Sopian (2014) reported that a cross between pelung chicken and sentul chicken at the age of 12 weeks to produce pelung sentul cross chicken (PS) which has a weight (PS) roosters reaching 1237.2 g and (PS) hens 1036 g.

This study was conducted to assess the performance of the descendants of the Pelung Sentul cross chickens (PS) with the Kampung meat type chicken (KR) and Pelung Sentul chicken (PS) with the Kampung meat type chicken at aged 0-10 weeks which have Kampung chicken: broiler breed genetic composition by 75%: 25%.

Methodology

The chicken used was a day old chicks (DOC) from the PS cross roosters with KR hens and RK hens produced 44 DOC of PSKR and 25 DOC of PSRK chickens. Other materials used were chaff, commercial feeds such as crumble, rice bran, and vitachick, colony cages as many as 24 units. 1 L drinkers and feeders each 24 pieces, Osuka digital scales with a precision of 0.5.

Feed given *ad libitum* during rearing. Commercial feed (BR-21E) was given on day old chicks (DOC) until the age of 4 weeks (PK 21%). For the cross chicken at the age of 5-10 weeks were given a mixture of commercial feeds and bran with PK 17.4%.

T test according to Walpole (1993) was used to determine differences in the average body weight, body weight gain, feed intake, feed conversion, and mortality among PSKR and PSRK chickens. That variables were measured every weeks.

Results and Discussion

The result showed that increasing the amount of feed consumption of PSKR, PSRK and BKPS chicken of along ages. PSKR chickens consumed feed as much 518 g and PSRK chickens consumed 502 g at the age of 0-4 weeks. Feed consumption of chicken crosses studied were among chicken belonging Darwati (2001) was 440.61 g, Pelung chickens consumed 460.43 g and broiler breed chickens according Fajri (2012) was 687.03 g. Rivai (2001) reported that grower period of local chicken at ages 5-12 weeks could consume feed as much as 246.63-414.16 g. This means that consumption of chicken crosses was high more than the local chicken at the age of 5-11 weeks. Differences in consumption caused by the chicken crosses had a combination of different strains that $\frac{1}{4}$ local chicken, $\frac{1}{4}$ meat type chicken, $\frac{1}{4}$ pelung chicken, and $\frac{1}{4}$ sentul chicken. This was in accordance with the opinion of Ensminger (1992) found differences in feed intake affected by the strain and the feed.

DOC weighting variance coefficients of PSKR cross and PSRK cross remain high at 20% and 23% with the same weight ($P > 0.05$) 35 g and 34 g respectively. It showed that both DOC of PSKB cross, PSRK cross still need to be selected to be uniform. Average weights of PSKR roosters at age 10 weeks were 1084 g and PSKR hens were 905 g, PSRK roosters were 1100 g and PSRK hens were 1031 g. Statistically, PSKR roosters and PSRK roosters were not significantly in the case as same as PSKR hens and PSRK hens did not different. Differences in body weight between the sexes caused different of the performance (Muir and Aggrey 2003). The body weight gain showed increased along with age. The increase was influenced by their genetic composition of broiler as much as 25% were able to improve the genetic quality of local chicken. Broiler generally experience the most rapid growth occurred when they hatched until the age of 4-6 weeks (Kartasudjana and Suprijatna 2006). According to Noor (2008), crossbreeding could better performance than the average performance of the parent for particular properties.

PSKR and PSRK roosters had a higher body weight gain compared to a hen. This was due to sex steroid function was to control the growth of body weight (Davies 1982). One example of a steroid hormone was testosterone found in male animals that had function on protein anabolism. Also according to Leeson and Summers (2001), that the body weight gain was strongly influenced by the consumption of feed.

Total feed conversion from week 0 to week 10 showed that the feed conversion value most efficient rooster is a PSKR rooster (3.78). This can be achieved because the chickens are crosses between the individual influenced individual direct genetic effect, maternal and paternal effect and individual heterosis (Gunawan and Sartika 2000). In general, hen had higher feed conversion it was in accordance opinions North and Bell (1990) that the roosters more efficient in converting feed into meat because it had a faster growth compared to hen. According to Supriadi *et al.* (2001) feed conversion of local chicken was 7.92.

The percentage mortality of PSKR chickens at age 0-4 weeks were nol (0%) and 8% of PSRK chickens. This was lower than the mortality of local chicken amounted to 26.3% (Iskandar and Pym 1998). At the age of 5-10 weeks, mortality of PSKR roosters (18.75%) and PSRK roosters (18:18%) whereas in PSKR hen (23:07%) were higher than PSRK hen (18:18%). Generally, deaths occurred in chickens at the age of 0-4 weeks because it still depends on brooder, while the death of chickens at the age of 5-10 weeks due to humidity inside the enclosure was relatively high at around 86.25% - 89.46%. Zainal *et al.* (2012) revealed that mortality rates could be reduced through improved management includes system maintenance, feed, improved sanitation and a clean environment.

Conclusion

PSKR chicken's performance was better than PSRK at the age of 10 weeks. It were seen from feed intake, body weight, body weight gain and feed conversion. PSKR chicken PSRK chicken already could reach slaughter weight 0.9-1.1 kg at the age of 10 weeks.

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Physiological Responses and Milk Qualities of Holstein Friesian During Long Dry Season at High Altitude

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Abstract

The objectives of this study were to explore physiological responses of Holstein Friesian (HF) cattle during long dry season at Cikole DD Station in Lembang West Java. Cattle as research sample were identified by purposive sampling method. Components of microclimates observed were ambient temperature, relative humidity (RH), air velocity, solar radiation and temperature-humidity index (THI). While physiological responses were observed for rectal-, skin-, and body temperature, as well as respiration- and pulse rate. Mean THI (73.93 ± 5.51) showed dairy cows suffered heat stress. Mean of rectal-, skin-, and body temperature were $37.94 \pm 0.20^\circ\text{C}$; $32.15 \pm 1.25^\circ\text{C}$; $37.13 \pm 0.32^\circ\text{C}$, while those for respiration- and pulse rate were 39.13 ± 3.00 and 79.74 ± 6.19 respectively. THI affected significantly on rectal-, body- and skin temperature but did not affect to heart rate and respiration. This indicates that the dairy cows in the highlands adapted to mild stress condition.

Keywords: *long dry season, milk qualities, physiological responses*

Intruduction

Dry season is one of the obstacles in the dairy cattle development. In dry season temperatures hotter than wet season, including in upland areas who usually have lower temperature. In 2015, these obstacles become more severe because dry season in Indonesia last longer. In general, dry season in Indonesia runs from April to October, but in 2015 the dry season lasts until November (BMKG 2015). The long dry season, increasing the average ambient temperature and relative humidity (BMKG 2016).

High ambient temperatures during the dry season causes changes in dairy cows physiological responses (Purwanto *et al.*, 1993). These changes occur because body heat accumulates as a result of heat process production is not balance with heat release to the environment (Correa-Calderon *et al.*, 2004; Atrian and Shahryar, 2012). In the heat exposure conditions, cows will experience body temperature increase accompanied with heat loss increase through evaporation in the form of respiration rate increased (Esmay 1982; Kumar *et al.*, 2011). When livestock exposed to extreme heat, they will undergo blood vessels and reduction of blood supply to the organ system that is offset by an increase in heart rate (Atrian and Shahryar, 2012; Tyler and Enseminger, 2006; Rastogi, 2007).

Long dry season causes heat stress on dairy cows last longer. Heat stress affected on dairy cows physiological responses. Studies to evaluating the physiological response of dairy cows at the end of long dry season in the highlands should be done. The objectives of this

study were to explore physiological responses of Holstein Friesian (HF) cattle during long dry season at.

Methodology

The study was conducted in the Cikole DD Station in Lembang West Java, which has an altitude of 1200 meters above sea level. The research was conducted in October 2015. The sampling timing is based on the dry season condition with the lowest rainfall and highest ambient temperature. Sample were identified by purposive sampling method. Observation of the environmental conditions include altitude and microclimate conditions consisting of temperature, humidity, wind speed, solar radiation, annual rainfall and THI (themperature Humidity Index). Microclimate data obtained from measurements every 2 hours from 06.00 - 16.00. Parameter physiological responses observed were rectal-, skin-, body temperature, heart rate, and respiration frequency who measured every 4 hours starting at 8.00 to 16.00 pm. Data were analyzed with descriptive statistics and T test to determine differences in physiological responses on each measurement. Regression and correlation analysis was conducted to determine the effect of THI on physiological responses.

Results and Discussion

The measured of microclimates aspec consisting of ambient temperature, relative humidity, wind speed, solar radiation and THI (Table 1).

Table 1. The average of the microclimates element in Cikole DD Station Lembang, West Java.

Weather elements	Time of Observation (WIB)						Mean
	06.00	08.00	10.00	12.00	14.00	16.00	
THI	63.4±1.0	73.1±1.92	76.7±1.41	77.9± 1.58	77.8±1.19	74.7± 0.62	73.9±5.51
Ta	16.8±0.5	25.4±1.29	28.4±0.82	29.6±1.19	29.5±0.87	26.5±0.50	26.0±4.82
Rh	83.3±3.4	52.0±8.76	47.8±5.04	43.5±3.66	42.4±2.19	53.8±7.45	53.8±15.13
Av	0.0±0.00	0.1±0.11	0.5±0.44	0.9±1.03	0.3±0.22	0.9± 0.68	0.42±0.37
Rs	0.0±0.00	17.5±7.64	19.1±10.04	24.5±12.23	20.5±9.16	14.2±11.20	17.0±9.07

Ta(°C) = ambient temperature in Celcius; Rh = relative humidity persentase; Av= air velocity m per second; Rs = solar radiation in Watt per m²

The mean value of THI, air temperature and relative humidity ($73.9 \pm 5:51$; 26.0 ± 4.82 and $53.8 \pm 15:13$) generally indicates dairy cows are in heat stress. THI value shows cows in a state of mild stress. The mean daily temperature and relative humidity are outside the comfort zone so it is not suitable for dairy cows.

Physiological parameters of dairy cows were observed consisting of a rectal-, skin-, body temperature, respiration- and heart rate. The results of the measurement of physiological parameters shown in Table 2.

Table 2. Physiological response of dairy cow in Cikole DD Station Lembang, West Java

Parameter	Time of Observation (WIB)		
	08.00	12.00	16.00
THI	73.12±1.92 ^a	77.96± 1.58 ^b	65± 0.62 ^a
Respiration rate per second	35.67±3.89 ^a	40.89±2.92 ^a	83±2.88 ^a
Heart rate per second	75.08±5.26 ^a	77.37±3.21 ^a	86.77±5.23 ^b
Rectal temperature (°C)	37.71±0.20 ^a	38.00±0.24 ^{ab}	38.10±0.12 ^b
Skin temperature (°C)	30.97±0.91 ^a	33.46±0.69 ^b	32.02±0.34 ^a
Body temperature (°C)	36.77±0.17 ^a	37.36±0.27 ^b	37.25±0.15 ^b

Description: different letters in the same row indicate significant differences ($P < 0.05$)

Results of correlation analysis shows that the THI effect on rectal-, skin- and body temperature, but not at the frequency of respiration and heart rate. Rectal temperature is an indicator of response to dairy cows on the environment (Rejeb *et al.*, 2016). The body temperature showed the same pattern changes with THI. Mean daily rectal-, body-, skin- and ambient temperature showed gradual deterioration ($T_r > T_b > T_s > T_a$). The decline shows that in the flow of heat from the body of dairy cows headed to the environment. This indicates adaptation response of dairy cows to adjust to the ambient temperature changed. In accordance with the conditions Ulvshammar (2014) which states that the warm-blooded animals can maintain body temperature greater than the ambient temperature.

Conclusion

High ambient temperatures during long dry seasons in the highlands causing heat stress conditions. Mean THI (73.93 ± 5.51) showed dairy cows suffered heat stress. Environmental temperature changes at the end of a long dry season causes changes in physiological responses in the form of an increase in rectal-, body- and skin temperature but does not affect to heart rate and respiration. This indicates that the dairy cows in the highlands adapted to mild stress condition.

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Effects of Rumen Mechanical Stimulating Brush Administration on Eating Behavior and Dry Matter Digestibility of Brahman Cross Steers Fed with Low Forage Diet

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Abstract

The objective of this research was to investigate the effects of Rumen Mechanical Stimulating brush (RMS) administration on production performance and eating behavior of Brahman Cross (BX) steers. Twenty Brahman cross steers 267.50 ± 3.456 kg live weight were randomly distributed into four pens. There were two control pens without RMS and two RMS pens. A video surveillance unit was set up in each pen to record daily time spent for eating, drinking and ruminating. Eating behavior data were taken for a month (24h/d) started at the second month of the experiment. Animals had access to high concentrate (94.5%) and low fiber diets (5.5%) containing 18.2% crude fiber and 12.24% crude protein. All steers were fed based on 3% dry matter of average body weight. Allowance of the concentrates was offered to all animals twice a day at 7 a.m. and 12 p.m. Results showed that RMS administration caused a significant increase in rumination time ($P < 0.05$). On the other hand, it significantly decreased eating and drinking time ($P < 0.05$). Dry matter intake (DMI) and dry matter digestibility were not affected by the application of RMS ($P > 0.05$). Thus, dietary factor is a determinant factor of DMD in this study. It can be concluded that synthetic physical dietary fiber supplementation affected eating behavior of the BX steers fed with low forage diet without giving adverse effects to DMI and DMD throughout the fattening period.

Keywords: *Rumen Mechanical Stimulating Brushes, BX steers, eating behavior, dry matter intake, dry matter digestibility*

The Study on The Use Ofrough Fecal Particle Proportion to Estimate Feed Digestibility on Post-Weaned Lambs

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Abstract

This research was aimed to study the use of fecal particle proportion to estimate feed digestibility in post-weaned lambs. Twelve weaning lambs aged 3 months old with body weight of 15.03 ± 0.24 kg (CV= 1.61%) was used in this study. The lambs were fed various feeding regimes containing $\pm 12-16\%$ of crude protein (CP) and 60% of total digestible nutrients (TDN) to make various feed digestibility. Data of particle size proportion were obtained by soaking 10 g of feces in 50 ml of water for 24 hours, then sifted and soaked to pass 0.10 mm of sieve. Data were analyzed using correlation-regression to find the correlation between fecal rough particle and feed digestibility. The result showed that fecal rough particle and feed digestibility has highly (strong) positive correlation valued of 0.787 ($P < 0.05$). The conclusion of this study was fecal rough particle could be used to predict feed digestibility as indicated by highly correlation of particle size with feed digestibility.

Keywords: *digestibility, fecal rough particle, weaning lambs*

Introduction

Weaning lambs has a big potency to fulfill the demand of nation animal protein due to the rapid growth and, in addition the lamb has advantages produce less fat meat (Mahgoub *et al.*, 2000). Nowadays, the demand of lamb is increasing, but the production is still low or less developed. Animal production could be improved by increasing quantity and quality of feed which will be accompanied with feed digestibility that lead feed utilization by animal (Mathius *et al.*, 1998).

Digestibility is an important parameter for knowing the respond of animal to the feed given, especially on term of feeding management for production (Tillman, 1998). The feed digestibility is influenced by maturity or conditions of digestive tract. In weaning lambs, the rumen is still in developing, and it possibly to give a different feed utilization during they grow. Thus, to monitor the respond of animal to utilize the feed is a handicap in weaning lamb rearing. However, one alternative to determine feed digestibility is by evaluate characteristic of feces as reported by Santoso *et al.* (2015). Their study concluded that the easier feed digested the easier feed to be degraded into small pieces and it will provide a large surface of feed to be penetrated by digestive enzymes (Santoso *et al.*, 2015).

The aim of this study was to evaluate the use of particle size of feces to determine dry matter (DM) digestibility of feed. The advantage of this study was to provide an alternative tool for monitoring feed utilization by animal, especially for weaning lambs to ensure the successful feeding management.

Methodology

Twelve lambs with aged around 3 months and 15.03 ± 0.24 kg (CV= 1.61%) of body weight were used in this study. The feed given in this study was formulated in complete feed formed in pelleted. Feed ingredients used were peel of cassava, molasses, sugar cane top, rice bran, dried cassava, soybean meal, fishmeal, and minerals. Nutrient content of feed was formulated to give crude protein at range of 12 – 16% with total digestible nutrients of 60%. The lambs were allowed freely to feed and water.

The lambs were adapted to the feeds for at least one month. Adaptation was considered completed if the feed intake reach more than 3% body weight and relatively constant for a week. Parameters measured were digestibility and proportion of rough particle of feces. Digestibility was measured by total collection method for 7 days digestion trials. Particle proportion of feces was measured by collecting feces for 24 hours were then sampled for at least 10 g of feces. The feces was then soaked for 24 hours and sieved to pass 0.1 mm.

The obtained data were analyzed using correlation-regression to find the correlation between fecal rough particle and feed digestibility. The strength of correlation indicated that particle size could be used as estimation method for digestibility.

Results and Discussion

Correlation of particle size proportion and the digestibility is presented in Figure 1. The figure showed that fecal rough particle has a strong correlation ($r = 0.787$) with DM digestibility in weaned lamb.

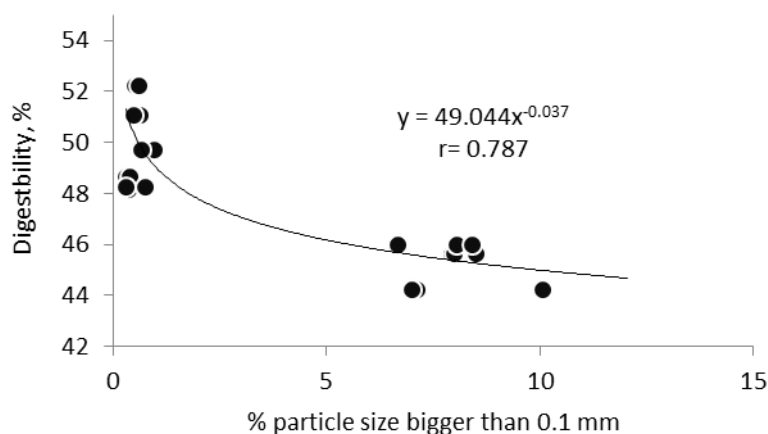


Figure1. Correlation between fecal particle size bigger than 0.1 mm and DM digestibility

The higher DM digestibility was found in a fewer proportion (percentage) of rough fecal particle size, and vice versa. This indicated that when the proportion of rough particle of feces was fewer, then the fine particle was bigger and it expressed a higher portion of digestible portions. The digestive process was started by breaking down the feed consumed into smaller particle to make the feed easier for absorption by intestine. Feed was changed from macro- into micro-molecules during mastication process in the mouth and then moved towards the rumen. In rumen, feed would be degraded and fermented by microbes activities. The bigger size of feed particle than reticulo-omasal size would be returned to the mouth for remasticating and again being degraded by rumen microbes (Ulyatt *et al.*, 1986; Poppi *et al.*, 1980) became into smaller particle (Santoso *et al.*, 2015).

The correlation between proportion of particle size bigger than 0.1 mm and the digestibility followed the equation of $y = 49.044x^{-0.037}$ ($r=0.787$); where y is digestibility while x is proportion particle size higher than 0.1 mm expressed in percentage. By this

equation it could be predicted that if proportion of particle size is 10%, so the digestibility is estimated to be 45.04%, and so on.

Conclusion

This study concluded that fecal rough particle proportion in lambs has a strong enough correlation to feed digestibility, and therefore could be used as an alternative method for estimating the digestibility.

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**Oral Presentation 4 Focus Session:
Socio-Economic and Agribusiness
Friday, 21 October 09:45-11:35
Room: Welirang**

Business Characteristic of Salted Egg in the Agro Industrial Center, Brebes, Central Java

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Abstract

The aim of this study was to analyze business characteristic of salted egg in the agro industrial center Brebes, Central Java. The observational study to 40 respondents chosen using purposive random sampling was conducted on June 6 – August 6, 2016. The primary data were collected through interview, questioner, and field observation, and the data were analyzed descriptively. The result showed that the agro industry of salted egg in Brebes is the core business managed by 37.50% female workers and 55.00% male and female workers. Most of the producers, from the perspective of human resources, have lack of potency to be developed as their business experiences fell into low – intermediate category; 67.50% has lack of business experiences (5 – 10 years) and their formal education is also low; 65% of them possess only less than 9 years of formal education. The agro industry of salted egg is categorized small scale industry as their capital is relatively small; 65% of the respondents can only buy duck egg approximately 5,000 per week. Moreover, the producers have difficulty in marketing; the price of the salted egg varies from IDR2,500 – IDR3,500, as 40% of them have stores around their dwelling place; while, 25% do not have one.

Keywords: *agro industry, business characteristic, marketing, resources, salted egg*

Introduction

Agro industry is part of the post harvest processing activities aimed to encourage farmers to shift their traditional perspective of life by interacting with stakeholders. The existence of salted egg in Brebes is supported by the fact that the production of duck egg is number one in both provincial level and surrounding region, such as districts of Pemalang, Tegal, and Tegal municipality (Animal Husbandry Statistic of Central Java Province, 2015).

Although problems related production has taken place, the agro industry of the salted egg has started to be the potential source of economy in Brebes. The problems are that the consumption of salted eggs in Indonesia is still low; 0.047 eggs/capita/week (Statistics of Indonesia, 2015); and the availability of duck eggs, the primary component of salted eggs, in Brebes tends to be fluctuating as the number of eggs decreases from 69,442,241 in 2013 to 66,970,735 in 2014 (Brebes in Figures, 2015).

The development of food agro industry is influenced by various factors, such as volume and access to loan (Taubadel and Saldea, 2014); oblivious to risk (Sumekar et al., 2015; Andrabe and Anneberg, 2014); producer organizations to gain profit through efficient market circuit especially small scale of food agro-industries (Lanfranhi and Giannetto, 2014; Sumekar.W and Isbandi, 2013). Therefore, the aim of this study was to examine business characteristics of salted egg in the agro-industrial center of Central Java.

Methodology

The population of the research of agro industry of the salted egg that owned PIRT was 50 located in 12 sub districts out of 17 sub districts of Brebes (Animal Husbandry of Brebes, 2016), from which 40 samples were chosen using purposive random sampling located in the sub districts of Brebes, Bulakamba, and Warnasari; where most of the salted egg agro industry exist. The respondents chosen were the owners of the agro industry of the salted egg. The activities were conducted on June 6 to August 6, 2016. The primary data were gathered using guided-questions interview, while the secondary ones were collected from the available documents provided by related institutions, and all data were analyzed descriptively.

Results and Discussion

Respondents Identity

The existence of the salted egg agro industries in Brebes closely related to the background related skills and experiences of the producers. The shows that agro industry of the salted egg is the core business of most of the respondents (87.50%) in Brebes. This business mostly runs by those whose range of age is in their productive state (80%) of male (60%) having low formal education (65%) and less experiences of doing this business; less than 5 years to 10 years (67.50%).

Having a certain level of experiences and education in doing agro industry of the salted egg influences the development of human resource potencies in achieving the purpose of the business. Farmers having a relatively low – moderate level of business experience combining with less formal education possession tend to neglect risks especially that of related to new technology development (Andrabe and Anneberg, 2014 and Sumekar *et al.*, 2015).

Tabel 1: Business Characteristic of Salted Egg Agro Industry In Brebes

Business Characteristic	n	%
Purchasing duck egg per week		
<1000 - 5000	26	65,00
>5000 - 10000	9	22,50
>10000	5	12,50
Source of duck egg purchased		
Outside Brebes	24	45,00
Inside Brebes	7	32,50
Inside Brebes and outside Brebes	9	22,50
Level of sales of salted eggs per day		
<500	26	65,00
≥500 - 1000	7	17,50
≥1000 - 5000	7	17,50
Points of salted egg sales		
Permanent shops	14	35,00
Non permanen shops	26	65,00
Price (Rp/egg)		
2,500– 2,600	13	32,50
2,700– 2,800	12	30,00
2,900– 3,000	10	25,00
3,400– 3,500	5	12,50

Business Characteristic of Salted Egg Agro Industry in Brebes

The development of agro industry of the salted egg in Brebes is influenced by several factors that form a specific characteristic of this business. Table 1. shows that the business

characteristic of the agro industry of salted egg in Brebes is a family business which its scale is small (65% of the respondents had a sales rate of salted eggs less than 500 eggs/day. This characteristic is consistent with the fact that the capital invested is small (65% of the respondents can only buy duck eggs less than 5,000 eggs per week), the unsupported marketing strategy (40% of the respondents have a store around housing complex and 25% of the respondents do not have a store), and the selling price of the salted eggs are varied between Rp 2,500 and Rp 3,500, - per egg.

As an agro industrial center of salted eggs, the programs provided by Brebes district fail to encourage farmers who raise ducks to provide eggs within agribusiness system, proven by > 45% of the respondents buy duck eggs from outside Brebes. It is suspected as duck farms are scattered with an average availability of duck eggs is relatively small (Sumekar et al., 2013).

Conclusion

The conclusion of the research is that the agro industry of salted egg in Brebes is the core business managed by 37.50% female workers and 55.00% male and female workers. Most of the producers, from the perspective of human resources, have lack of potency to be developed as their business experiences fell into low. The agro industry of salted egg is categorized as a small scale industry as their capital is relatively small. Moreover, less strategic of the product marketing causes the selling price of the salted eggs varies.

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Application of Science and Technology Through Making Compost Fertilizer for Group Members of Pig Farming

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Abstract

Most people in Tempok Village raising pigs as a source of income. The problem is, development of pigs farming in this village led to waste of pig farms, which have an impact on environmental pollution. Based on problems, it has carried out a study which aims to determine extent of science and technology application through composting farmer group "Maesa". This study was conducted using a survey method. Research sample is Maesa Group with consideration that this group is pilot of Animal Husbandry Faculty Unsrat. Empowerment by using two methods: extension and training. Empowerment is done with science and technology application through composting. Data analysis was performed using descriptive analysis. Results showed Maesa Group consisting of 8 members with ages varying between 22-68 years. Group education level 25 percent of each elementary and middle school graduates, 50 percent of high school graduates. This shows group educational level is still considered low, so their knowledge of pigs farming is environmentally friendly and sustainable is still low. In conclusion, science and technology application through composting helpful in improving farmers' knowledge in production process of sustainable pigs farming. Suggestions should be submitted so that science and technology application is carried out also for other farmers in Tempok Village.

Keywords: *compost, science and technology, pig*

Introduction

Tempok village is one of villages in Tompaso District. Villagers are largely raising pigs as a source of income. Pigs in addition to acting as a source of income as well as a source of animal protein for most people. Research area Christian majority that demand for pork is quite high, so farms have considerable market potential. Pigs farming is a business opportunity for community, for both livestock and dairy products, considerable potential as national export commodities (Kementerian Pertanian, 2012). Another advantage of business development of pigs as a cash buffer, capital reserve, hedge against inflation, and as a form of investment (Pamungkas and Hartati, 2009).

Problem is development of pigs farming in Tempok Village causing waste impact on pollution of soil, water and air (primarily causes smell). Under these conditions it is necessary empowerment to farmers, so that pigs farm in Tempok Village environmentally friendly and sustainable. Based on background and problems it has carried out a study which aims to determine extent of science and technology application through composting of Maesa Group in Tempok Village.

Methodology

This study was conducted using a survey method in the Tempok Village Tompasso District. Research sample is Maesa Group with consideration that this group is pilot of Animal Husbandry Faculty Unsrat. Empowerment by using two methods: extension and training. Empowerment is done with science and technology application through composting. Data analysis was performed using descriptive analysis.

Results and Discussion

Maesa Group consists of eight group members with ages varying between 22-68 years. Most farmers, categorized productive age, so impact on development of pigs farming. Group education level, 25 percent of each elementary and middle school graduates, 50 percent of high school graduates. This shows group educational level is still considered low. This condition causing group members' knowledge about pigs farming is environmentally friendly and sustainable is still low. This is supported by location of pigsty, which is located next to a residential house which is next to kitchen. Pigs farming is done in middle of settlement villagers Tempok. Farmers accommodate pig manure on front and back of enclosure. Some farmers dispose of or drain pig manure and urine in garden beside house, some of them carrying pig manure to garden.

Group members are trained to make compost made from pig manure. According Hosen (2012), an increase agricultural and livestock production is largely determined by knowledge and skills level of farmers, making it necessary adaptive assistance to farmers intensively.

Utilization of pig manure as compost (organic fertilizer) is useful in efforts to minimize environmental pollution, in addition to compost can substitute inorganic fertilizers which tend to be rare and expensive. Use of inorganic fertilizers constantly and tends to excess can cause a lot of agricultural land are in pain conditions (Kariyasa and Pasandaran, 2004). Organic matter from manure and crop residues can improve soil physical properties (Prasetyo and Suriadikarta, 2006). According Widowati (2009), organic matter helpful in improving physical, chemical, biological, soil, and fertilizer use efficiency occurs, which in turn is able to maintain and even increase crop production (Rachmadhani et al. 2014). One effort to increase tomatoes production not only with inorganic fertilizer but organic manure (Pangaribuan et al. 2012). Jazilah et al (2007) suggest that a organic and organic fertilizers combination can increase production because nutrients can be provided and readily absorbed by plant roots, can also soil and environment improve. Organic fertilizers provision can significantly on growth and yield of mustard (Nurshanti, 2009). According Dahono et al (2011), economically, benefits derived from use of a NPK fertilizer and manure combination is higher than on use of NPK fertilizer without manure, so it can be considered in plants cultivation.

Conclusion and Suggestion

Based on results of study can be concluded that science and technology application through composting helpful in improving farmers' knowledge in production process of sustainable pigs farming.

Based on the study results, it can be suggested that science and technology application is carried out also for other farmers in Tempok Village.

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Impact on Capital Assistance Group Revenues Pig Farm "Maesaan" Pinasungkulan Bitung City

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Abstract

This study aims were to determine operating income, before and after receiving assistance; and to know the knowledge of raising pigs of breeder group members. The research method used a combination of quantitative and qualitative methods. The results showed that the average income of the farmer group members prior to receiving assistance in the amount of IDR3,8336 million, while the average income of the farmer group members Maesaan after receiving assistance from PT MSM (*Mearest Soputan Meaning*), IDR5,412 million. The test results showed that the correlation between the two variables is equal to 0.997 with a significantly by 0.00. This shows that the correlation between the two average incomes before and after is a strong and significant assistance. Raising the knowledge gained from experience, asks other breeders and learns on their own. In conclusion, the aid affects the venture capital raising pigs in group "Maesaan" Pinasungkulan Bitung. Support raise capital and knowledge have a strong relationship to the business development in the group of pig farms.

Keywords: pigs, income, group pig farmer.

Introduction

Pigs have an important role as a provider for the public good source of protein, income, jobs, savings, and fertilizer. Pig has many advantages over other livestock that the growth rate is fast, easy to breed, easy to find the source of feed and carcass value is high enough as a provider of animal protein for humans (Nugroho and Whendrato, 1990). Pigs are one of the many animals kept and cannot be separated from the lives of most people in North Sulawesi, particularly in district Pinasungkulan Bitung City. The farmer group consists of a set of farmers who have a common interest in farming (Kartasapoetra, 1994).

The main purpose of raising pigs is to work in order to obtain the maximum profit to be gained from selling piglets, pigs sapling, beef or pig meat and fertilizer results from the processing of pig waste. Generally, people who raise pigs in traditional knowledge are still lacking on the issue of management, health, diet, and cage. This causes often encountered people who have failed in raising pigs, mainly related to a health problem or disease of livestock. Another failure is the price of pork is often fluctuate and often cannot cover production costs. Sariubang and Kaharuddin (2011) argued that the selling price of pigs that high would generate revenue, and vice versa. In this case, members of groups of farmers faced with the decision-making in the production process of pigs taking into account the cost of production (Abraham et al. 2013).

Assistance the capital of PT MSM is expected to contribute significantly to increased income group members pig farm "Maesaan" in the village Pinasungkulan. Based on this

background, this study aims to determine the impact of capital assistance to group members pig farm income.

Methodology

This research was conducted in the village of PinasungkulanBitung, using purposive sampling method on "Maesaan group". Groups of farmers receive aid in the form of a cage and funds for the production of pigs since 2014. In-depth interviews conducted on 10 members of the household pig farmers. Data were collected by questionnaires that have been prepared previously as cost data, revenue and data relating to knowledge of raising pigs. Data incomes before and after receiving aid were collected for analysis compare means using SPSS 22 and descriptive analysis to explain the development of pig farm group.

Respondent Characteristics and Sources

Pig farmer group's success is largely determined by the characteristics of the respondent or household as a resource. Age and education level was taken into consideration in the development of enterprises of pigs in groups of farmers. Based on this study, the age range of the group was around 44-60 years old. The age range indicated that farmers generally were classified as productive, so to do the business of pigs was still potential. Moreover the educational level of farmers was 75% graduated from junior high school, so it is considered not enough for the development of pigs. Based on the age and level of education of farmers, there is no influence on the management of pigs. The breeders are looking for information about the maintenance of pigs from people who have made pig farms.

Results and Discussion

The average income of the farmer group members prior to receiving assistance was amount of IDR3.8336 million, while the average income of the farmer group members "Maesaan" after receiving assistance from PT MSM (*Mearest Soputan Meaning*), was amount IDR5.412 million. The test results showed that the correlation between the two variables is equal to 0.997 with a significantly by 0.00. This shows that the correlation between the two average incomes before and after is a strong and significant assistance.

Raising pigs knowledge of the group members "Maesaan" PinasungkulanBitung, derived from experience, ask other breeders and learn on their own. Venture capital assistance influences the development of pigs in the group. Because of the assistance given, the group of farmers has a passion for breeding and forgets the failures at the time when they were not receiving any aid. The profit taken from selling pigs is additional income beside from other agricultural businesses. Groups of farmers in Sub PinasungkulanBitungCity, formed on the basis of togetherness and family from one village. Characters and characteristics of groups of farmers were following the pattern of kinship that has been created from a pattern of "Mapalus". Mapalus literally means an action of a group of people in a community to help each other to minimize the financial burdens in religious and cultural events.

Conclusion

The aid affects the venture capital raising pigs in group of "Maesaan" PinasungkulanBitung. The capital support and the knowledge of breeding have a strong relationship in the development of business of pig farms group.

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Empowerment for Farmers Group of Cattle Farming in the Tonsewer Village

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Abstract

Cattle farmer groups in the Tonsewer village was formed in an effort to increase the productivity of cattle. In fact, cattle farming developed with traditional systems. Based on this reality, has done research on the empowerment of group members in improving their knowledge through the application of science and technology. Objective studies have been conducted to evaluate the empowerment activities of the group in the village Tonsewer. The method used is survey and direct observation. Furthermore, it has carried out activities through the introduction of technology to group members. Respondents were members of Citawaya and Manguni. The results showed that 100 percent of the group members develop cattle, by grazing on agricultural land, with a removable system. Cattle consuming agricultural wastes on agricultural lands such. Wastes from agricultural waste is consumed including horticulture and corn waste. Empowerment has been done with extantion and training methods. Extantion is done to improve the knowledge of members of the group of cattle farm management. The training is done with the introduction of quality grass (dwarf) and utilization of waste from cattle to compost. In conclusion, extantion related to cattle farming management ever done but was not applied by the group members. Training is done a good respond from its members. Suggestions submitted are necessary assistance by the government and universities to group members be independent and sustainable.

Keywords: empowerment, group, cattle, sustainable

Introduction

The government's efforts for supporting livestock development to reduce dependence on imports to sufficient domestic needs is increase investment , market opportunities and strengthening the role of private sector in the development of animal husbandry and utilize local resources optimally. (Directorate of Livestock Development 2004).

Government as a motivator, an accelerator, regulator, facilitator and promoter was very decisive in the development of animal husbandry. North Sulawesi Provincial Government have taken a various of policy , but the development of the cattle farm is depent on to the existing natural resources so that the livestock policy should be based on the potential areas.

Generally catle farm in Minahasa district was dominated by small-scale farmers and maintenance traditionally ,and the types of livestock is cows, pigs . Population of livestock in Minahasa district shown in Table 1 as follows:

Table.1.Types of livestock in Minahasa district.

No	Types of livestock	Population (tail)
1.	Cattle	20.559
2.	Pigs	113.757
3.	Local Chicken	6.999.990
4.	Laying Hen	260.020
5.	Broiler	318.800
6	Quail	80.975
7.	Goat	2.682
8.	Rabbit	1.450

Source : Departemen of agriculture (2014)

The development of farm in Minahasa needs synergistic cooperation between the government and non government, for example the private sector. In general the farm of cattle in the North of Sulawesi have traditional maintenance.The farmers needs intensive counseling about maintenance management for bussines orientation.

Grouping is the optimal result of practice and counseling.The government has declaration a program of institutional development for group farmers organized and intensive accompaniment.The aim of formed Cattle farmer groups in the village Tonsewer is increase the productivity of livestock.

In fact developed the cattle business is still traditional. Based on this reality, the research was conducted on the empowerment of group members in improving their knowledge in the application of science and technology. The purpose of this study to evaluate development activities of the group in the village Tonsewer.

Methodology

This research was conducted in the district of Minahasa North Sulawesi Province by using survey methods and direct observation (Singarimbun and Effendi 1995). Furthermore, the introduction of technology to group members. Respondents were members of the cattle in the village Tonsewer namely the Citawaya and Manguni.

Result and Discusion

The results of this research showed that 100 per cent of the group members by maintaining cattle grazing on farmland with removable system. Cattle consuming agricultural wastes on the area. Agricultural waste is consumed of cattle including horticultural waste and corn. Empowerment groups held with counseling and training methods.

According Elly.F.H et al (2008) says that the successful development of cattle farming - plant integration , among others, determined by the cooperation between farm and government through a team approach. Counseling be made to improve the knowledge of members of the group for the cattle business management (Rintjap A. et al , 2015) The training is done with the introduction of quality grass (dwarf) and the use of waste for compost.

Conclusion

The results of the study cattle livestock farmers in South Minahasa has made the development of dwarf grass in a location of cage and the area under the palm tree also in the land and home area of farmer (Elly.F.H et al , 2013).

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Productivity of Pigs and Contribution of Pig Farming on Household Income in Pinasungkulan Village Bitung City

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Abstract

This study aims to determine the productivity of pigs and contributing to the household income. Respondents are members of the pig farmers, Maesaan and Metuari in the Pinasungkulan Village, Bitung City, is a beneficiary group through CSR funds of PT MSM and TTN in 2014. This study uses in-depth interviews, analysis descriptive data on 20 members of the group which maintains 20 breeding pigs. The results showed that the productivity as follows: such as the number of litter per year of 2 times, the litter size of 10 piglets, while the number of weaned is 7 piglets. The output is sold as a piglet weaning with IDR700,000/piglets, generated through the maintenance of pregnant sows about 114 days, then lactating sows for 44-52 days, the maintenance of dry sows about 21 days, so the total time to maintain the sow that is 6 months. The conclusion that the productivity of pigs is quite high, with a contribution of 28,5% of household income.

Keywords: pig, productivity, contribution.

Introduction

People from North Sulawesi, is a potential consumer of pork, based on the percentage of the population of diverse Christian is 69.17% (Sulawesi Utara dalam Angka, 2015). It opened up business opportunities pigs to be developed by the community. The reality is, Bitung city government programs for the development of animal husbandry in the district Ranowulu. The region is expected to become a pillar of livestock commodities for export to other regions because there is a sea port in the city of Bitung (RPJMD Bitung, 2016).

There Pinasungkulan village, in the district of Bitung City Ranowulu, an area near the mine of PT MSM and TTN. As compensation, including the area around the mine, the people in that village get CSR funds. Maesaan group and metuari as recipients of funds, formed in 2014 and funded in the form of cages and pigs. Initially the group members do not know about how to raise pigs, resulting in the maintenance of pigs based on the experiences of others.

Advantages maintain pigs, which are prolific with the ability to have 8-14 piglets per birth (Sihombing, 2006), can utilize the byproduct and the rest of the kitchen because it is omnivora (Williamson and Payne, 1993). According to Fahmy and Bernard (1972), there are properties desirable breeder of poultry reared, the nature of pigs that are useful and meaningful economically so profitable pig breeders, such as power production, number and weight of piglets at birth, weaning and bred, mortality low and high feed efficiency.

Farming of pigs, has been cultivated almost two years in the Village Pinasungkulan through CSR funds of PT MSM and TTN. However, it remains unknown how the productivity of pigs and how the farming contribution to household income. Based on this background, it is necessary to do research, to determine the productivity of pigs in terms of quantity and pig farming contributes to the household income of pig farmers.

Methodology

This research was conducted in the Village Pinasungkulan Bitung City, is purposive sampling with the consideration that there are groups Metuari and Maesaan, who keep pigs since 2014. In-depth interviews conducted on 20 members of the household pig farmers, who have 40 breeding pigs, then use the analysis descriptive. Data taken with regard to the productivity of pigs is measured qualitatively (Chrysostomus, 2013), which is the number of births each year, the litter size, the number of pigs weaned, the mortality rate. Contributions farming of pigs against total household income is measured by comparing the pig farming income per year with the total amount of household income per year.

Result and Discussion

Characteristics of Respondents

The success of pigs farming is largely determined by the characteristics of households as respondents, were age and education level. Based on this research, the age range of the group, around 44-60 years. The age range indicates that generally farmers are still categorized as productive, so as to conduct the pig farming. The education level of farmers is 75% graduated from junior high school, so it is considered not sufficient to carry out the pig farming. Based on the age and education level of the farmers, there is an influence on the management of pig farming. Farmers are looking for information about the maintenance of aircraft, disease prevention, even treat sick animals.

Qualitative Productivity of Pig Farming

Table 1 is explained the qualitative productivity of pig farming in the Village Pinasungkulan through CSR funds of PT MSM and TTN.

Table 1. Qualitatif Productivity of Pig Farming

Information	Average Number
the number of births each year	2
the litter size	10
the number of piglets weaned	7

Based on table 1, it is known that, the number of births each year of 2 times, that is, farmers group “Maesaan dan Metuari” mated the sows 2 times per year. The situation is related to the level of their knowledge of techniques mated. The litter size, which is 10 piglets per birth per year, but the number of piglets weaned, which is 7 piglets. It is known that genetically productive sows can be said for being able to produce as many as 10 piglets. However, the number of piglets weaned smaller than the litter size, or mortality of 0.3%. Based on the results of the study, mortality of piglets generally occurs after 1-2 weeks of birth. This is because the sow crushing piglets exists. This indicates that the lack of knowledge of farmers on the maintenance of breast-feeding mother, so the mortality of 0.3%.The litter size, describes fertility sows and boars as well as management of quality. (Deyoeand Krider, 1952; Lasley, 1978). This is influenced by environmental conditions, age of the pig, varieties of strains (Deyoeand Krider, 1952;Lasley, 1978; Pond and Maner, 1974).

Contribution of Pig Farming to Total Income of Household

Table 2 is explained the Contribution of Pig Farming to total income of Household in the Village Pinasungkulan through CSR funds of PT MSM and TTN.

Table 2. Contribution of Pig Farming to Total Income of Household per Year

Information	Revenue	Cost	Income	Percentage
Pig farming	14,000,000	6,412,500	7,587,500	28.5
Corn farming	10,000,000	3,000,000	7,000,000	26.3
Coconut farming	15,000,000	3,000,000	12,000,000	45.1
Total Income			26,587,500	100,0

Source : Data were analyzed

Based on table 2, it is known that, the total income per year of household in farmer group "Maesaan and Metuari" are IDR26,587,500. Pig farming contribution to household income that is IDR7,587,500, or about 28,5 persen. Currently, a member of the group maintains only one sow of each household, so it is necessary to increase the number of sows reared, so that revenue can be increased.

Conclusion

Members of the group "Maesaan and Metuari" had prolific sows, although it requires increased knowledge of farmers in pig farming, so that livestock mortality rate can be reduced. Pig farming is a sideline for group members, because its contribution is still low to the total household income.

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Introduction of Feed Technology for Development of Cattle, in North Bolaang Mongondow

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Abstract

North Bolaang Mongondow is one of regency launched a program of cattle development. The problem is less forage available, so farmers use corn straw as feed, the quality is low. This study aims to assess extent of introduction of technology to development of cattle feed in North Bolaang Mongondow. The research method that has been done is a survey method in this area. Respondents are members of "Keong Mas" group. Keong Mas group is one of groups that exist in North Bolaang Mongondow, Sangkub District, who keep cattle in a way grounded. The number of cattle that are kept as many as 24 head with a value of R / C ratio of 1.53. The results showed that feed given in form of rice straw and rice bran. Rice straw is given as much as 10-15 kg/head/day and rice bran as much as 5 kg/head/day. Based on results of this study concluded that majority of cattle farmers in research area maintains cattle, with how stabled and given feed is rice straw. Introduction of feed technology is done in order to improve quality of rice straw. This activity was responded well by members of Keong Mas group. Based on results of this study it is suggested further research to analyze nutritional value of ammoniation derived from rice straw.

Keywords: Introduction, technology, feed, cattle

Introduction

North Bolaang Mongondow is one of regency launched a program of cattle development. This is due to farming of cattle is one of sources of community income. Role of cattle, in addition to sources of income, as well as a source of food (meat), as a saving, a source of labor, the source of organic fertilizers and alternative energy sources. Cattle, in that it can be sold if farmer and his family needed money. Government to give serious attention and pursue policies with regard to increase in cattle population, including availability of forage continuously.

Cattle in North Bolaang Mongondow cultivated traditionally, in terms of cattle are not grounded. Cattle grazing on farmland and allowed to consume agricultural waste and grasses that grow wild. Cattle be moved from one farm to another farm. Some researchers such as Elly (2008); Elly et al (2008); Salendu (2012); Rundengan (2013) and Susanti et al (2013), stated that main problem often faced by farmers is feed problem. This problem is causing productivity of cattle in North Bolaang Mongondow, lower than cattle in other areas.

Based on above background, studies has been done on cattle feed technology introduction in North BolaangMongondow. Rationale is increase of productivity and cattle population in need of support of availability of food throughout year both quantity and quality. Feed comes from forage is generally largest share of cattle needs. Feed technology

introductions has done for farmers, so this study aims to determine extent of introduction of technology to development of cattle feed in North Bolaang Mongondow.

Methodology

This research has been conducted at Regency North Bolang Mongondow using survey methods. Sources of primary data obtained from interviews with members of group. Respondents in this study are members of Keong Mas Group. Subsequently has made empowerment of members of extension approach and application of science and technology. Application of science and technology is done through introduction of technology for cattle feed. Data were analyzed using descriptive analysis.

Results and Discussion

Forage is main feed for cattle and life is fundamental in development of animal husbandry. It is as stated Yamin et al (2010), Gunawan et al (2013) and Rusdiana and Adawiyah (2013). The important factor that must be considered in order to increase productivity of cattle is provision of feed, throughout year, whether a sufficient quantity and quality.

Research in North Bolaang Mongondow shows that farmers provide food crop waste for needs of cattle. Food crops waste, given that rice straw and corn straw. According to de Lima (2012) that straw which is fibrous waste is an important component in supply of cattle feed. Rice straw is classified potensial as cattle feed because there was almost total in all regions (Nababan, 2012). Such efforts can be done in order to meet needs of substances of animal feed to maintain survival and integrity of organs of livestock (basic living needs) and purpose of production (production needs) be sustainable.

Keong Mas is one of groups that exist in North Bolaang Mongondow, Sangkub District who keep cattle in a way stabled. Number of cattle that are kept as many as 24 head with a value of R / C ratio of 1.53. Results showed that feed given in form of rice straw and rice bran. Rice straw is given as much as 10-15 kg/head/day and rice bran given as much as 5 kg/head/day.

Rice straw has a high fiber content and low energy levels so low digestibility value. But according to Samadi et al (2010), use of agricultural waste as an alternative feed is one solution to anticipate a shortage of feed. This requires a treatment that is easily digested by fermentation process (Kardiyanto, 2009). Feed technology introductions has been done by making rice straw ammoniation.

Conclusions and Suggestions

Based on results of this study concluded that most cattle ranchers in area of maintaining cattle by using cages and given feed is rice straw. Feed technology introductions is done in order to improve quality of rice straw. This activity was responded well by members of Keong Mas. Based on results of this study it is suggested further research to analyze nutritional value ammoniation derived from rice straw.

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Fresh Beef Demand Elasticity Among Households in Malang City

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Abstract

Research was conducted at the five traditional markets (*Blimbing, Merjosari, Kebalen, Induk Gadang, and Pasar Besar*) in Malang City. This study aimed to investigate the household responsiveness towards the fresh beef demand including its own price, cross and income elasticities. Data were collected from 19th February to 5th March 2015. 150 consumers which 30 persons for each market were selected by accidental and purposive sampling method. Primary data were obtained by survey methods using structured questionnaire, while secondary data were gathered from related institutions and sources. The data analysis applied Cobb-Douglas function in order to explain the fresh beef demand elasticity among households in Malang city. Results found that family consumption of fresh beef was 2.36 Kg in monthly basis. Household demand towards fresh beef substituted with meat chicken (0.256), while it was being complementary with eggs (-0.239) and rice (-0.165). They considered the fresh beef as normal goods (0.215) instead of luxury food.

Keywords: *own price elasticity, cross elasticity, income elasticity*

Introduction

In the recent year, national economic was growing along with the rise per capita income. The increase of earning has impact on the raise of meat consumption particularly fresh beef that structured the second high contribution after broiler to national requirement. Demand of commodity become fluctuation in line with its own price, the available of product substitution, the presence of complementary product, and (Nicholson, 2001). Substitution product refers to commodity that has the similar usefulness and benefit with the original product (Putong, 2003). The price of both substitution and complementary products associated with its demand (Nuraini, 2005). Winardi (2002) pointed that the level of income might determine the society consumption pattern. The high income therefore, the good consumption pattern since they had a high purchasing power. Putri (2013) discovered that fresh beef demand in Medan performed insignificant influence toward its own price, substitution price of broiler price, complementary product of rice price, and PDB.

Beef demand in Payakumbuh appeared elastic and it had a significant relationship with the price of fresh beef, chicken egg, red bean, and rice, and per capita income (Lestari, 2008), The increase of buying power will enhance the number of demand toward good and services (Arsyad, 2008). The fresh beef price has decreased the demand of its product since its product perceived as a luxury food among consumers (Ilham, 2001). Beef product has substitution relationship with chicken price (Siahaan, 2011). High-income Nigeria Household price elasticity was -0.80, while being -1.47 for low-income household (Ezedinma, et al., 2006). Beef complements with chicken meat (-0.26 vs. 1.51) and eggs (-0.10 vs 0.22) (Ezedinma, 2006). The evidence confirmed that beef consumption has the

relationship with the price change of both this cattle meat and the other foods. It is interesting to explore the responsiveness of fresh beef demand toward the price alteration. Therefore, this study proposed to investigate the fresh beef demand elasticity among households in Malang city.

Methodology

Research was held in five traditional markets (*Blimbing, Merjosari, Kebalen, Induk Gadang, and Pasar Besar*) in Malang city. Consumer was household representative that engaged the purchase activity in those traditional markets. This research used accidental and purposive sampling methods to select 150 respondents which covered all these five traditional market which 30 consumers for each market in order to acquire the representative sample. Data collection was carried out about one month. Primary data were obtained by survey method employing structured questionnaire. It included consumers' characteristics, fresh beef buying frequency and its price, the price of chicken, eggs, and rice. Secondary data were provided by related institutions. The analysis of demand elasticity towards freshbeef among households in Malang city employed the Cobb-Douglas equation. The formulation of the fresh beef demand elasticity was:

$$Y = a X_1^{b_1} X_2^{b_2} \dots X_5^{b_5}$$

This equation then converted into the following logarithm regression formulation.

$$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + e$$

where:

Y	: household demand toward fresh beef (Kg/ month)
X1	: household income (IDR/ month)
X2	: Beef price (IDR/kg)
X3	: Meat chicken price (IDR/kg)
X4	: egg price (IDR/kg)
X5	: Rice price (IDR/kg)
e	: error
β_0	: constant
$\beta_1 \dots \beta_5$: elasticity coefficient

Results and Discussions

Fresh beef demand might fluctuate in accordance with the change of its own price, the price of substitution and complementary products. The alteration of household income also influenced on the fresh beef consumption. The responsiveness of the fresh beef demand regarding these change is recognised as elasticity. The following paragraph discussed the own price or demand elasticity, cross elasticity, and income elasticity in regard to household consumption towards fresh beef.

Demand elasticity of fresh beef

Household demand towards beef relied more on the fluctuated in cattle price which tend to increase. The change of freshbeef price will influence on household demand consumption towards this product. Table 1 presented that demand elasticity of beef (Ed) was-0.256. It means that the 10% alteration of fresh beef price will effect on the reduce about 2.56% in the household consumption toward this food. The household demand of fresh beef performed in-elastic since the more increase about IDR 9,520 (10%) of its own price resulted on less decrease approximately 0.236 Kg (2.56%) on their consumption toward this food. This finding was little responsive compared with meat price elasticity in Thailand which being 0.84 (Lippe, et al., 2010). Two reasons explained this evidence. First, household in

Malang city has a good earning that enhances their purchasing power towards foods. Second, the rising fresh beef price emerge impact on its food demand, however the willingness to buy this food might be regardless this price. The tendency of significantly increase of beef price however, it might reduce its consumption in accordance with the demand law towards product.

Cross elasticity of fresh beef

Cross elasticity measures the responsiveness regarding the price change of fresh beef toward the consumption for both substitution and complementary products. Table 1 reported the estimation of cross elasticity between fresh beef and meat chicken was positive 0.452 and it pointed out that between two foods has substitution relationships. The raising 10% fresh beef price has resulted on the increase to 4.52% of household demand toward broiler. This discovering indicated in line with the study of Siahaan (2011) that meat chicken can replace the beef demand.

The fluctuation of fresh beef price indicated the opposite direction with the egg consumption among household in study area. The cross elasticity between beef and eggs was -0,239. It means that the fresh beef complements with chicken egg for household demand in Malang city. The 10% increasing on fresh beef price will decrease the demand towards the bread. It will therefore effect on 2.39% reducing on the egg demand since this food is required to make bread. This results agreed with study of Lestari (2008) that the fresh beef demand in Payakumbuh city has complementary relationships with the egg demand.

The fluctuation of beef price indicated the adverse direction with the household demand toward rice. The cross elasticity between beef and rice was -1.165 (Table 1). It can be interpreted that fresh beef complemented with rice. The 10% rising in fresh beef price will decrease the demand towards side dishes of processing. Hence, the rice as the food that closed to the side dishes also experienced in 11.65% declining in its demand. The finding confirmed with the study of Saifoel (2001) that beef demand has complementary association with rice consumption.

Income elasticity of beef

This elasticity refers to the responsiveness of fresh beef demand toward the alteration of household income. The income elasticity (E_i) was 0.215 (Table 1.). Household in Malang city has therefore, recognised the fresh beef as the normal product instead of its luxury commodity. It can be interpreted that the 10% rising household income has impact in 2.15% only enhancing household consumption toward fresh beef. This result indicated similar to the study of Siahaan (2011) which the increase of income per capita showed unresponsive regarding to the beef demand in Bondowoso Regency. Ezedinma, et al., 2006 supported this evidence that high-income household in Nigeria revealed less price responsiveness with respect to higher-value of fresh beef (-0.80) than those for low-income household (-1.47). The budget allocation for meat consumption was about 8% in Thailand (Lippe, et al., 2010). It is evidence that household income tend to increase in the study area and it influenced on the purchasing power improvement. The alteration of fresh beef price has less important in the whole household expenditure because of their income enhancement. They presumed that fresh beef hasn't luxury food anymore because they could purchase the fresh beef in the presence of the good family income.

Conclusions

Research on fresh beef demand elasticity among household in Malang city has the following conclusions.

1. Household has consumed fresh beef about 2.36 kg in monthly basis.
2. Household demand towards fresh beef substituted with meat chicken (0.256), while it was

being complementary with eggs (-0.239) and rice (-0.165). They considered the fresh beef as normal goods (0.215) instead of luxury food.

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Analysis of the Self Ability Level of Farmers in the Integration System of Cattle and Oil Palm Plantations in Jambi Province

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Abstract

The objectives of this research is to analyze the level of self ability of farmers in the integration system of cattle and palm oil plantations, and then can be made effective and efficient method to increase the self ability of farmers in implementing the integration system. The research method was survey. The respondents were choosen by multistage cluster random sampling. The primary data obtained from interviews and direct observation with a participatory approach. Data was analyzed by descriptive analysis. To analyze the self ability level of farmers was done by scoring system based on five basic principal of beef cattle farm. The results showed that the ratio of the number of cattle in oil palm plantation area is still categorized as very rare. The self ability level of farmers is moderate (60.20%), with lower levels in obtain calf and heifer (49.72%). Most of farmers are in the passive category to empowerment their self ability. The level of self ability that the low point indicated two things, farmers have been make efforts, but the situation and condition is not support their efforts yet, while the second is farmer have not efforts to increasing their self ability, but there are interventions that massive than other hands/institution to improve the ability of farmers. The main thing that the farmers have to be motivated continously that the cattle farm is not just a sideline activity with traditional system, but in order to farmers always make efforts to increase production and productivity of their cattle farm.

Keywords : *self ability, farmer, integration, cattle, palm oil*

Oral Presentation 5 Focus Session:

Feed and Nutrition (1)

Friday, 21 October 12:30-14:40

Room: Panderman 1

Feed Consumption and Dry Matter Digestibility of Feed Containing Different Protein Levels in Thin Tailed Lambs Fattened After Weaning

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Abstract

This study aimed to assess the effect of protein level on feed consumption and dry matter digestibility of feed on thin tailed lambs fattened after weaning. Materials used were 12 lambs thin tailed lambs, age \pm 3 months with an average body weight of 14.95 ± 1.48 kg (CV = 9.93%) arranged to methods completely randomized design (CRD). Feed given was formulated as complete feed in the form of pellet and administered ad libitum. Feed intake was obtained from the amount of feed given and residual, while digestibility values was obtained from calculation of dry matter intake and excreted during one week total collection. Treatments were three levels of crude protein (CP) 12% (T1), 14% (T2) and 16% (T3) with total digestible nutrients (TDN) of 60%. Dry matter intake and digestibility among the treatments were not different ($p > 0.05$) with an average dry matter intake of 1016.67 g/day and digestibility of 48.77%. Based on the results of this study, it can be concluded that the protein levels at 12-16% had no effect on dry matter intake and digestibility on the lambs weaning.

Keywords: *lambs, weaning, intake, digestibility, protein level.*

Introduction

The phenomenon of the rapid growth phase in lambs can be used for early fattening. Fattening performed on lambs as it has done in the countries of Eastern Europe, Middle East, Africa, America Latin and the State of Tropical in Asia such as India proved to have been successful, measured by the appearance of the production and quality of meat (Negese et al, 2001; Shadnous et al, 2004; Archimede et al, 2008; Bhatt et al, 2012; Sormunen-Cristian, 2013; Carvalho et al, 2015). But to support the rapid growth, lambs needed good quality feed, and the required quality feed which can be determined by the amount or level of protein in feed (Prima et al, 2016).

Protein is one of the important components in feed, because for lambs that are on the rapid growth, protein function to the growth in the form of cells, tissues and organs as well as on ruminant protein is also required for the formation of rumen microbial protein, therefore the protein requirement should be considered in lambs (Jurgens, 1993). Nutrient content of the feed can affect feed intake and feed digestibility (Ferreira et al., 2014; Guimaraes et al. 2014)

Based on thus, so this study aims to determine the effect levels of protein in feed on and dry matter intake and dry matter digestibility at lambs, based on dry matter intake and dry matter digestibility can be known level of protein in feed is appropriate for fattened lambs after weaning.

Methodology

The materials used were 12 male thin-tailed lambs, age of approximately 3 months old with body weight of 14.95 ± 1.48 kg (CV = 9.93%). They were fed complete feed in form of pellets consisting of sugarcane top, cassava peel, rice bran, flour cassava, soybean meal, fish meal, molasses and minerals which were formulated to give crude protein content of 12%, 14% and 16% and total digestible nutrients at 60%. The composition of the feed is shown in Table 1. The feed and water were provided ad libitum.

Parameters observed were dry matter intake and dry matter digestibility. Intake is calculated from the results of the provision is reduced by the rest of the feed given. Dry matter digestibility was obtained from the total collection of feed and feces for 7 days.

The experimental design used was a completely randomized design according to Gomez and Gomez (1995) with 3 treatments (protein level) and 4 lambs as replicates of each treatment. Data were analyzed using ANOVA and significance were tested by F test, and if there were any differences, the further test using Duncan test was carried out.

Table 1. Composition and nutrients content of feedstuffs in the diets

Feed stuff	CP12%	CP14%	CP16%
	------(%)-----		
Sugarcane top	30.2	29.0	28.5
Cassava peel	15	15	15
Rice bran	18	16	14
Flour dried cassava	11.5	9.5	7
Soybean meal	13.5	17.5	21.5
Fish meal	3.8	5	6
Molasses	6	6	6
Mineral	2	2	2
Nutrient contents	------(%)-----		
Crude Protein	12	14	16
Total Digestible Nutrients	60	60	60
Crude Fiber	18.4	17.5	16.9

Result and Discussion

Dry matter intake and dry matter digestibility are presented in Table 2.

Table 2. dry matter intake, dry matter digestibility, body weight gain and feed efficiency

Parameters	CP12%	CP14%	CP16%	P value
Dry matter intake (g/day)	1004	1067	979	0.332
Dry matter digestibility (%)	47.99	46.88	51.45	0.155

Feed consumption and dry matter digestibility

Feed consumption and dry matter digestibility was not significantly different ($P > 0.05$) among treatments. However, although dry matter (DM) intake was not significantly different statistically, but with increasing levels of protein, DM intake tends to decrease while the dry matter digestibility tended to increase with increasing protein. Feed consumption is higher at T2 and T1 compared to T3 for feed rate at T2 and T1 faster than T3. According to Usman (2015) feed rate can affect intake, the higher the feed rate, then the digestive tract more quickly empty and lambs consuming feed again, so that the feed intake higher. Faster feed rate can be seen on the dry matter digestibility values were lower numbers on T2 and T1 compared to T3. According Purbowati (2007) feed faster leaving the digestive tract has a lower digestibility value for the feed did not have time to digest.

As for the other factors that affect feed intake is a way of feeding, physiological condition of livestock, the environment, the feed stuff and nutrient content of the feed (Van der Heide et al. 1998). In this research using animals of the same age that were the same physiological state, maintained in the same environment, feed formed pellet and provided ad libitum in all treatments with feed consisting of the ingredients making up the same but in terms of nutrients, distinguished on the amount of protein but the energy contained in the feed at all the same treatment. Nutrient of feed more influence on feed intake is energy content (Ebrahimi et al. 2007). Results of research Sayed (2009) on the lamb fattened after weaning feed intake was higher in fed with total digestible nutrient (TDN) 65% compared with 79%, while the protein level of 11% -17% as reported Negesse et al (2001) in the Saanen goat fattened after weaning did not affect on feed intake.

The digestibility values are more influenced by the crude fiber content of the feed (Christiyanto et al., 2005). In this study, with increased levels of protein feed, causing crude fiber content of the feed decreases and it can be seen in T3 with crude fiber content of lower digestibility values tend to be higher than T2 and T1 with coarse fiber feed is higher. Haddad et al. (2001) has also been reported that the protein level of 10% -18% also did not affect the digestibility in lambs.

Conclusion

Based on the results of this study, can concluded that 12-16% protein level had no effect on feed consumption and feed on the lambs.

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Effect of Storage Time and Physical form of Diet with Formulated from Local Feed Based On Nutrient Composition of the Diets

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Abstract

The aim of this experiment is to evaluate the effect of storage time and physical form of with formulated of local feed based on nutrient composition (water, protein, and fat) of the diets. . The study was designed with a factorial randomized block design. The first factors consist of 2 (two) block ie. PM (mash) and PP (pellet), and the second factors consist of 6 treatments of storage ie. M0 (0 week); M2 (2 week); M4 (4 weekk); M6 (6 wk); M8 (8 wk). Each treatment get 8 replications. Data were analyzed according to the design used. Variables observed are : water, protein, and fat content of the diets. The results was shown that the treatment of physical form and storage time affected significantly ($P < 0.05$) on water content, protein and fat content of the diets. The longer the storage of the diets the water content increased, however the content of protein and fat were reduced. The conclusion that the used of local feed in diets formulation that processing into feed pellets can maintain the quality of protein and fat during storage.

Keywords: diets composition, local feed, mash, pellet, storage time

Introduction

Feed is one important factor in poultry industry, because it is a source of nutrients for growth, production and reproduction of the animals. Growth depend on the nutrient content of the feed that consumed by animal, if the feed contains nutrients with good quality then it will be able to achieve optimal growth. Poultry were given ration with sufficient nutrient content and balanced requirement can provide better growth (Amrullah, 2006).

Quality of nutrients in diets affected by the environment, storage, and processing. The feed material is expressed both physically if it meets several criteria for the water content of 12% - 14%, free of fleas or other insects, not broken, smell, taste, the outward appearance remains unchanged (Handari, 2002). Besides the physical quality of the feed is also influenced by the particle size, shape and characteristics of the feedstuff (Retnani et al., 2009). Further stated that the storage of feed ingredients affect the nutrient quality of these feeds, as with prolonged storage can provide an opportunity for the insects to breed and damage the nutrient composition. Winarno (1984) reported that the water content of the feed may affect the resistance to microbial attack. Feed that has been providing quality processing different nutrients than not through the treatment process. Pellet is one physical feed form that has undergone a process of mechanical processing through compaction. Novriani D. (2006) reported that the factors affecting pellet quality that is the production process, production equipment and raw materials used. Nutirien content of the feed is influenced by the quality of feed used, feed ingredients which both provide good quality of nutrients. The aimed of this study was to observed the effect of storage time and physical

form of diets that formulated of local feed based on nutrient composition (water, protein, and fat) of the diets.

Methodology

This research was conducted in Laboratory NMT Faculty of Animal Husbandry and Fishery Tadulako University, using local feed ingredients such as corn, rice bran, fish meal, soya beans, Moringa leaf powder and turmeric powder. Formulation composition rasum following composition: corn (58%), bran (13%), fish meal (12%), soybeans (11%), Moringa leaf powder (5%) and turmeric (1%) with a protein content of 20.34 % and 2786.74 kcal ME. The treatment is designed to use RAK factorial design. Factor 1 is the treatment of the physical form of feed consisting of two physical forms that feed mash (PM) and pellets (PP). Factor 2 is the storage time with 5 treatment ie. M0 (storage 0 wk); M2 (deposit 2 wk); M4 (storage 4 wk); M6 (storage 6 wk); M8 (8 wk of storage). Each treatment get 8 replications. Data were analyzed according to the design used (Steel and Torrie, 1993). Variables observed that the levels of protein, fat and water content of the feed.

Results and Discussion

Research data on nutrient composition based on the analysis of water content, protein content and fat content listed in Table 1

Table 1. Average percentage (%) of water, crude protein, and crude fat of each treatment

Variables	Storage time (weeks) ¹				
	M0	M2	M4	M6	M8
Water:					
PM	9,52 ^a	10,62 ^a	10,72 ^a	11,14 ^a	14,21 ^b
PP	9,52 ^a	6,30 ^b	6,85 ^b	7,99 ^b	8,27 ^a
Protein:					
PM	21,26 ^a	21,77 ^a	18,31 ^b	17,29 ^b	16,41 ^c
PP	21,26 ^a	20,11 ^a	17,78 ^b	17,65 ^b	16,40 ^c

A different letter on the line showed significant differences (P<0,05)

Results were shown the treatment storage time provides a significant effects (P <0.05) on the water, protein, and fat contents of the diets. The longer the storage of the diets the water content increases. The water content of the diets of mash form M0 (9.52%) and M8 (14.21%) with the increased of 33%., meanwhile in pellet form value (9.52% - 8.27%). The increased water content of the diets during storage of mash form due to the absorption of water from the environment during storage. While on treatment of physical form of diets affect significantly (P <0.05) on water content. Feed form of mash has higher moisture content than the pellet form. It is caused by the pores in the component feed pellet form denser so that the lower water absorption. Syarief and Halid (1993) reported that the water content of the feed influenced by their constituent material, storage duration and degree of such materials. The water content affect the quality of the feed and the higher the water content, the higher the level of damage. Winarno (1984) states that the water content of the material will affect the resistance against insects and microbes. Based on a commercial poultry feed SNI maximum water content is 14% (Khalil, 1991; Handari R.D., 2002; Mulyadi, 2013). The longer the storage caused the protein level decreases. Feed with 4 weeks of storage time reduced protein content of 13.87% (from 21.26% decreased to 8.31%), while the 8 weeks were reduced of 22.81% (from 21.26% decreased to 16, 41%). Khalil and Suryahadi (1997) found that the storage time may affect the quality of the protein that caused by damage the component of amino acid. The same results was found from the

fat contents of the diets. Hafsah et al (2015) stated that the fat content of local feed are relatively the same as the feed manufacturers and provide no significant effect on growth performance of broiler. It was affected by raw materials, processing and storage.

Conclusion

The results showed that the storage time can affect the composition of the feed quality as specially in the content of water, crude protein and crude fat. The longer the storage time could be increased the water content of the feed from M0 (9.52%) and M8 (14.21%), which can cause feeding damage. Increased levels of water with 8 weeks of storage is 33%. At the protein level of feed with a reduction in the 8 weeks 22.81% (from 21.26% decreased to 16.41%) and a reduction in fat content of 54.50% (from 6.33% to 2.88% decline).

Acknowledgements

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A pathway to Sustainable Agriculture through Protection and Propagation of Indigenous Livestock Breeds of Pakistan- Cholistani Cattle as a Case

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Objectives

The present work is being presented with a general aim of highlighting the role of protection/propagation of indigenous breeds of livestock in an area. Specifically, the aim is to introduce a formerly neglected Cholistani breed of cattle being reared by the Cholistani desert nomads of Pakistan.

Method

The said work will present a detail account of research work conducted during the last five years by the author. Furthermore, it will present the performance (productive and reproductive traits) of this breed as being reared under various nomadic systems of the desert.

Results

Results will be deducted on the basis of the research work conducted on Cholistani cattle and keeping abreast the latest reforms being provided by the Food and agriculture Organization (FAO) and World Initiative to Support Pastoralism (WISP) of the UN.

Conclusions

The timely attention towards the protection and propagation of this neglected breed of cattle will pave a smoother way towards poverty alleviation of rural/suburban areas and a successful sustainable agriculture in low input production systems such as Pakistan.

Effect Of Encapsulant Materials In Encapsulation Process Of Leaf Green Grass Jelly Extract (*Cyclea Barbata* L. Miers) On Product Microcapsule Quality

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Abstract

The purpose of this research was to examine the encapsulant materials in the encapsulation process of leaf green grass jelly extract with using a microwave oven to the quality of product microcapsule. The method used was laboratory experimental method using Completely Randomized Design (CRD) consisting of 4 treatment type encapsulan (E1= maltodexstrin-skim, E2= maltodexstrin-whey, E3= arabic gum -skim, E4= arabic gum -whey) with 5 replications. The Variables observed in this research were density, yield, solubility of solids, flavonoid total content and antioxidant activity. Data were analyzed by analysis of variance (ANOVA) of the experiment using Completely Randomized Design (CRD). If there were significant influence it would be tested by using Duncan's Multiple Range test. The results showed that the used of type encapsulant materials showed highly significant ($P > 0,01$) effect on characteristic of encapsulation product were density, yield, solubility of solids, flavonoid total content and antioxidant activity. It can be concluded that encapsulation product process of leaf green grass jelly leaf (*Cyclea barbata* L. Miers) extract with microwave oven and encapsulant of arabic gum and whey (4:1) and used 25% encapsulant levels can protect active compounds of extract green grass jelly leaf on characteristic product encapsulation were density, yield, solubility of solids, flavonoid total content and antioxidant activity.

Keywords : *encapsulant, green grass jelly leaf extract, quality.*

Nutritive Value of Various Legume Tree as Protein Sources in Animal Nutrition

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Abstract

This research aimed to determine nutritive value of various legume tree as protein sources in animal nutrition. There were five legume tree that used in this research, which were *Adenanthera pavonina*, *Albizia chinensis*, *Calliandra calothyrsus*, *Gliricidia maculata* and *Indigofera sp*. Each of legume tree was measured by proximate analysis, NDF Analysis and gas production to determine potential degradable NDF (pdNDF). The result of the research has shown that there was a variation on each tree legume on DM, OM, CF, CP, TDN, NDF and pdNDF value. Among five tree legume, *Indigofera sp* has the best value of CP (27.07 %), TDN (74.53 ± 2.87 %), NDF (27.44 ± 0.72 %) and pdNDF (92.808 mg). It can be concluded that *Indigofera sp* has the best nutritive value as protein sources in animal nutrition.

Keywords: nutritive value, NDF, in vitro gas production, legume, protein source

Effect of Storage Time and Physical Form of Diet With Formulated From Local Feed Based on Nutrient Composition of The Diets

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Abstract

The aim of this experiment is to evaluate the effect of storage time and physical form of with formulated of local feed based on nutrient composition (water, protein, and fat) of the diets. The study was designed with a factorial randomized block design. The first factors consist of 2 (two) block ie. PM (mash) and PP (pellet), and the second factors consist of 6 treatments of storage ie. M0 (0 week); M2 (2 week); M4 (4 weekk); M6 (6 wk); M8 (8 wk). Each treatment get 8 replications. Data were analyzed according to the design used. Variables observed are : water, protein, and fat content of the diets. The results was shown that the treatment of physical form and storage time affected significantly ($P < 0.05$) on water content, protein and fat content of the diets. The longer the storage of the diets the water content increased, however the content of protein and fat were reduced. The conclusion that the used of local feed in diets formulation that processing into feed pellets can maintain the quality of protein and fat during storage.

Keywords: *diets composition, local feed, mash, pellet, storage time*

Introduction

Feed is one important factor in poultry industry, because it is a source of nutrients for growth, production and reproduction of the animals. Growth depend on the nutrient content of the feed that consumed by animal, if the feed contains nutrients with good quality then it will be able to achieve optimal growth. Poultry were given ration with sufficient nutrient content and balanced requirement can provide better growth (Amrullah, 2006). Quality of nutrients in diets affected by the environment, storage, and processing. The feed material is expressed both physically if it meets several criteria for the water content of 12% - 14%, free of fleas or other insects, not broken, smell, taste, the outward appearance remains unchanged (Handari, 2002). Besides the physical quality of the feed is also influenced by the particle size, shape and characteristics of the feedstuff (Retnani et al., 2009). Further stated that the storage of feed ingredients affect the nutrient quality of these feeds, as with prolonged storage can provide an opportunity for the insects to breed and damage the nutrient composition. Winarno (1984) reported that the water content of the feed may affect the resistance to microbial attack. Feed that has been providing quality processing different nutrients than not through the treatment process. Pellet is one physical feed form that has undergone a process of mechanical processing through compaction. Novriani D. (2006) reported that the factors affecting pellet quality that is the production process, production equipment and raw materials used. Nutrien content of the feed is influenced by the quality of feed used, feed ingredients which both provide good quality of nutrients. The aimed of this

study was to observed the effect of storage time and physical form of diets that formulated of local feed based on nutrient composition (water, protein, and fat) of the diets.

Methodology

This research was conducted in Laboratory NMT Faculty of Animal Husbandry and Fishery Tadulako University, using local feed ingredients such as corn, rice bran, fish meal, soya beans, Moringa leaf powder and turmeric powder. Formulation composition rasum following composition: corn (58%), bran (13%), fish meal (12%), soybeans (11%), Moringa leaf powder (5%) and turmeric (1%) with a protein content of 20.34 % and 2786.74 kcal ME. The treatment is designed to use RAK factorial design. Factor 1 is the treatment of the physical form of feed consisting of two physical forms that feed mash (PM) and pellets (PP). Factor 2 is the storage time with 5 treatment ie. M0 (storage 0 wk); M2 (deposit 2 wk); M4 (storage 4 wk); M6 (storage 6 wk); M8 (8 wk of storage). Each treatment get 8 replications. Data were analyzed according to the design used (Steel and Torrie, 1993). Variables observed that the levels of protein, fat and water content of the feed.

Results and Discussion

Research data on nutrient composition based on the analysis of water content, protein content and fat content listed in Table 1

Table 1. Average percentage (%) of water, crude protein, and crude fat of each treatment

Variables	Storage time (weeks) ₁				
	M0	M2	M4	M6	M8
Water:					
PM	9,52 _a	10,62 _a	10,72 _a	11,14 _a	14,21 _b
PP	9,52 _a	6,30 _b	6,85 _b	7,99 _b	8,27 _a
Protein:					
PM	21,26 _a	21,77 _a	18,31 _b	17,29 _b	16,41 _c
PP	21,26 _a	20,11 _a	17,76 _b	17,65 _b	16,40 _c
Fat:					
PM	6,33 _a	6,19 _a	5,95 _a	5,80 _a	2,88 _b
PP	6,33 _a	5,72 _a	5,37 _a	5,29 _a	5,14 _a

PM = mash form; PP = pellet form; ₁ Average of 8 replicates

A different letter on the line showed significant differences (P<0,05)

Results were shown the treatment storage time provides a significant effects (P <0.05) on the water, protein, and fat contents of the diets. The longer the storage of the diets the water content increases. The water content of the diets of mash form M0 (9.52%) and M8 (14.21%) with the increased of 33%., meanwhile in pellet form value (9.52% - 8.27%). The increased water content of the diets during storage of mash form due to the absorption of water from the environment during storage. While on treatment of physical form of diets affect significantly (P <0.05) on water content. Feed form of mash has higher moisture content than the pellet form. It is caused by the pores in the component feed pellet form denser so that the lower water absorption. Syarief and Halid (1993) reported that the water content of the feed influenced by their constituent material, storage duration and degree of such materials. The water content affect the quality of the feed and the higher the water content, the higher the level of damage. Winarno (1984) states that the water content of the material will affect the resistance against insects and microbes. Based on a commercial poultry feed SNI maximum water content is 14% (Khalil, 1991; Handari R.D., 2002;

Mulyadi, 2013). The longer the storage caused the protein level decreases. Feed with 4 weeks of storage time reduced protein content of 13.87% (from 21.26% decreased to 18.31%), while the 8 weeks were reduced of 22.81% (from 21.26% decreased to 16, 41%). Khalil and Suryahadi (1997) found that the storage time may affect the quality of the protein that caused by damage the component of amino acid. The same results was found from the fat contents of the diets. Hafisah et al (2015) stated that the fat content of local feed are relatively the same as the feed manufacturers and provide no significant effect on growth performance of broiler. It was affected by raw materials, processing and storage.

Conclusion

The results showed that the storage time can affect the composition of the feed quality as specially in the content of water, crude protein and crude fat. The longer the storage time could be increased the water content of the feed from M0 (9.52%) and M8 (14.21%), which can cause feeding damage. Increased levels of water with 8 weeks of storage is 33%. At the protein level of feed with a reduction in the 8 weeks 22.81% (from 21.26% decreased to 16.41%) and a reduction in fat content of 54.50% (from 6.33% to 2.88% decline).

Acknowledgements

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Enrichment of Feedstuff With Fermented Soybean Peel to Increase Rabbit Body Weight

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Abstract

This study aimed at finding out the best feed supplement formula to increase Rabbit Body Weight. A randomized block design with one factor namely the percentage of fermented peel added (0%; 5%; 10% and 15% w/w) on to the plan feedstuff and replicated six times was carry out to run this study. The addition of 10% (w/w) of fermented soybean peel providing the highest dry feed material consumption (41.86 g/head/ day), but the increase of body weight was only (16.83 g/head/day) which is lower than that of the addition of 15% fermented peel (17.45 g/head/day). A significant difference among treatment font on the feed conversion. The lowest feed conversion was obtained in treatment of 15% fermented feel (2.36 g/head/day). After 24 hours of fermentation the slurry become very moist due to the absorption of water from the environmental. To extend the storage stability of the fermented feel the addition of 5% maltodextrin and 0.5% tween 80 shown the best result of granulated fermented feel which is stable at room temperature (25°C) and could with stand until 1 month of storage. The moisture content of granulated feed supplement is about 11.2%. The proximate analysis of granulated flour shown that after being resolution contain the isoflavone of the granulated animal feed supplement is 10,100 ppm.

Introduction

Fermented soybean (tempeh) is one of the most important vegetable protein source which has gained consumen acceptance by most of Indonesian people. Prior to processing the bean was cooked and steamed and the peel of the bean is removed. Kumalaningsih and Surya (2012) and Ardhiansyah *et al.* (2014) stated that about 50.92 – 67.898 kg per year of solid waste year is discarded and sold as animal feed of low prices. Furthermore Nasahi (2010) reported that solid waste contain high valuable bioactive compound as glycoside and should be degraded into three biotic namely dietary fibre, microbes and also isoflavone through fermentation process.

The nutritional benefit of solid waste (peel) should be therefore being socialized to the farmers to enrich the ordinary feedstuff to increase the quality of animal feed. However the preparation practices standing from the show chart, and formulation as well as the storage stability of the healthy feed supplement which could carried out by the farmers should be clearly explained.

de Blas and Wiseman (2010) stated that rabbit is one of the most potential animal having a distinct digestive system which could metabolism dietary fibre and converted to volatile fatty acid which is main factor as source of energy to support the growth of the animal. Socialization of this method to the farmers is urgently required. However the low level of handling and technology of the farmers at rural region become the main hindrance the extension service for making feed supplement.

Under such circumstances, second stages should be therefore being carried out for the product of feed supplement which is easy to perform and mainly at the rural region. The use of soybean waste (peel) as raw material for making probiotic feed supplement containing microbes is expected to provide beneficial effect.

Effective microbe (EM4) has been commercialized and most of farmers known the use of this organism for the degradation of solid or liquid waste (Saleh, 2008). The inoculation of EM4 on to the solid soybean or peel waste is expected could hydrolyzed the glycoside found in the peel to be several biotic.

However the main important factor is how to stabilize the storage stability of this fermented peel. Previous study carry out by Zulfikar (2015) stated that the use 5% dextrin and 0.5% tween 80 could protect the biotic during storage. The objective of this study is to find out the best processing method for making granulated fermented peel containing bioactive.

The enrichment of the ordinary feedstuff with the granulated fermented soybean waste is thought beneficial not only reducing the environmental problem but also increasing body weight of the animal.

Methodology

Soybean peel was purchased from the small scale traditional fermented soybean (tempeh) located at Malang region, East Java Province, Indonesia. Feedstuff was prepared in the following composition: yellow corn, cake of coconut extraction, rice bran, fish protein concentrate, salt and mineral. The standard feed (BRI) is a from tofu waste

Processing of fermented solid waste for Rabbit feed.

3. The solid waste or peel of soybean was weighed 100 g and process blended and pressed again until the moisture content reached 40%, the pasteurized for 15 minutes.
4. Commercial effective microbe (EM4) was prepared by diluted 10 ml of concentrated liquid EM4 on to 900 ml aquades and added with 2 g of sucrose than incubated at 24 hours to experiment. Solid waste (peel) 100 g of was grinded and pressed to reached a moisture content of 40% (w/w) then pasteurized for 15 minutes, cooled and inoculated with prepared culture of EM4 (1%) then added with 2.5% skin milk, and 2 g of sucrose. Prepared cultures of EM4 (1%) was the inoculated on to the solid soybean waste incubated for 24 hours, and used to enrich the feedstuff based on the treatment.

Feeding Trial

The Rabbit New Zealand variety with weight variete from 200-900 g were used for the feeding trial the selected Rabbit were divided into three groups. Including to the body weight, i.s small, medium, and large size.

Group I consisting of small Rabbit

Group II consisting of medium Rabbit

Goup III consisting of large Rabbit

All the cages were given the code of treatment the feed will be given twice per day based on the body weight. All the Rabbit received dry feedstuff 6% based on the body weight. Observation concerning the feed consumption was carried out everyday.

Statistical Analysis

A randomized block design with one factor (0; 5; 10; and 15%) of fermented feed and replicated 6 (six times).

Chemical Analysis

The chemical composition analysis was determined by AOAC series methode (Horwits *et al.*, 2010). Mineral content (AOAC, 2005), dietary fibre (AOAC, 2005), isoflavone (Zhang and Scwartz, 2005), protein (AOAC, 2005)

The New Zealand white rabbit age of one month were used and grouped into 4 groups containing one rabbit. Placed in battery cages or individual pan. Each pan containing one rapid replicated 6 (six) to that is 24 pans.

Result and Discussions

Experiment 1. Effect of enrichment of fermented peels as the Rabbit productivity

4. Dry feed material consumption

Statistical analysis showed that a significant difference between treatment of control and the addition of fermented peel. The results were depicted in Table 5.1 below.

Table 1. Dry feed material consumption

Treatment	Dry Comsumption (g/head/day)	Material	Notation
P0 (Control)	39.28		A
P1 (+5% fermentated peel)	40.70		B
P2(+10% fermentated peel)	41.86		B
P3(+15% fermentated peel)	41.23		B

The enrichment of feedstuff with fermented peel from 5% to 15% showed no significant different on the dry material consumption. However the addition of fermented peel by 10% showed the highest feed consumption (41.86 g/head/day). Apparently the presence of fermented peel containing isoflavone has a significant effect on the palatability of feed as reported by (Kumalaningsih and Surya, 2012).

5. The Increase Body Weight

The enrichment of fermented peel also increase the rabbit body weight as shown in Table 2 below

Table 2. The increase body weight

Treatment	The Increase Body Weight (g/head/day)	Notation
P0 (Control)	14.35	a
P1 (+5% fermentated peel)	15.67	B
P2(+10% fermentated peel)	16.83	c
P3(+15% fermentated peel)	17.45	d

The higher increase weight is obtained in treatment of P3 or the addition of 15% fermented peel (17.45 g/head/day). Apparently the more fermented peel added the more increase the body weight. According to Kumalaningsih and Surya (2012) the mixture of the feed supplement not only increase the presence of isoflavone but also enhancement the palatability of feed, consequently this condition improve the feed intake and could increase the body weight.

6. Feed Conversion

The feed conversion is given in Table 3 below.

Table 3. Feed Conversion Ratio (FCR)

Treatment	Feed Conversion Ratio (FCR)	Notation
P0 (Control)	2.74	bc
P1 (+5% fermentated peel)	2.60	b
P2(+10% fermentated peel)	2.49	ab
P3(+15% fermentated peel)	2.36	a

The feed conversion ratio (FCR) is calculated as the following.

$$\text{FCR} = \frac{\text{Feed Intake}}{\text{Average Daily Gain}}$$

Analysis statistic showed that the more concentration of feed supplement the more decrease the feed conversion. The addition up to 15% of feed supplement the feed conversion is 2.36. This is due to the body weight also increase.

Characteristic of the feed supplement

The characteristic of the feed supplement after fermentation is depicted in this Table 4 below

Table 4. Chemical Characteristic of Feed Supplement

Composition	Before Fermentation	After Fermentation
Crude Protein (%)	17.29	23.92
Crude Fat (%)	6.61	9.78
Ash (%)	3.94	4.05
Fiber (%)	40.18	29.36
M. Content (%)	10.03	15.48
Isoflavone (ppm)	5213.44	7121.42

From the Table above it could be seen that the crude protein content before fermentation was 17.29% (w/w) and after 24 hours increase up to 23.92%. Apparently this is due to the fact that EM4 consisting mixture of microbes that although only being fermented for 24 hours the protein content has increased by 23.92 – 17.29%. It is surprising that the crude fiber decreased from 40.18% to 29.36% due to the decomposition of crude fibre by mold or bacteria. This evidence indicated that the cell wall which contain lignin, cellulose and hemicellulose has been converted to be soluble crude fibre.

The precence of low molecule weight of cellulose is very important for the feedstuff, to improve the digestion system, and also increased the availability of dietary fiber which is shortage during the dry season.

Characteristics of blend feed supplement

Tabel 5. Chemical composition of fermented soybean peel

Ingredients						
Ho	Prote	F	A	Moi	Fi	Isofl

urs	in	at	sh	sture	bre	avone	
24		23.9		4.	15.4	29	712
	0	9.79	10	8	.48		1.42
36		25.1	1	5.	15.8	28	701
	7	0.38	32	9	.31		1.30
48		26,9	1	6.	16.1	28	698
	8	1.03	21	7	.01		7.41

Experiment 2. Effect of filler and emulsifier on the chemical composition and storage stability on granulated flour.

Storage stability of granulated Feed Supplement

Table 6 The Moisture content of fermented and granulated feed supplement show

Hours	Fermented (%)	Granulated (%)
24	30.6	11.2
36	31.3	11
48	37.8	10.5

The moisture content increased substantially during storage after 48 hours the peel very moist and the moisture content is about 37.8% . The granulated flour has the moisture content in the range 10.5 – 11.2% and not increase during storage at room temperature (27°C). This avoidance indicated that the method for the granulated flour production has been established. According to Narsih (2013), the use of maltodextrin and tween 80 shown a promising result. Kumalaningsih *et al* (2011), reported that maltodextrin has very soft and gentle carbohydrate and could be absorbed by the organism during storage. The proximate composition of granulated flour is showed in the Table 7. The isoflavone of the granulated flour is above 10,100 ppm. Hernawati (2010) stated that the existent of isoflavone in the animal feed is important to support the growth and increase the rabbit body weight.

Table 7. Chemical Composition of Granulated Flour

Composition	Before Fermentation (%)	After Fermentation (24 hours) (%)
Crude Protein	14,92	16,26
Crude Fat	7,89	12.51
Ash	11.76	4.77
Fiber	20,83	37,89
M. Content	13.44	6.55
Isoflavone	0.000127	0.0078

Conclusion and recommendation

3. Enrichment of plain feed supplement with fermented peel improve the body weight of rabbit.
4. The use of 5% maltodextrin and 0.5% tween 80 could stabilize the granulated flour during storage.

Recommendation

The feeding trial with granulated flour should be further investigated to confirm the prospect of the granulated flour as feed supplement to substitute the existing imported feed supplement used.

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Broiler Chickens Performance as Affected by Animal Fat and Plant Oil under Hot Arid Conditions of Sudan

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Abstract

The influence of dietary animal fat and plant oil on broilers performance under Sudan conditions was studied. The experiment lasted seven weeks. One hundred and fifty one - day old, unsexed Lohmann breed chicks were divided randomly into three dietary treatments (50 birds /treatment) with five replicates of ten birds each. Average minimum and maximum temperatures during the experimental period were 26.1°C and 38.9 °C, respectively. Parameters measured were feed intake, body weight gain, feed conversion ratio, and mortality rate. Three dietary treatments were used in this study. Diet A with no fat added (NF), diet B was supplemented with 5% peanut oil (PO) and in diet C 5% beef tallow (BT) was added. The three diets were made to be isonitrogenous. All nutrients were calculated to meet the USA National Research Council Requirements (NRC, 1984) for broiler chicks. The results indicate that during the experimental period feed consumption was not affected by fat addition, irrespective of its source. There was a trend to increase the total body weight gain but the difference did not reach significant level. It was noticed that the ambient temperature during the experiment was very high which might upset the beneficial effect of dietary fat.

Keywords: *Peanut oil, Beef tallow, Broiler, Performance, Sudan*

Introduction

Supplemental fat has been used in poultry feed for energy adjustment (a high-density energy source) and to improve efficiency of feed utilization. Song et al. [1] reported that availability of amino acid in Chinese oil corn than in conventional corn. There are many factors influencing fat utilization, such as level of fat inclusion and basal diet composition, degree of saturation of the total lipid fraction, age and temperature. Environmental temperature is the most important factor affecting bird performance in the tropics. High temperature has adverse effects on the performance of the hen due to inadequate intake of nutrients. In growing chicks and turkeys, growth depression and reduction in feed intake are caused by environmental temperature above 20 °C [2]. Many workers tried to overcome this growth depression. Hurwitz et al. [2] and Charles et al. [3] failed to overcome this depression by increasing both protein and energy. In an attempt to diminish the detrimental effects of a constant high environmental temperature, Payne [4] suggested suitable dietary modifications. Fuller and Rendon [5] explained that the "extra calorific" effect of fat resulted from the low heat increment factor of fats, consequently, supplementation of fat has the effect to minimize some detrimental effects of high ambient temperatures. In Sudan, small-scale broilers production is carried in open poultry houses. Evaporative cooled housing is confined to large poultry projects in Khartoum. Producers avoid rearing broiler during summer months due to hazards of high temperature. Little information is available in Sudan

concerning the influence of type of fat on birds' performance during high temperature. This study was therefore conducted to determine the role of dietary fat in feed utilization efficiency and Broilers utilization efficiency of vegetable oil versus animal fat.

Methodology

This experiment was carried out at Faculty of Animal production, University of Khartoum. Minimum and maximum temperatures outside the poultry unit were 26.4°C and 38.9°C respectively. The experiment lasted for seven weeks

Birds, House and Management

A total of 150 one-day old, unsexed commercial broiler chicks (Lohman) obtained from commercial hatchery, were used in this experiment. They were vaccinated against Merke's disease. On arrival, all chicks were selected, weighed. The chicks were randomly distributed into 15 pens, and each pen contained 10 birds of approximate equal body weight. The pens were then randomly allocated to the three experimental diets (50 birds / treatment). The house long axes were situated in an East-west direction. The house was constructed of iron posts, wire netting sides, corrugated iron roofing, and concrete floor, the pens inside the house were made from iron posts with wire netting. Dry wood-shaving was used as litter materials at a depth of 5 cm. Each pen was provided with clean disinfected feeder and drinker that were filled with feed and water all the time. Light was provided 24 hours in a form of natural light during the day and artificial light during the night. 60 watt bulb was used for each two pens.

Three experimental diets were studied. Diet A contained no fat (NF) and served as the control. 5% peanut oil (PO) was added in diet B, and 5% beef tallow (BT) was added in diet C. The composition of these rations is listed in table 1. In the ration in which fat was included, sorghum was replaced with 5% either tallow (BT) or peanut oil (PO). The diets were calculated to be isonitrogenous. The main difference between the diets was in their source of energy. The assumed ME values were 7700, 8800 kcal /kg for tallow (BT) and peanut oil (PO), respectively according to NRC[6].

Vitamins and antibiotics were administered in the water for five consecutive days for each treatment during the fifth week. The nutrients of the experimental diets were calculated to meet the National Research Council requirement [6] of broiler chicks. The calculated and determined nutrients of the experimental diets are shown in table 2. The experimental diets were fed for the whole seven weeks period. Feed and water were offered ad libitum (ad-lib). Records of body weight, feed consumption were maintained on a weekly basis per replicates. Mortality rate was recorded throughout the experimental period.

Experimental design and statistical analysis

The experimental design of the trial was a complete randomized design. The data obtained (feed intake, body weight gain, and feed conversion ratio) were tabulated and subjected to analysis of variance (ONE -WAY ANOVA) using the SAS computer program. The least significant difference (LSD) test was used for treatment means separation.

Results and Discussion

Table 3 shows performance during the whole experimental period. There was a trend to increase final body weight by fat supplementation but the differences were not significant. Feed intake was not affected by addition of fat regardless of its source. Inclusion of both sources of fat in broiler diet tended to improve feed conversion but it did not reach level of significance. Total mortality during the 49-day experiment was 48 % in group A, 44 % in group B and 40 % in group C and postmortem examination showed that the cause of death was heat stroke rather than related to ration treatments. There was no difference in feed intake

between the three groups treatment however; there was a numerical increase in feed intake with tallow added diet. This result supported the work of Bartov[7] who found no effects on feed intake resulted from the dietary fat source (tallow, soybean oil) in broiler during summer. There was a trend to improve total body weight gain with both fat supplemented diets but the differences were not reach significant level. Feed conversion tended to improve with both fat added diets but the difference was not significant. This supported the previous data of Skinner and Waldroup[8] The expected beneficial effects of supplemental fat were not obtained. This may due to the effect of higher ambient temperature during the experiment which masked the beneficial effect of fat. Also may due to higher mortality which occurred as a result of the heat wave during the experimental period.

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Table1. Composition of experimental diet

Ingredients %	Treatments			
	Treatment control(NF)	Treatment A	Treatment B Oil supplement	Treatment C Fat supplemented
Sorghum	58.46	53.46	53.46	53.46
Super concentrate	05.00	05.00	05.00	05.00
Sesame meal	12.00	12.00	12.00	12.00
Groundnut meal	20.30	20.30	20.30	20.30
Wheat bran	03.00	03.00	03.00	03.00
Oil	-	05.00	-	-
Animal fat	-	-	05.00	05.00
Oyster shell	00.70	00.70	00.70	00.70
Salt	00.25	00.25	00.25	00.25
Lysine	00.24	00.24	00.24	00.24
DL. methionine	00.05	00.05	00.05	00.05
Total	100.00	100.00	100.00	100.00

Table2. Determined chemical analysis of experimental diet

Ingredients (%)	Treatments		
	A	B	C
Crude protein	22.75	22.75	21.87
Ether extract	5.10	10.20	9.20
Ash	6.80	7.10	6,80
Moisture	6.20	5.80	5.90
Crude fiber	8.80	8.90	9.10
Nitrogen free extract	50.35	45.25	47.13

Table 3. Effect of dietary fat source on broiler performance

Parameter	Treatment			
	A(control)	B(oil-supplemented)	C(tallow-supplemented)	SEM
Average body weight : initial (1-day).g.	43.16	43.12	43.18	
Final (49-days) .g.	1242.20	1257.80	1398.40	
Average body weight gain .g.	1199.04	1214.68	1355.22	2.321
Feed intake (g/chick/day)	53.58	53.44	55.98	
Total feed intake	2625.00	2618.00	2743.00	5.087
Feed-to-gain ratio (kg feed /kg body wt.)	2.19	2.16	2.02	0.171
Mortality %	48	44	40	0.407

Calcium And Phosporous Absorption Of Field Grass During The Dry Season At Medium Altitude In Garut

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Abstract

Research on the mineral uptake of Ca and P of field grass during the dry season in medium altitudes in Garut district has been conducted in September and October 2015. The study was aimed to determine how much and on which location or village was effected by Ca and P mineral uptake of field grass. The method used in this study was an experimental method with a completely randomized design (CRD). Treatments were locations or villages with six replications samples of field grass by a “quadrant” of 0.5 x 0.5 m², for each village. Variables observed was the absorption of the calcium (Ca) and phosphorus (P) minerals. Data was tested by variance and Duncan's multiple range test to determine differences between the treatments. The results showed that at Mekarjaya village, the Ca mineral uptake was higher than mineral Ca uptake at the Cisompet Village and Rancabango Village, while the uptake of P mineral showed the same results for all locations in the three villages

Keywords: field grass, mineral uptake, location

Introductions

Field grass as a forage for ruminants was very important to meet their needs and to be provided continuously. The livestock sector in Garut at the medium altitudes (500-700 m asl) like Mekarjaya Village, Rancabango Village and Cisompet Village were very potential for ruminants. Botanical composition of grass in that area was higher than legumes and weeds, because the grass growth was faster than legumes and weeds. Grass was grown from the stem base point, it lead the field grass to be resistant from grazing and cattle weight and fast to grow back.

Calcium was very important in the formation and stability of the cell wall and maintenance of membrane structure and permeability, activates several enzymes, and regulate the various responses of plant cell stimulation. Plants with the lack of calcium have characteristics like deformation on the leaves, reducing the growth of roots and dead shoots. Mineral phosphorus was a component of nucleic acids, phospholipids, adenosine triphosphate and some co enzymes. Phosphorus deficiency in plants was characterized by old leaves purple, fewer fruits and seeds as well as the disruption of growth (Soetan et al., 2010).

Methodology

This research was conducted in three villages at medium altitudes of Garut district, the Mekarjaya Village, Cisompet Village and Rancabango Village from September to October 2015 during the dry season. The experimental design used was completely randomized design (CRD) with the village as a treatment. Ca and P minerals uptake was obtained from the field grass dry matter multiplied by the content of Ca and P. Data were

tested by the using of variance analysis and Duncan's multiple range test to determine differences between the treatments. Availability of field grass can be anywhere, such as at the paddies area, crops area, plantations area, forestry and fallow area. The indicators used to assess the quality of the field grass was a botanical composition obtained from the sample collection with 6 replications by using a quadrant sized of 0.5 x 0.5 m². Forage botanical composition and the results of laboratory analysis (mineral content of Ca and P) on the field grass was the primary data. Secondary data was obtained from the agencies concerned, such as animal husbandry department, and the district office. The data was analyzed descriptively. Zoning area was based on a consideration of the number of ruminant populations and representatives of medium altitude region in Garut district.

Results and Discussions

Research on field grass has been carried out in three villages in Garut. Determination of the villages were based on ownership of ruminants, and the selected area were Mekarjaya village, village Cisompet and Rancabango village. Field grass was identified, and it was found there were 25 species of grasses, legumes and weeds. Field Grass growth was very easy and quick, especially during the rainy season, so it was very highly spreaded.

Ruminant productivity was highly dependent on the quantity, quality and availability of field grass. Production of dry matter was a characteristic which indicates the level of productivity of field grass at the locations. Average yield of field grass dry matter in the Mekarjaya village was the highest (47.83 g / 0.25 m²) and significantly different when compared to the Cisompet Village (30.83 g / 0.25 m²) and Rancabango Village (33.67 g / 0.25 m²). Mineral uptake of Ca and P obtained from the calculation of the dry matter content of Ca and P multiplied by field grass can be seen in the table below. In the opinion of Gardner et al., (1991), dry matter production reflected the productivity of plants in a particular location or region.

Table 1. Average DM, Ca and Phosphorus Uptake of Field Grass at Medium Altitude, Garut

Treatments (Location)	Field Grass (g/0,25 m ²)		
	DM (Dray matter)	Ca (Calcium)	P (Phosphorous)
Mekarjaya village	47,83 a	0,143 a	0,159 a
Cisompet village	30,83 b	0,120 b	0,064 a
Rancabango village	33,67 b	0,097 b	0,056 a

Notes: The different letters at a column shows the significantly different.

Results of variance showed that the mineral uptake Ca at Mekarjaya Village is significantly different and higher than Ca uptake at the Cisompet Village and Rancabango Village. It is directly proportional to the amount of dry matter content at the Mekarjaya Village field grass. The highest component of field grass dry matter at Mekarjaya Village was the grass species then followed by legume species and weeds, this indicate that the grass stems are dominant. Calcium (Ca) is one of the important nutrients for plants because it is required for the cell wall structure that mostly contained in the plant stems (White and Broadley, 2003). High concentration of Ca is not reduce the accumulation of Ca in the leaves and seeds. Plants with a high Ca concentration resulted in higher dry matter contained in stems and roots (Domingues, 2016).

P mineral uptake results of variance showed no significant difference in three villages in Garut. Field grass is a grass that grows by itself without fertilization and human intervention so that mineral P content is very low, which in turn mineral P uptake was not significantly different for the three villages. This is in accordance with the opinion of

Dismawan et al., (2014) that the P content of 0.026 to 0.24% is only enough for weaning calves maintenance and not sufficient condition for growth.

Phosphorus (P) is a component of nucleic acids, phospholipids, adenosine triphosphate (ATP) and coenzyme for growth and yield of field grass. Phosphorous sufficient levels are very helpful for root development resulting the maximum field grass dry matter. This is in accordance with the opinion of Zulaikha and Gunawan (2006) that the adequacy of nutrient P, assist in the process of photosynthesis in forming glucose and then synthesized into sucrose then distributed to all organs of the plant through the phloem to reach the maximum growth, yield and nutritional value.

Conclusion

The Ca mineral uptake at Mekarjaya village was higher than mineral Ca uptake at the Cisompet Village and Rancabango Village, while the uptake of P mineral showed the same results for all locations in the three villages.

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Isolation and Screening of Lactic Acid Bacteria from *Dadih* for Glutamic Acid Production as Precursor of γ -Amino Butyric Acid (GABA) Induced Heat Stress in Broiler

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Abstract

This study aims to obtain isolates of Lactic Acid Bacteria (LAB) producer of glutamic acid as precursor of GABA. The study consisted of three stages: stage 1; isolated of LAB from *Dadih* used of MRS agar contained CaCO₃, 2%. Stage 2 was the selection of glutamic acid-producing LAB qualitatively and quantitatively with inducers of monosodium glutamate (MSG). Stage 3 was the characterization of selected LAB isolates biochemically. The result found that 10 isolates of LAB producing glutamic acid, namely Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8, Y9, Y10. After tested the ability to produce a qualitative glutamic acid of 10 isolates of LAB has capability to produce glutamic acid in the extracellular and intracellular which indicator changed the color to purple, but after the test quantitatively obtained two isolates (Y2 and Y8) which resulted in the production of glutamic acid, the highest yield of glutamic acid were 41.73 mg/L and 40.86 mg/L, respectively. The characterization of two isolates (Y2 and Y8) was bacilli, convex surface, white milk, and was a gram positive bacteria and aerobic. Based on catalase test and oxidase test showed that isolate Y2 and Y8 was negative catalase and oxidase, but for the glucose, sucrose and mannitol test the two isolates were positives and negatives to lactose test. Based on the characterization, the two isolates were *Lactobacillus* sp. The results of this research, can be concluded that 10 isolates of LAB that isolated from *Dadih* potentially producer glutamic acid, which the highest production was 41.73 mg/L by isolate Y2 (*Lactobacillus* sp) can be as precursor of γ -Amino Butyric Acid (GABA).

Keyword: LAB, glutamic acid, *dadih*, MRS agar, GABA

Introduction

Glutamic acid or glutamate is an important molecule for all living organisms, which plays a role in various metabolic processes. It is a non essential amino acid involved in protein synthesis and other fundamental processes such as glycolysis, gluconeogenesis and the citric acid cycle. It is also a key metabolite because it serves to link nitrogen and carbon metabolism (Kondoh *et al.*, 2009). Catabolism of glutamate occurs mainly by the action of either glutamate dehydrogenase or glutamate decarboxylase (GAD). The first enzyme, among other roles, is important for the assimilation of ammonia to amino acids, while the second is important for resistance mainly against acid but also other stresses (Inoue *et al.*, 2003)

γ -aminobutyric acid (GABA) is a non-protein amino acid that is widely distributed in nature from microorganisms to plants and animals. It acts as the major inhibitory neurotransmitter in the mammalian central nervous system. In addition, GABA has

hypotensive, tranquilizing and diuretic effects, and can prevent diabetes (Tamoe *et al.*,2009) . Also, GABA may improve the concentration of plasma growth hormone and the rate of protein synthesis in the brain and inhibit small airway-derived lung adenocarcinoma. Therefore, GABA has potential as a bioactive component in foods/feeds and pharmaceuticals.

Minang Kabau in the West Sumatera, which is located in the west part of Sumatera island, is one of the major areas in which people produce various fermented milk buffalo products, names is *dadih*. Many studies have reported the mass production of GABA using *Lactobacillus brevis* isolated from alcohol distillery lees and kimchi (Park,*et al* 2005), *Lactobacillus paracasei* from fermented fish (Komatsuzaki *et al.*, 2005), and *Lactococcus lactis* from cheese starters (Nomura *et al.*, 1998), but the isolation of lactic acid bacteria from the *dadih* to produce glutamic acid as a precursor γ - aminobutyric acid (GABA) production has been no reported. The aim of this study was to screen various LAB exhibiting a strong ability to glutamic acid production that can be bioconversion to produce GABA, which are expected to enhance the development of functional feeds.

Methodology

Five locally available fermented milk buffalo (*dadih*) were purchased from Bukittinggi, Payakumbuh, Sijunjung, Padang Panjang dan Solok as LAB-strain local sources. The study consisted of three stage: stage 1; isolated of LAB from *Dadih* used of MRS agar contained CaCO₃, 2%. Stage 2, was the sreening of glutamic acid-producing LAB qualitatively and quantitatively with inducers of monosodium glutamate (MSG). Stage 3 was the characterization of selected LAB isolates biochemically.

Results and Discussion

Isolation of lactic acid bacteria from *dadih* begins to grow on selective media MRS broth were incubated for 7 days. The research showed that from five locally available *dadih* found that 45 isolates of lactic acid bacteria that could be seen clear zone around the colony using selected media MRS agar after added 2% CaCO₃. The research also showed that 10 isolates of 45 that produced glutamic acid were isolated from fermented milk buffalo (*dadih*) (Table 1)

Table 1. Qualitatif glutamic acid production of LAB by extraselluler and intraselluler

No.	Name of isolates	Qualitative Glutamic Acid	
		Extraseluler	Intraseluler
1	Y1	++	+
2	Y2	+++	+
3	Y3	++	+
4	Y4	++	++
5	Y5	++	++
6	Y6	++	+
7	Y7	+++	+
8	Y8	+++	+
9	Y9	+++	+
10	Y10	++	+

Description: + : faded, ++ : concentrated, +++ : very concentrated

For the quantitative screening of glutamic acid from LAB, the results showed that the ten isolates produced glutamic acid can be seen in Figure 1.

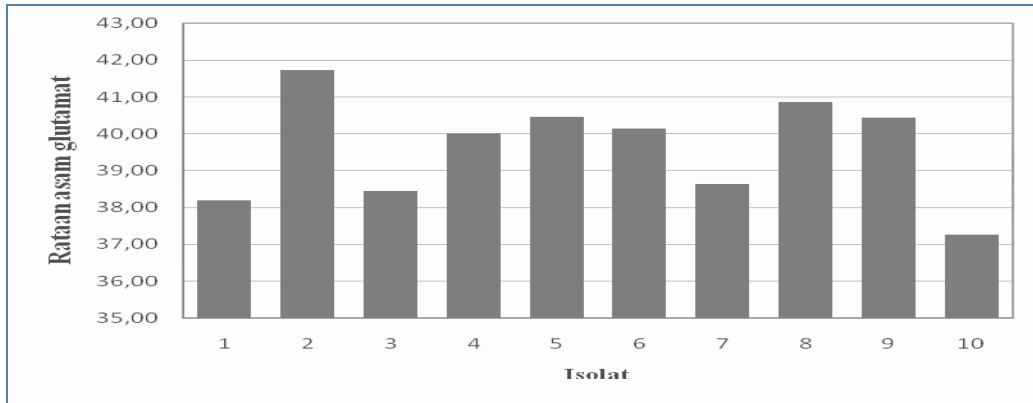


Figure 1. Quantitative screening of glutamic acid produced by LAB

As shown in Table 2, out of 2 colonies, appeared to be positive in lactose utilisation test. These isolates were able to ferment lactose to produce lactic acid that lowers the pH of the MRS media that, in turn, changed the purple indicator dye to yellow indicative of fermentation activities. Gram reaction and morphology studies showed that all of these isolates from *dadih* as Gram-positive cocci.

Tabel 2. Characterication of Isolates Y2 and Y8 Lactic Acid Bacteria Producing Glutamic Acid

No.	Treatments	Results	
		Y2	Y8
1	MRSA	+	+
2	Coloni (Color, shape, Sifat)	white, bacill	white, bacill
3	Gram (Morfologi, Spora)	+	+
4	Aerob	+	+
5	Catalase	-	-
6	Oxidase	-	-
7	Lactose	-	-
8	Glucose	+	+
9	Sucrose	+	+
10	Mannitol	+	+
11	Gas production	-	-

Conclusions

The results of this study concluded that found of 45 isolates of Lactic Acid Bacteria (LAB) and after screening for glutamic acid production, 10 isolates have cabability to produced of glutamid acid, the higher glutamic acid production found that two isolates (Y2 and Y8). The Characterization of two isolates were gram positive, negative catalase and can be as *lactobacillus* sp, which glutamic acid production 41.73 mg/L.

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The Effect of Fertilizers on Soil Characteristics of Sand-Mining Land and Nutrients Content of Sorghum Patir 3.7 (*Sorghum Bicolor* (L) Moench)

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Abstract

This study aimed to evaluate organic fertilizer, biological fertilizer and soil conditioner on soil fertility and nutrients content of sorghum on sand-mining land. The research design applied in this study is a complete randomized design (CRD) with six treatments of three replicates for the parameter of nutrient treatment and a descriptive for soil characteristics. Fertilizer treatments consist of T0: sand; T1: 100% NPK (270 kg ha⁻¹); T2: manure, AMF and EM; T3: T2 and NPK 50%; T4: T2 and HA; T5: T4 and NPK 50%. Variables observed in this study were physical and chemical soil fertility, and nutrients content of sorghum. Results showed that treatment of T2 - T5 can improve physical and chemical soil fertility by lowering the content of sand, increasing organic matter, and maintaining the cation exchange capacity (CEC) of the soil. Dry matter was improved significantly with fertilizer treatments. The content of fiber fraction has a tendency to decrease with the fertilizer treatment. Fertilizer treatments had increased the protein content of sorghum. Treatment with manure, AMF, ME and humic acid could improve physical and chemical soil fertility. It has sustainable potential of productivity and better quality of sorghum.

Keywords: *in vitro*, mycorrhizal, organic fertilizer, sand, sorghum

Introduction

Sand-mining land is one of unexploited marginal lands with the main problems of low soil organic matter, water holding capacity and high leaching. The marginal land is potential for forage cultivation. The soil analysis result of our previous study showed 80% sand, 8% silt and 12% clay with organic matter (OM) 0.38% carbon (C) and 0.03% nitrogen (N) while the phosphorus (P) 92 mg 100/g and potassium (K) 29 mg 100/g. Soil which is dominated by sand fraction has large pores that facilitate penetration of plant roots, water and air circulation, but it has low water holding capacity, organic matter and other substances. Drought and leaching are the main problems faced in plant cultivation. Organic matter (OM) content in this land is considered to be in a very low category. The improvement of physical, chemical and biological soil condition is needed and can be made by adding some fertilizers such as organic fertilizer, biological fertilizer and soil conditioner. Soil microorganisms widely used are arbuscular mycorrhizal fungi (AMF) and effective microorganism (EM) which improve nutrients uptake and plants growth. AMF is able to increase the absorption of nutrients through soil organic acids and drought resistance by expanding the root area and diseases resistance, and increase the production of plant biomass (Song, 2005; Christopher *et al.*, 2008; Sowmen *et al.*, 2012). Humic acid is a soil conditioner that increases the cation

exchange capacity (CEC) of soil and reduces nutrient leaching. The fertilizers and soil conditioner application on soil can be expected to improve soil conditions for sorghum cultivation in comparison with the use of NPK fertilizer as positive control treatment.

Sorghum brown midrib (BMR) is a mutant sorghum having less lignin, high digestibility, and adaptable on marginal land resulting in high productivity. The potential of sorghum makes it an important food crop in the world. It is also used to produce bioethanol and animal feed with good digestibility (Reddy *et al.*, 2006). Evaluation of the nutrients content of sorghum planted on sand-mining soil has never been done. The objective of this study was to determine the effect of adding some fertilizer to the soils of sand-mining soil on the soil characteristics and nutrients content of sorghum.

Methodology

This study was conducted at the greenhouse of University Farm at Cikabayan, Bogor Agricultural University. The treatments were a combination of inorganic and organic fertilizers, consisting of sand soils (T0); soils with 100% NPK fertilizer (T1); soils with manure, arbuscular mycorrhizal fungi (AMF) and soil microbes (ME) (T2); soils with manure, AMF, EM4 and 50% NPK (T3); soils with manure, AMF, ME and humic acid (HA) (T4); soils with manure, AMF, ME, HA and 50% NPK (T5). The NPK dosage used on this study was 270 kg/ha. Before treatment, soil was assayed in terms its physical structure and chemical content. The soil-manure ratio in 40-kg polybag capacity used in this study was 9:1, and the organic fertilizers were applied with 20 g AMF, 5 ml EM4 and 180 ppm humic acid that had been previously diluted with distilled water. Sorghum seeds of the variety Patir 3.7 *brown midrib* used (bmr) were used and obtained from SEAMO BIOTROP. Sorghum were watered, weeded, applied with NPK fertilizer 15 and 30 days after planting and measured for their growth parameters every weeks. They were harvested and sampled when 80% of the sorghum plants reached a soft dough stage of grains maturity. The samples were analyzed for the dry matter (DM) content, crude protein according to the Kjeldahl method, crude fiber (AOAC, 2005) and cell wall components (Van Soest *et al.*, 1991). Analysis of variance (ANOVA) was tested to calculate the significance of treatment affect on the nutrient composition

Results and Discussions

The soil on this research is sandy loam type of soil with sand fraction dominating soil composition. Soil fraction determines soil textures and the physical, chemical and biological characteristics of the soils.

Tabel 1. Physical and chemical soil contain

Treatments	Kandungan Nutrien (%)						
	Sand	Silt	Clay	C	N	C/N Ratio	CEC (cmol _c kg ⁻¹)
Soil	80	8	12	0.38	0.03	13	11.06
P1	75	14	11	0.14	0.02	7	9.15
P2	74	13	13	0.46	0.05	9	10.00
P3	73	12	15	0.73	0.07	10	10.77
P4	70	14	16	0.59	0.07	8	10.69
P5	71	17	12	0.66	0.07	9	11.10

Description: T0: sand soils; T1: 100% NPK; T2: manure, AMF, ME; T3: T2 + NPK 50%; T4: T2 + HA; T5: T4 + NPK 50%. C: carbon; N : nitrogen; CEC : Cation Exchange Capacity.

Sandy loam soil belongs to a class of moderately textured nature sand fraction with large size pores that facilitate root penetration, good air and water circulation but of low water holding capacity (Bhupinderpal-Singh *et al.*, 2006; Djajadi *et al.*, 2012). Manure and some other organic fertilizers tend to reduce the percentage of sand fraction. Organic matter

content in soils after cultivating has improved from 0.46 to 0.73% carbon (C) and 0.05 to 0.07% nitrogen (N) higher than that of the early soil and T1. Organic fertilizer on soils improved C and N content and provided organic matter for sorghum regrowth compared with T1. Cation exchange capacity (CEC) content on soils were from 9.15 to 11.10 $\text{cmol}_c \text{ kg}^{-1}$ which was included low criteria ($< 16 \text{ cmol}_c \text{ kg}^{-1}$) but still within the appropriate criteria for sorghum growth. When compared fertilizers (P2 - P5) treatments and P1, showed the applying organic fertilizer on soils to maintain CEC after harvesting. It has the effect of humic acid application that improved the absorption of nutrients and decreased leaching.

Tabel 2 nutrients content of sorghum

Treatments	Kandungan Nutrien (%)					
	DM	Ash	EE	CP	CF	TDN
T0	15.00±1.31b	10.70±2.01	2.85±0.40	5.89±0.52b	23.52±2.09	40.74±6.52
T1	17.38±2.25ab	9.28±1.86	3.38±0.72	8.87±0.19a	19.00±3.31	54.95±10.08
T2	18.28±1.98a	9.83±0.20	2.82±0.50	9.42±0.83a	18.27±1.79	53.29±5.96
T3	18.73±1.62a	10.95±0.84	3.80±0.72	9.61±0.21a	18.11±1.23	58.66±6.57
T4	18.10±0.19a	10.37±1.14	3.09±1.14	9.54±0.53a	22.09±2.96	47.65±10.98
T5	20.07±1.41a	9.93±1.42	3.21±1.42	9.59±0.53a	19.81±1.46	52.83±3.58

Description: Means in the same row with different superscript differ significantly ($p < 0.05$). T0: sand soils; T1: 100% NPK; T2: manure, AMF, ME; T3: T2 + NPK 50%; T4: T2 + HA; T5: T4 + NPK 50%. DM: Dry matter, CP: crude protein, CF: Crude fiber, EE : Ether Extract, TDN : Total Digestible Nutrient.

The average of CF concentration in sorghum were similar among fertilizer treatments, that varying between 18.11 - 23.52%. Application of fertilizers has increased crude protein of sorghum than T0. This study result is similar to the result of studies on *bmr* sorghum varieties, 5.83% and 7.2% (Miron *et al.*, 2005; Marsalis *et al.*, 2010). The protein content on sorghum was influenced by the availability of nitrogen in soils, sorghum varieties and plant maturity at harvest time influence nutrient composition of sorghum.

Conclusion

The fertilizers treatments can improve the soil properties of sand-mining land and increased dry matter and crude protein of sorghum.

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Addition of Different Species of Forages Legumes on Physical, Chemical Characteristics and in Vitro Digestibility of Dairy Cattle Feed Pellet

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Abstract

This study aims were to determine the effect of various species of forage legumes (*Calopogonium mucunoides*/Kalopo, *Centrosema pubescens*/Sentro and *Pueraria phaseoloides*/Kudzu) on durability, crude fiber content, in vitro digestibility of dry matter (IVDMD), in vitro digestibility of organic dry matter (IVDOMD), ammonia content (NH₃) and volatil fatty acid (VFA) of pellets for dairy cattle. Research has been conducted experimentally with 6 treatments, R1 = 20% Kalopo + 80% concentrate, R2 = 30% Kalopo + 70% concentrate, R3 = 20% Sentro + 80% concentrate, R4 = 30% Sentro + 70% concentrate, R5 = 20% Kudzu + 80% concentrate, R6 = 30% Kudzu+ 70% concentrate. Each treatment was replicated 4 times. The experimental designs were complete randomized block design and tested by Duncan's Multiple Range Test. The results showed that the addition of various species of legumes affect crude fiber content, IVDMD, IVDOMD, NH₃, and VFA content, but no significant effect on durability of dairy cattle feed pellet. The most obvious finding to emerge from this study is that the addition of 30% kudzu showed the optimum results i.e. 95.6% durability, 19.26% crude fiber content, 69.19% IVDMD, 63.68% IVDOMD, 6.33 mM NH₃ content and 174 mM VFA content.

Keywords: *sentro, kalopo, kudzu, pellets, durability, concentrate of dairy cattle*

Introduction

The main limitation in every dry season is that forage supply, which very abundant in the rainy season. Drying and pellet-making is one method to solve the problems. The advantage of making pellet are easy to storage and easy to handle for transportation. Availability of forages should be produce from superior forage in order to obtain the high yield and quality as well.

High quality of pellet is determined by the composition of the constituent materials. Forage legume is one of feedstuffs which use in the manufacture of pellets because of protein content higher than forage grasses. There are many species of legume in Indonesia. Legume widely used as forages and have high production and high quality among others i.e. Sentro (*Centrosema pubescens*), Kalopo (*Calopogonium mucunoides*) and Kudzu (*Pueraria phaseoloides*) which have crude protein content 23.60%, 22.01% and 19.20% respectively.

Pellet is a form of preserving feed materials which ensure the availability and quality of feed (Retnani, 2011).

Methodology

Research has been conducted experimentally with 6 treatments, R1 = 20% Kalopo + 80% concentrate, R2 = 30% Kalopo + 70% concentrate, R3 = 20% Sentro + 80%

concentrate, R4 = 30% Sentro + 70% concentrate, R5 = 20% Kudzu + 80% concentrate, R6 = 30% Kudzu+ 70% concentrate. Each treatment was replicated 4 times. The experimental designs were complete randomized block design and tested by Duncan's Multiple Range Test. Concentrates have a 16% crude protein content. The ingredients of the ration are cassava, pollard, rice bran, peanut meal, molasses, and mineral

Parameter measured: 1. durability. The measurement of durability is using tumbling box with a speed of 50 rpm for 10 minutes, then filtering with German sieve number 8. The pellets left in the sieve are weighed and compared to the weight of the pellets before using the tumbling box. 2. Analysis of the crude fiber content (AOAC, 2015) 3. Analysis of dry matter (IVDMD) and organic matter in vitro (IVDOMD) 4. The content of NH3 results in vitro 5. The content of VFA results in vitro (Tilley and Terry, 1963)

Results and Discussions

All treatments gave durability over 80% which qualify as good pellets. Pellets with high durability, would easy to handling both in storage and transport time. Pellets with high durability will be stable and not fragile, so the integrity of the pellets will still be awake. High durability is obtained because of the arrangement of the building blocks of pellets in part as a source of energy that has high starch content, i.e. cassava, pollard and molasses. The starch serves as a binder in the form of pellets. Starch would be gelatinized due to heating at the time of making pellets that will affect durability (Iin, et.al. 2015).

The content of crude fiber of pellet increased with increasing doses of forage legumes. Forage legume is a source of fiber for ruminants. IVDMD content obtained from the pellets with the addition of legumes 30% kudzu and 20% Sentro: 69.20% and 65.20% respectively. Generally, materials with high fiber content have lower digestibility. For ruminants, crude fiber contents determine the digestibility, because ruminants can digest cellulose and hemicellulose, except lignin. The addition of 30% kudzu showed the highest content of NH3 and VFA in vitro because of legumes kudzu has the highest IVDMD and IVDOMD. These factors may explain the content of NH3 and VFA are high too. This study has found that a dose of 30% forage legume kudzu + 70% concentrate followed by Sentro 20% + 80% concentrate, showed the optimum dose. These finding can be applied in the field to measure the direct effect on productivity of livestock dairy cows, ie the milk production and quality.

Table 1. In vitro degistibility, ammonia concentration (NH3), crude fiber content, VFA, and durability on pellet mixed between legume and concentrate.

	IVDMD (%)	IVDOMD (%)	NH3 (mM)	Crude fiber (%)	VFA (mM)	Durability (%)
T1	53.43 ^f ±0.81	51.00 ^e ±0.41	4.51 ^{cd} ±0.09	19.06 ^a ±0.29	122.00 ^d ±3.34	94,6 ^{ns} ±1.61
T2	58.20 ^d ±1.38	53.33 ^d ±0.72	5.51 ^b ±0.23	17.35 ^b ±0.44	134.63 ^c ±10.04	96,05±0.68
T3	65.20 ^b ±0.36	61.03 ^b ±0.75	5.06 ^{bc} ±0.06	15.14 ^c ±1.11	154.63 ^b ±1.93	93,75±0.5
T4	55.61 ^e ±1.64	51.86 ^{de} ±0.76	3.94 ^d ±0.37	17.05 ^b ±0.47	132.38 ^{cd} ±6.38	95,7±1.24
T5	61.25 ^c ±0.52	56.51 ^c ±0.91	4.71 ^c ±0.20	17.99 ^{ab} ±0.39	161.38 ^b ±5.56	95,25±1.55
T6	69.19 ^a ±0.83	63.68 ^a ±1.09	6.33 ^a ±0.49	19.26 ^a ±0.97	174.00 ^a ±2.74	95,6±1.35
Sign.	**	**	**	**	**	ns

IVDMD= In vitro digestibility of dry matter, IVDOMD= In vitro digestibility of organic dry matter, NH3= Ammonia, VFA= Volatile Fatty Acid, T1 = 20% Kalopo + 80% concentrate, T2 = 30% Kalopo + 70% concentrate, T3 = 20% Sentro + 80% concentrate, T4 = 30% Sentro + 70% concentrate, T5 = 20% Kudzu + 80% concentrate, T6 = 30% Kudzu+ 70% concentrate, ns : not significantly different, **: significant different

Conclusion

The results of this investigation show that the addition of various species of legumes affects crude fiber content, IVDMD, IVDOMD, NH₃, and VFA content, but no significant effect on durability of dairy cattle feed pellet. These findings enhance our understanding of 30% kudzu mixed with concentrate showed the optimum results i.e. 95.6% durability, 19.26% crude fiber content, 69.19% IVDMD, 63.68% IVDOMD, 6.33 mM NH₃ content and 174 mM VFA content.

Acknowledgements

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The Potential of Local Feed Sources for Silage Production in Supporting The Cattle Raising Business in East Ranotongkor Village

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Abstract

The potential of feed resources for the development of the cattle-raising business needs to be studied. The study of this potential has been conducted in East Ranotongkor Village as one of the Ipteks Bagi Masyarakat (Science and Technology for the Community) target villages. Data collection was conducted between August and September 2016 using the FGD and observation techniques and secondary data analysis. Analysis of the potential was conducted using the Carrying Capacity Index, minimum requirement, and total carrying capacity. The results of this study revealed that introduction of silage production in East Ranotongkor Village was supported by the availability of local forage fodder, both natural forage potential and waste materials. This availability would allow a population increase by 238 percent of the current population. This potential must be supported by the farmers' knowledge and skills in producing preserved feed so that feed could be available all the time. Therefore, the government is expected to motivate the farmers in increasing the production of silage to support the sustainability of the cattle-raising business in East Ranotongkor Village.

Keywords: *Feed, Potential, Silage*

Introduction

The performance of the cattle-raising business in East Ranotongkor Village, East Tombariri District, Minahasa Regency, North Sulawesi Province is characterized by: (a) grass is the main feed without supplementary feed, leading to low livestock productivity, (b) cattle lose weight in the dry season because of the lack of feed, but during the rainy season when feed is abundant, the feed is neglected, agricultural waste is discarded and burned, (c) the farmers lack knowledge and skills in preserving feed during the harvest season.

The introduction of feed-preserving technology, for example in the form of silage-producing technology is necessary. The first phase in introducing silage for feed is to study the potential local feed sources in East Ranotongkor Village in supporting a sustainable feed supply. This study was aimed to study this potential.

Methodology

The study was conducted in East Ranotongkor Village, Minahasa Regency as one of the Ipteks Bagi Masyarakat (IbM) activity target villages. The study used the survey method by conducting focus group discussions (FGD) and observations. The study was conducted between August and September 2016. The data collected were primary data from FGDs and observations and secondary data from the village, district, and regency.

Data was analyzed using qualitative and quantitative descriptive statistics. The analysis of potential used the land Carrying Capacity Index (IDD) analysis approach (Ashari

et al 1996), analysis of the ruminant livestock minimum requirement per livestock unit (ST) calculated according to Thahar *et al.* (1991):

$$K = 2.5\% \times 50\% \times 365 \times 250 \text{ kg} = 1.14 \text{ ton BKC/ST}$$

where: K is the minimum feed requirement for 1 ST per year, the livestock body weight (2.5%), the average digestibility of various plants (50%), the number of days per year (365), and the biomass per livestock unit (250 kg).

The total carrying capacity and number of livestock could still be increased (Ashari *et al* 1996). The calculation of Waste Potential = (wetland rice x 0.4) + (corn x 3 x 0.5) + (legumes x 2 x 0.55) + {(yams x 0.25/6) + (cassava x 0.25/4)} x 0.65. The natural forage potential = (Plantations x 2.875) + (Pasture x 0.75). Carrying Capacity Index (IDD) is the ratio between feed availability and the total forage requirement.

Result and Discussion

The Sources and Types of Forage Fodder in East Ranotongkor Village

The types of feed that are most commonly consumed by cattle are corn stover, followed by pasture grass, dallis grass, elephant grass, and rice straw. This is also commonly found in traditional cattle-raising in other villages in North Sulawesi Province. Elly *et al.* (2013), Channabasavanna *et al.* (2009) found in a study in South Minahasa Regency that corn stover dominated cattle consumption, followed by pasture grass, elephant grass, and dallis grass.

In the effort to improve the quality and quantity of feed, the introduction of dwarf elephant grass cultivation technology has already been initiated even though it is planted on limited plots as pilots. This introduction was done because the quality of dwarf elephant grass is better than the other tropical grasses. Its advantages are it has high leaf to stalk ratio, it is draught-resistant, propagation is through the vegetative method, it can grow in many places, it is resistant to shade, it responds well to fertilizing and it is highly palatable to ruminant livestock. In addition, this grass has the highest nitrogen (N) and dry-matter digestibility among all tropical grasses (Muslim and Nurasa 2007, Polakitan and Kairupan 2015).

Potential Local Feed Sources for Silage Production

There are four categories of feed that have potential as feed sources: (1) livestock feed plants (natural grasses or introduced grasses, leguminous herbs and multi-purpose trees); (2) crop by-products/waste materials; (3) agro-industrial by-products; and (4) unconventional feed materials that have not yet been exploited but have potential as feed. Table 1 presents the production and waste potential and natural forage which can support the production of silage in East Ranotongkor Village with an assumption of one planting season.

Table 1. Production and Waste Potential and Natural Forage for the Production of Silage

No.	Type of Plant	Forage Production (tons)	Waste Potential (tons)	Natural Forage Potential (tons)
1	Corn	158 806	238 209	-
2	Rice	750	300	-
3	Legumes	541.5	595.65	-
4	Yam	320.4	26.02	-
5	Grass	701 234.42	-	525 925.82
6	Plantation crops	690.02	-	1 983.81
	Total	862 342.34	239 130.67	527 909.63

Source: East Tombariri District in Numbers (2014), *processed*

The results of the calculation of the total carrying capacity and number of livestock that could still be developed in East Ranotongkor Village are as follows: Land Carrying Capacity Index (IDD) was 2.38, the total feed available was 767,040.3 tons/year, and the

2016 livestock population was 282.75 ST. The carrying capacity of the area was 955.7 ST, so the number of cattle that can be added to the population is 672.95 ST.

Introduction of Silage Production

Based on the analysis of forage availability in the form of both waste potential and natural forage, it was discovered that East Ranotongkor Village has potential for developing the cattle-raising business. However, this potential needs to be supported by the farmers' ability to produce high-quality preserved feed so that feed could be available all year long. Introduction of silage production could be done through extension and training programs. These activities were received positively by the farmers in East Ranotongkor Village.

Conclusion

East Ranotongkor Village has the potential feed sources to develop their cattle-raising business. This availability will enable an increase in the population by 238% of the current population. This potential must be supported by the farmers' knowledge and skills in producing preserved feeds. The introduction of the technology was accepted by the farmers and implementation has begun in the feeding pattern. It is suggested that the government to continue to motivate the farmers in increasing their silage production to support the sustainability of the cattle-raising business.

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Oral Presentation 5 Focus Session:

Feed and Nutrition (2)

Friday, 21 October 12:30-14:40

Room: Panderman 2

Legumes Wafer for Improvement The Post-Weaning Etawah Crossbreed Goats Performance

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Abstract

This research aimed to evaluate the effect of feeding legumes wafer to improve the performance of post weaning Etawah Crossbreed goats. The research was designed using completely randomized block with 4 treatments and 4 blocks of 16 heads post weaning Etawah Crossbreed goats with average body weight 13.10 ± 0.91 kg. The treatments were T0 (basal diet = control), T1 (T0 + 13.79% *Indigofera zollingeriana* wafer), T2 (T0 + 15.66% *Leucaena leucocephala* wafer) and T3 (T0 + 14.12% *Calliandracalothyrsus* wafer). The post weaning Etawah Crossbreed goats performances observed dry matter and organic matter intake, average daily gain (ADG), feed efficiency (FE), income over feed cost (IOFC). The result showed that the performance of the goats especially ADG, FE, and IOFC significantly increased ($P < 0.05$) by supplementation of legumes wafer. The best performance of the goat was achieved by supplementation of *Leucaena leucocephala* wafer (18.36% dry matter intake, 29.20% organic matter intake, 66.18% ADG, 41.63% FE, 19.09% IOFC). As conclusion, all of legumes wafer have a potency to improve the post-weaning Etawah Crossbreed goats performance, and the *Leucaena leucocephala* wafer is the best wafer.

Keywords: *post-weaning Etawah Crossbreed goats, performance, wafer supplement of legumes.*

Introduction

Milk consumption is still low in Indonesia society which is around 11.09 litres per capita per year compared to some countries in ASEAN (Association of South East Asian Nations) are around 20 litres per capita per year (Kemenperin, 2014). The biggest contributor of national milk consumption is derived from dairy cattle. Whereas in addition to the supplied from dairy cattle, small ruminants such as dairy goats can also contribute to the fulfillment of the needs of the milk consumption of Indonesia society. One of the dairy goats as potentially for produces milk is Etawah Crossbreed goat.

The growing phase of post weaning goat is the initial phase to determine the success rate of productivity of a goat, either as a candidate for dairy goat or breeding (Mathius *et al.*, 2002). Mellado *et al.* (2011) showed that this growth period is very influential on the productivity of the dairy goats that is the level of production of milk produced at the same time profit breeders. So it takes an effort to increase the growing phase of post weaning goat, one of them, namely through the quality improvement of the feed. The use of an additional source of protein as legume for livestock can be used as one of the efforts to improve the

quality of feed. Legume which can be utilized as an alternative forage feed include *Indigofera zollingeriana*, *Leucaena leucocephala* and *Calliandra calothyrsus*.

Forage as feed ruminants have a weakness that its availability depending on the season, easily a foul, and voluminous. So the necessary processing technology forage that can be applied throughout the year with the manufacture of wafers. Wafer feed is one of the results of feed preservation technology to make it more durable during storage, easy to stored, easy to distributed, and easy to given to the animal. The research objective was to evaluate the effect of feeding legumes wafer to improve the performance of post weaning Etawah Crossbreed goats.

Methodology

Sixteen (16) post-weaning Etawah Crossbreed goats aged about 4 months with average body weight around 13.10 ± 0.91 kg were maintained in individual cages shaped stage equipped. The experimental design used in this study was completely randomized block design with 4 treatments and 4 blocks as replications. The treatments were: T0 (basal diet = control), T1 (T0 + 13.79% *Indigofera zollingeriana* wafer), T2 (T0 + 15.66% *Leucaena leucocephala* wafer) and T3 (T0 + 14.12% *Calliandra calothyrsus* wafer). Parameters measured were dry matter and organic matter intake, average daily gain (ADG), feed efficiency, and income over feed cost (IOFC). The data were analyzed using an ANOVA and the differences among treatments were examined with Duncan test.

Result and Discussion

Performance of post-weaning Etawah Crossbreed goats were presented in Table 1. It is shown in Dry matter intake of post-weaning Etawah Crossbreed goats in this research was almost similar among the treatments, with average 661.40 – 792.77 g/head/d. According to Suparjo *et al.* (2011) the range of dry matter intake is around 434 – 560 g/head/day and 556 – 603 g/head/d (Lee *et al.*, 2014). The dry matter intake affect the supply of nutrients for maintenance and growth of animal. The nutrient intake depends on the amount of dry matter intake and nutrient content are given to the animal. The dry matter intake was influenced by the difference of nutrient energy and protein (Negesse *et al.*, 2001), physiological condition of livestock, sex, and feed.

Table 1. Dry matter and organic matter intake, average daily gain, and feed efficiency of control and treatments diets.

Parameters	Treatments				Sign.
	T0	T1	T2	T3	
Intake (g/head/d)					
Dry matter	661.40±57.95	770.72±36.62	782.87±57.19	792.77±87.64	Ns
Organic matter	92.64±8.15 ^a	119.94±5.05 ^b	119.69±8.08 ^b	122.87±12.49 ^b	**
Average daily gain (g/d)	46.99±16.62 ^a	72.87±5.73 ^b	78.09±16.96 ^b	62.32±17.52 ^{ab}	**
Feed efficiency	6.99±1.82 ^a	9.43±0.76 ^{ab}	9.90±1.44 ^b	7.78±1.65 ^{ab}	**
IOFC (Rp/head/d)	18288±2695 ^a	20945±1173 ^{ab}	21779±2367 ^b	20910±2639 ^{ab}	**

Ns: Non significant, ** = significant (α 0.95)

The addition of legumes wafer either *Indigofera zollingeriana* wafer, *Leucaena leucocephala* wafer, and *Calliandra calothyrsus* wafer on post-weaning Etawah Crossbreed goats showed increasing average daily gain 32.62% to 66.18% higher than control. This is due to feed intake in post-weaning Etawah Crossbreed goats given wafer supplement of legumes are higher than without any given wafer supplement of legumes. Body weight gain was influenced by several factors, i.e. the total consumption of protein, sex, age, genetic, environmental, physiological condition of livestock and management (NRC, 1985).

The post-weaning Etawah Crossbreed goats are given legumes wafer have feed efficiency, higher than control. The higher value of feed efficiency indicated that more efficient feed is used to increase the daily body weight gain. *Leucaena leucocephala* wafer is the best in feed efficiency because the post-weaning Etawah Crossbreed goats given *Leucaena leucocephala* wafer have the highest ADG with the lowest organic matter intake. Feed efficiency was influenced by feed intake and average daily gain.

Income over feed cost (IOFC) is an advantage gained by breeders by analyzing income after deducting the cost of feed used during this research. The post-weaning Etawah Crossbreed are given legumes have IOFC were higher than control. *Leucaena leucocephala* wafer is the best in IOFC because the post-weaning Etawah Crossbreed goats given *Leucaena leucocephala* wafer have the highest ADG and feed efficiency.

Conclusion

The conclusion of this research is all of legumes wafer have a potency to improve the post-weaning Etawah Crossbreed goats performance, and the *Leucaena leucocephala* wafer is the best wafer.

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Utilization of Cricket Meal in Creep Feed Diet of Growing Etawah Crossbred Goats

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Abstract

This research was aimed to evaluate utilization of cricket meal as soybean meal substitution in the creep feed diet of growing etawah crossbred goats. A Completely randomized design was used for analyzed of three treatments such control (R0), 50% cricket meal substitute of soybean meal (R1) and 100% cricket meal substitute of soybean meal in the ration (R2) by using twelve growing goats. The diets were iso protein (16%) and iso TDN (65%) and the ratio of concentrate : forage in the ration was 70 : 30. Parameter measured were nutrient consumption, performance, physiological status and blood profiles. Results showed that nutrients consumption and were not significance difference among the treatments but ADG in R3 was the highest (154 g.d⁻¹). Heart rate and respiration at noon were higher (140 beat.min⁻¹ and 55 times.min⁻¹) than morning and afternoon due to the environment effect, meanwhile the hematology profiles were same in all treatments. It is concluded that utilization of cricket meal until 100% substitute of soybean meal could be used in the growing goats diet without giving any problems to the physiological status, blood profiles and still keep good performance.

Keywords: *cricket meal, crossbred goats, growing etawah, physiological status and soybean meal*

Introduction

Feeding management in traditional farming system is still have problems, especially for finding the protein sources. Cereals as conventional ingredient is more expensive as protein source for fattening ration, compare to legumes. It needs to find an alternative protein source especially for ruminant ration before and just after weaning period (1-4 month) with low price, high quality and save to consume. Nutrient requirement for post weaning kids or growing goat with ADG 150 g/d is around 86 g/d protein intake and 0.43 kg/d of TDN intake (NRC, 2007). Source of protein is comes from plant protein and animal protein. Price of animal protein is quite expensive and mostly from import. One of plant protein for concentrate is soybean meal with crude protein content around 49%. Dendi (2012) reported that utilization of 15% soybean meal in the ration has increased performance of growing lamb, but the feed cost was also high. The small ruminant mortality (including kids) during pre-weaning time is around 20-70%, meanwhile the mortality after weaning or start for growing period is still high with more than 17% (Astuti, et al., 2008). Problem with triplet or quart birth was the limitation of milk quantity from the mother, so it is needed to solve this problem in order to increase population.

Insect is one of an alternative in-conventional ingredient which is have high protein content, approximately 60 to 70 %, and they are also fairly low in [carbohydrates](#). Sinaga et al, (2010) reported Cricket has protein content (48.84% - 56.02%), fat (24.41% - 32.84%) and gross energy 4610 Kal/kg.

This research was aimed to evaluate utilization of cricket meal as soybean meal substitution in the creep feed diet of growing etawah crossbred goats.

Methodology

A Completely randomize designed was used for analyzed of three treatments such control ration whitout cricket meal (R0), 50% cricket meal substitute of soybean meal in the ration (R1) and 100% cricket meal substitute of soybean meal in the ration (R2). The cricket meal wass prepared without chitin. This experiment was carried out for three months, using twelve post weaning Etawah crossbred with 10-14 kg of body weight and randomly allocated into randomized block design consisted of three treatments and four replicates. The rations were iso protein (16%) and iso TDN (65%) and the ratio of concentrate : forage in the ration was 70 : 30. Parameter measured were nutrient consumptions and performance, physiological status and blood profiles.

Result and Discussion

The treatment showed that there were no significant effect on dry matter, crude protein, crude fiber, calcium, and phospor intake. The intake of fat was significant defference ($P < 0.05$), where R2 has the highest fat intake, (57.35% higher than treatment R1) due to high content of fat in cricket. The nutrient intake was looked suitable and adequate for the growing kids requirements.

Table 1. Feed intake, performance, and digestibility of post-weaning etawah crossbred lamb receiving dietary treatments

Parameter	R0	R1	R2
	----- g/d -----		
Intake			
Mix Grass	210.32	198.33	211.81
Consentrate	538.47	532.08	481.07
Dry matter intake	748.78	730.40	692.88
Crude fat	20.34 ^a	41.17 ^b	57.35 ^c
Crude Protein	132.08	136.55	129.33
Crude fiber	80.23	78.20	88.82
Calcium	13.86	13.22	14.28
Phospor	4.36	4.13	4.15
Daily gain	135.3	123.4	136.5

R0 = control; R1 = ration containing 50% cricket meal substitute of soybean meal; R2 = ration containing 50% cricket meal substitute of soybean meal

Daily weight gain were not significance difference among the treatments, although R2 have same weight gain with control. However kids in R2 tended to have higher weight gain than R1 ration. Based on Aka (2012) experiment in growth of post-weaning etawah crossbred kids have ADG around 123 g/d, meanwhile Sodiq (2012) showed that etawah crossbred kids in 120 day old have 128.7 g/d of daily gain.

Table 2. Physiological responds of kids fed with cricket meal

Parameters	Treatment	Time			Normal
		Morning	Noon	Afternoon	
Heart rate (x.min ⁻¹)	R0	119.59±6.67	139.88±4.71	132.47±7.03	70- 135*
	R1	121.13±3.18	139.88±2.05	132.25±4.81	
	R2	124.92±6.63	141.28±4.31	133.09±4.27	

	Average	121.60±2.00 ^c	140.34±1.43 ^a	132.60±1.46 ^b	
Respiration (x min ⁻¹)	R0	46.13±2.51	54.38±1.59	49.81±1.49	26-54*
	R1	47.54±3.13	56.34±0.61	50.41±0.99	
	R2	45.69±2.15	54.13±1.15	48.59±1.28	
	Average	46.35±0.49 ^c	54.95±0.49 ^a	49.60±0.25 ^b	
Rectal temperature (⁰ C)	R0	38.93±0.06	39.20±0.06	39.17±0.03	38.5- 40.0*
	R1	38.95±0.12	39.22±0.10	39.17±0.06	
	R2	38.98±0.07	39.24±0.04	39.19±0.08	
	Average	38.95±0.03	39.22±0.03	39.18±0.03	

R0 = control; R1 = ration containing 50% cricket meal substitute of soybean meal; R2 = ration containing 50% cricket meal substitute of soybean meal. *= Normal values (Frandson 1996).

There were no significance difference of physiological responds and hematological profiles in kids which fed cricket until 100% replace of soybean meal. All those parameters were in range of normal values. It means that substitution of soybean meal with cricket meal up to 100% have no effect on healthy status of kids or growing goats. This result was similar in growing sheep which reported by Astuti et al.(2016).

Table 3. Hematological profiles of kids fed with cricket meal

Parameters	Treatments			Normal
	R0	R1	R2	
RBC (10 ⁶ mm ⁻³)	13.22±5. 79	15.17± 5.60	13.10±2 .61	8-17*
Haemoglobi (g dL ⁻¹)	11.03±0. 93	11.52± 0.81	12.21±0 .45	10- 12**
Haematokrit (%)	36.00±4. 40	36.50± 4.43	36.00±3 .46	19- 38***
WBC (10 ³ mm ⁻³)	12.28±2. 84	14.23± 5.00	13.54±2 .50	6-16*
MCV (μ)	32.00±15 .86	28.99± 18.57	28.79±9 .02	15- 30****
MCHC (5%)	28.00±2. 42	28.86± 1.79	31.03±2 .90	35- 42****

Keterangan: P0 = ransum mengandung bungkil kedelai; P1 = ransum mengandung bungkil kedelai dan tepung jangkrik; P2 = ransum mengandung tepung jangkrik; *= Gregg (2000); ** = Guyton dan Hall (1997); *** = Jain (1993); **** = Midway (1969).

Conclusion

It is concluded that utilization of cricket meal until 100% substitute of soybean meal could be used in the growing goats diet without giving any problems to the physiological status, blood profiles and still keep good performance.

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Performance of First Cutting of *Pennisetum purpureun* cv.Mott Under Different Level of light and Nitrogen Fertilizer

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Abstract

The objective of this study was to evaluate the morphological traits as tall of plant, long of leaf, number of leaf and crude protein under different level of light and nitrogen fertilizer. Treatment consist level of light and nitrogen. Treatments were arranged in a factorial pattern based on block randomized design. Data were analyzed by using analysis of variance and the treatment means were compared by honestly significant difference (HSD) test. Result showed that tall of plant, long and number of leaf, under low level of light was significant higher than full sun light. In general the needs of nitrogen fertilizer to achieve the higher of morphological traits and crude protein content under low light level was significant smaller than full sun. In conclusion, *P.purpureun* cv.Mott grown under low light at first cutting, able to achieve the higher of morphological traits and crude protein content.

Keywords: performance, pennisetum, light level, nitrogen fertilizer.

Introduction

Low price of red meat and beef cattle from overseas, compared product in country, is the main reason import still occurred in Indonesia. This is due to fattening in country used concentrate as fed which is more expensive since this commodity faced to the needs as food and even for bio-fuel. Contrary in Australia most of the time beef cattle feed forage as fed (Abdullah, 2012). Some factors effects low forage supply in country were limited area for forage production since many of more fertile soil priority used for food production and industrial crop in example oil palm, coconut and rubber. Actually those space potential to integrate with forage as animal fed but faced competition of light, water and nutrient. *Pennisetum purpureun* cv.Mott is productive and palatable species and potential to integrated as second commodity in plantation crops. Unfortunately the information of the ability of this grass to persist under shaded environment is still very limited. This experiment was designed to assess the response of this species under different level of light and nitrogen fertilizer, measured of some morphological traits and crude protein content.

Methodology

This experiment was conducted at the experimental station of Asasement Institute Agriculture Technology (AIAT) of North Sulawesi. Treatments were arranged in a factorial pattern based on block randomized design (Gomez and Gomez, 1995). Two factors were set for light level as factor A and amount of nitrogen fertilizer using urea as factor B. factor A divided into full sun light (a1) and 30% of light using 70% shade cloth (a2). Factor B were 0

N/ha (b1), 92 N/ha (b2), 184 N/ha (b3) and 368 N/ha (b4). Variable measured were including tall of plant, long of leaf, number of leaf and crude protein content of plant. Data were analyzed by using analysis of variance and the treatment means were compared by honestly significant difference (HSD) test.

Result and Discussion

Tabel below showed that among morphological traits measured as tall of plant, long and number of leaf, under low level of light was significant higher than full sun light. This phenomenon is a proof of one of some mechanism internal tolerance of plant grown under shade to be able to fulfill the needs of light for photosynthetic processing through high utilization of sunlight energy for efficient dry matter production in elephant grass (Nagasuga, 2007). Therefore, study of adaptation of forage species under shade environment is more important part of silvopastoral study (Barsila et al, 2013).

Tabel. Tall of plant, long of leaf, number of leaf and crude protein content of *Pennisetum purpureum* cv. Mott

Light (%)	Nitrogen (kg/ha)	TP (cm)	LL (cm)	NL	CP (%)
a1	b1	134.94 ^c	46.67 ^b	7.00 ^b	5.80 ^b
	b2	149.00 ^b	44.16 ^b	7.60 ^b	5.82 ^b
	b3	154.33 ^a	46.83 ^b	7.80 ^b	7.38 ^a
	b4	165.33 ^a	53.33 ^a	8.31 ^a	8.51 ^a
		150.90^y	47.74^y	7.67^y	6.88^y
a2	b1	147.67 ^b	49.33 ^b	8.49 ^a	8.98 ^a
	b2	151.66 ^a	53.66 ^a	8.35 ^a	9.43 ^a
	b3	168.00 ^a	61.00 ^a	8.32 ^a	11.29 ^a
	b4	179.60 ^a	54.70 ^a	8.54 ^a	10.67 ^a
		161.73^x	54.67^x	8.42^x	9.97^x

TP = tall of plant; LL = long of leaf; NL = number of leaf; CP = crude protein

Different superscripts in the same columns indicate significantly different (P<0.05).

In general the needs of nitrogen fertilizer to achieve the higher of morphological traits and crude protein content under low light level was significant smaller than full sun. Especially in the case of crude protein to get the same value needs 4 time amount of nitrogen. These data showed that shading has contribute significantly since under this circumstance the decomposition process occurred more effective and rapidly (Wild and Wilson. 1991; Pandey et al, 2011). Under low light, crude protein content of plant as fed, was significant higher than full sun. This value could fulfill the minimum level for rumen microbes proliferation (Coleman et al, 2003)..

Conclusion

Pennisetum purpureum cv.Mott grown under low light at first cutting, able to achieve the higher of morphological traits and crude protein content.

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Amino Acid Characterization of Tofu Waste Fermentation using Effective Microorganism-4 and *Lactobacillus plantarum* Culture

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Abstract

The research aimed to know the amino acid characterization of tofu waste fermentation using effective microorganism-4 (EM-4) and *Lactobacillus plantarum* culture with different concentrations. Research used Random Nested Design with 2 factors, factor 1 was a type of microbe (EM-4 and *Lactobacillus plantarum*) and factor 2 was the concentration of microbes consists of five levels (1%, 5%, 10% , 15%, and 20%, v/w). The results showed that the treatments giving very significant effect on amino acid parameter. The 20% concentration of *Lactobacillus plantarum* treatment producing 1612.72 mg/100 gr valine, 587.44 mg/100 gr methionine, 1694.62 mg/100 gr isoleucine, 2123.93 mg/100 gr leucine, 820.90 mg/100 gr tyrosine, 1468.8 mg/100 gr phenylalanine, 832.94 mg/100 gr histidine, 1632.66 mg/100 gr lysine, 1858.79 mg/100 gr arginine, 607.05 mg/100 gr tryptophan, 566.84 mg/100 gr glutamine, and 545.78 mg/100 gr cystine, higher than EM4. Methionine and lysine are limiting amino acid, which is crucial for animal growth.

Keyword : amino acid, fermentation, tofu waste, EM-4, *Lactobacillus plantarum*

Introduction

Amino acids are essential nutrients and should be in the food. In some ways amino acids can substitute other materials as a source of protein, helps in the storage protein or as a protein reserves, and reduce nitrogen excretion, and indirectly lower the cost of feed. As an example, lysine is resulting in the protein deposition and muscle growth, and it also has other functions such as improving digestion. Threonine in the diet can improve immunity (Anonymous, 2016). Increased content of lysine in the diet can increase the body weight of broilers (Anonymous, 2016) and resulted in the production of breast meat in high result (Barboza *et al.*, 2000). Threonine not only play a role in metabolism, but also involved in the maintenance process, such as updating the intestinal mucus and the synthesis of proteins associated with immune. Threonine is the third limiting amino acid after lysine and methionine.

Amino acids are chemically bound to the protein and should be broke from the main protein. This process occurs in the intestine with the aid of proteolytic enzymes. Amino acids and oligopeptides are absorbed in the intestinal wall and enter the bloodstream as free amino acids (Dalibard *et al.*, 2014). Today the use of amino acids as an additive in feed is crucial and must be added, either to feed poultry and ruminants. One source of protein that is widely used as animal feed is tofu waste. But it has some problems due to their anti-nutrients and amino acid content is low.

The using microbial fermentation is needed to solve the lack of nutrients in tofu waste. In this study using microbes EM4 and *Lactobacillus plantarum*. Tofu waste is a high protein

feed source and is rich in isoflavones (Astuti and Noviana, 2013). The use of two groups of microbes is expected to increase the amino acid content of fermented tofu waste.

Methodology

The research was done in Engineering Laboratory of Food in Tribhuwana Tunggadewi University, East Java. *Lactobacillus plantarum* was obtained from the Laboratory of Agricultural Product Technology, Brawijaya University, Indonesia. EM4 is effective microorganism-4 of PT Persada Songgolangit product which containing microbes *Lactobacillus casei* 1.5×10^6 cfu/ml, *Saccharomyces cerevisiae* 1.5×10^6 cfu/ml, and *Rhodopseudomonas palustris* 1.0×10^6 cfu / ml. Amino acid analysis was done in biochemical laboratory University of Muhammadiyah Malang.

Culture of *Lactobacillus plantarum* was made by boiling 200 g of potatoes (it was peeled and cut into small size) in 1000 ml of distilled water. Potato extract solution is filtered into Erlenmeyer, added by 15 g of sugar, stirring until dissolved. Before inoculated using *Lactobacillus plantarum*, all equipment and media were sterilized using an autoclave. On other hand, EM4 pure solution was diluted using distilled water. As an example for the needs of 1000 g tofu waste with 1% concentration EM4, the EM4 pure solution was diluted, its calculation was $1/100 \times 10 \text{ ml} = 0.1 \text{ ml}$. Next, 0.1 ml of EM4 inserted into a measuring cup and add 10 ml of distilled water until reaching 10 ml, then newly mixed into the tofu waste.

The Research used Random Design Nested two factors, the treatment consists of: Factors I: Microbial type, consisting of two levels, namely M1 = *Lactobacillus plantarum*, M2 = Effective Microorganism (EM-4); Factor II. The concentration of microbes, consisting of five levels, namely K1 = 1%, K2 = 5%, K3 = 10%, K4 = 15% K5 = 20% (v/w) where the second factor is nested on the first factor (microbes) to 3 replications

Research Activities

Tofu waste was squeezed to reducing the water content, steamed for 30 minutes and cooled. The sugar as much as 1% and 5% skim milk was added into cooled tofu waste then fermentation was performed using two groups of microbes in accordance with the treatment. Fermented tofu waste performed in an airtight plastic and fermented for 4 days. Fermented tofu waste opened and dried in an oven temperature of 60 °C, set it to dry analysis of amino acids. Determination of amino acid analysis using HPLC.

Result and Discussion

. Tofu is a food made from freshly precipitated soy beans which undergo coagulation caused by the addition of vinegar in the manufacturing process. Tofu has a moisture content 84.9-87.3%, 6.5-8.8% protein, 4.1-4.6% oil (Wang and Calvins, 1989). Tofu waste is a waste processing from tofu. The protein content of each product will vary depending on the materials used soybean and comparison with the water content. Data of fermented tofu waste comparing between two groups of microbes, EM4 (mixing bacteria consisting of *Lactobacillus casei*, *Saccharomyces cerevisiae*, and *Rhodopseudomonas palustris*) and *Lactobacillus plantarum* (single bacteria), is shown in Table 1. Compared with unfermented tofu waste, the result of fermented treatments, amino acids content of the average increases in both groups of microbes. However,. The results showed that *Lactobacillus plantarum* treatments give higher yields to all 14 amino acids compared to microbial EM-4.

Korhonen and Pihlanto (2003) said during microbes activity at fermentation process, it can release free amino acids and bioactive peptides. The research result is in line with research and Cavins Wang (1989), that the manufacturing process of tofu causes an increase in the amino acid valine, methionine, isoleucine, leucine, tyrosine, and phenilalanine. In this study, tofu waste is getting fermentation again using two groups of microbes and the results

showed an increase in all of the amino acids. Amadou *et al.* (2010) reported that fermentation of soybean by *Lactobacillus plantarum* release amino acids and forming peptides which have low molecular weights. Compared with the control (without fermented soybeans), fermented causing increasing amino acid valine, isoleucine, and leucine.

Table 1. Data influence of fermented tofu by EM4 and *Lactobacillus plantarum* to the amino acid content

Treatment	val	met	ile	leu	tyr	phe	his	Lys	arg	trp	asp	gln	cys
(mg/100 g)													
Tofu waste (non fermented)	1246.1	403.0	1312.7	1666.8	639.9	1126.9	672.8	1329.5	1532.7	470.1	300.9	386.5	369.3
M1K1	1322,8a	440,3a	1393,4a	1763,3a	713.6	1198,4a	651,4a	1338,5a	1531.9	457,7a	280,5a	422,1a	404,1a
M1K2	1422,4a	490,1a	1497,1a	1888,1a	750.7	1292,7a	713,7a	1441,6a	1646.6	507,7a	303,8a	471,1a	452,6a
M1K3	1424,6a	491,2a	1499,6a	1891,9a	752.6	1293,1a	715,0a	1443,6a	1647.3	509,3a	303,7a	471,8a	453,4a
M1K4	1450,1b	503,8b	1525,6b	1922,1b	768.5	1316,9b	730,6b	1467,9b	1674.8	523,1b	314,2a	485,1b	466,1b
M1K5	1531,2b	545,0a	1609,8b	2024,2c	820.9	1393,0b	781,2b	1551,3b	1767.2	565,1b	346,7b	525,7b	505,3b
M2K1	1323,8a	440,5a	1395,3a	1764,8a	687.5	1199,2a	652,9a	1341,1a	1535.5	457,2a	281,4a	422,5b	404,3a
M2K2	1375,7a	466,1a	1448,1a	1828,7a	720.7	1245,1a	684,3a	1393,0a	1592.0	484,5a	284,3a	448,1a	429,7a
M2K3	1395,9a	479,0a	1473,8a	1860,5a	736.3	1270,9a	699,6a	1417,9a	1621.8	497,1a	294,4a	460,2a	441,5a
M2K4	1503,2b	530,9b	1581,2b	1987,8b	800.9	1366,1b	763,9b	1522,0b	1735.8	549,7b	334,9b	511,4b	491,4b
M2K5	1612,7c	587,4c	1694,6c	2123,9c	748.9	1468,8c	832,9c	1632,6c	1858.7	607,0c	312,4a	566,8c	545,7c
BNT	P<0.01	P<0.01	P<0.01	P<0.01	p>0.05	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	P<0.01	p>0.05	P<0.01

Conclusion

The results showed that the treatments giving very significant effect on amino acid parameter. The 20% concentration of *Lactobacillus plantarum* treatment producing 1612.72 mg/100 gr valine, 587.44 mg/100 gr methionine, 1694.62 mg/100 gr isoleucine, 2123.93 mg/100 gr leucine, 820.90 mg/100 gr tyrosine, 1468.8 mg/100 gr phenylalanine, 832.94 mg/100 gr histidine, 1632.66 mg/100 gr lysine, 1858.79 mg/100 gr arginine, 607.05 mg/100 gr tryptophan, 566.84 mg/100 gr glutamine, and 545.78 mg/100 gr cystine, higher than EM4

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***In Vitro* Digestibility Profiles of Cricket Meal as Protein Source in the Ration**

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Abstract

Cricket is an edible insect can use as alternative feedstuff. Cricket meal can replace soybean meal or fish meal as protein sources for animal feed. Those (soybean and fish meal) mostly imported and they have high price in Indonesia. This experiment was carried out to study *in vitro* digestibility of cricket meal as protein source, replace of soybean meal in the ration in a Completely Randomized Block Design. Three kinds of cricket meals (raw, without chitin and extracted materials) and four kinds of goats rations such control (R0), 15% raw crickets meal in the ration (R1), 30% raw crickets meal in the ration (R2) and 30% crickets meal without chitin (R3). All treatments were fermented as *in vitro* method by using goat rumen fluids for measured dry matter and organic matter digestibility, and ammonia. Data for cricket meal as single ingredient was evaluated descriptively, meanwhile data of four treatments were analyzed statistically by orthogonal contrast. Result showed that ammonia were same in all treatments, even as single feed or in a ration, but the concentration of ammonia especially in the rations were quite low (6-7 mM), it means that cricket meal is a protein by pass in the rumen. The digestibility of dry matter and organic matter were same and high in all cricket meals either as single feed or in the rations.

Keywords: *edible insect, cricket meal, organic matter digestibility, protein by pass*

Introduction

Feeding management in traditional farming system face many problems, especially for finding the protein sources. Cereals as conventional ingredient is more expensive as protein source for fattening ration, compare to legumes. It is necessary to find alternative protein sources especially for poultry and ruminant ration before and just after weaning period (1-4 month) with low price, high quality and save to consume. Insect as a feed now is being introduced to many sectors, including in animal feeding management as a protein source, and might become one of the alternatives in-feed conventional ingredient which has high protein content. Since declaration of *Insect to Feed The World* at Wageningen University Netherland Conference last May, 2014, many kinds of insects were introduced as protein resources, including crickets. Moreki et al (2012) reported that insects as one of alternative good feed for the poultry ration. Sánchez et al (2014) suggested that insect meal as renewable source of food for animal feeding.

In cricket rearing, after producing eggs within 5 - 6 times layer crickets would be wasted due to their low productivity (50%). The wastes produced is very potential as non conventional ingredient and can be used as protein source for animals. The average waste products obtained by one farmer was 2-10 kg per week (private data, 2014). Wang *et al.* (2005) reported that in 100 g of cricket meal contained 58.30% protein, and chitin of 8.70% could disturb the nutrient absorption by animals.

Before using crickets as a feed, it is necessary to evaluate the potential meal products either as single feed, substitute of plant protein source or part of the ration as *in vitro* study. This experiment was carried out to study *in vitro* digestibility of cricket meal as protein source, to replace of soybean meal in the ration.

Methodology

Cricket meal preparation

Cricket was prepared (from waste of layer crickets after producing eggs within 5 - 6 times) which is collected from Bekasi cricket farm, West Java. After sun drying and oven drying (60°C), the materials was grinded in order to make a meal. The meal were prepared as raw material meal (whole cricket), cricket without chitin and cricket meal extracted. Chitin in the body was separate by loosing head, legs and wings of the crickets, meanwhile cricket meal extracted was prepared by using methanol extracted solvent. Proximate analysis was done before *in vitro* study.

Research on *in vitro* cricket meals was conducted using three of goat rumen liquor for evaluate the digestibility (DMD, OMD) using Telly and Terry method (1969) and ammonia concentration was analyzed using Conway method. There were four treatments of soybean meal substitution in the ration, such as:

R0 = ration without cricket meal (using soybean meal as control)

R1 = ration containing 15% raw cricket meal (50% substitute of soybean meal in the ration)

R2 = ration containing 30% raw cricket meal (100% substitute of soybean meal in the ration)

R3 = ration containing 30% cricket meal without chitin

A Completely Randomized Block Design method was used in this experiment with three replicates of goat rumen liquor (Steel and Torrie, 1993).

Results and Discussion

Result showed that the nutrient content of cricket meals have high protein (54.09%) and fat (26.94.30%), meanwhile by extraction of the meal the total of protein increased to be 61.99% but fat reduced to be 11.14%. The cricket meal without chitin resulted reducing of protein to be 50.26% with same fat and fiber content. Data *in vitro* digestibility of cricket meal as a single feed showed that ammonia were same in all treatments, but the concentration of ammonia was very high (about more than 18%).

This experiment showed that DM and OM digestibility of the cricket meal either as single feed or part of the ration (up to 30%) were same and resulted more than 70%. Cricket meal as protein source from insect has no secondary compound effect, while legumes or tropical browse plants with high protein content containing secondary compound tend to decrease *in vitro* digestibility profiles, as in the ration compare to as a single feed, it is due to the effect of those anti nutrition (Astuti et al., 2011). The ammonia concentration of cricket meal in a ration was decreased significantly ($P < 0.05$) compare to control. It was suggested that protein cricket was undegradable (bypass) protein. Mc Donald et al. (2002) reported that ammonia concentration of the rumen fermentation is around 6 to 15 mM. So that the *in vitro* fermentation in this experiment using cricket meal has in normal condition even though cricket meal in part of the ration showed gave interaction with other ingredients and resulted low ammonia.

Table 1. The *in vitro* Digestibility Profiles of Single Feed Cricket Meal.

Parameters :	Raw Cricket meal	Cricket meal without chitin	Extracted cricket meal
DM Digestibility (%)	74.72±0.83	76.65±2.01	75.90±1.26
OM Digestibility (%)	74.39±0.86	71.58±0.62	73.99±2.31
Ammonia (mM)	18.98±4.38	19.65±5.21	18.62±4.28

Table 2. The *in vitro* Digestibility Profiles of cricket meal as a ration

Parameters :	R0	R1	R2	R3
DM Digestibility (%)	78.64±1.48	75.00±3.50	70.73±1.28	
70.47±4.13				
OM Digestibility (%)	82.84±8.57	77.37±4.71	72.83±1.49	
72.47±1.24				
Ammonia (mM)	11.30±6.08 ^a	6.29±0.64 ^b	7.23±0.15 ^b	
6.39±0.61 ^b				

R0= control; R1 = ration with 15% CM; R2 = ration with 30% CM; R3 ration with 30% CM without chitin.

Mean in the same row with different superscript differ significantly (P<0.05).

Conclusion

The digestibility of dry matter and organic matter were same (more than 70%) in all cricket meals either as single feed or in the rations. Cricket meal in the ration has low ammonia concentration due to as a bypass protein.

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Production of Roughage Feed under Different Drying Methods and Evaluation of the Feeding Value

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Abstract

Lack of good quality forage year around is a major constrain to profitable dairy production in Sri Lanka. Need is felt for convenient forage conservation method which require less labour and time. This study was designed to evaluate feasibility of conserving roughages in dry pellet form and study the palatability and keeping quality. *Gliricidiasepium*, Hybrid Napier Grass (CO3 and CO4), and *Leucaena leucocephala* dried in oven (control), sun dried (T1), dried insolar drier (T2), pelleted and analysed for crude protein, energy, ash, keeping quality, aroma, acceptability and palatability of dairy cows. T-tests were carried out using SAS 9.2 and SPSS to analyse the palatability and dry matter change. There was a significant difference ($P < 0.05$) in palatability between the pellet and mash form of forages. Pelleted forage meal recorded better palatability than the fresh forages. Among the four types of pellet *Gliricidiasepium* is the most palatable, but there was no significant different ($P > 0.05$) based on drying method. The dry matter yield was significantly difference based on drying method. Dry matter loss of the solar dryer is low compare to sun drying. Average required amount of wet forages to produce the 1 kg of dry pellet is 4.66 kg and cost of production of dry grass meal pellet was Rs 28/kg. Average weight of the pellet was 652kg/m³ and product can be stored over 3 months in bulks without quality losses. Sun drying is convenient but solar drying more effective in terms of dry matter recoveries. The study indicated that pelleted grass meal is acceptable, economical, and high in quality and potential alternative method for forage conservation.

Keywords: forages, pellet, drying, conservation, palatability

Introduction

Dairy sector is considered as the most important of all livestock sub sectors in Sri Lanka. This is mainly because of the influence it can make on the rural economy. Sri Lanka needs to increase the milk production in the country up to a considerable level within next 5 years. It is very clear that this target must combine with good quality green forages. Dairy industry in Sri Lanka primarily depends on natural pasture and fodder. Very few farmers grow pasture and fodder for the purpose of feeding their animals. There is a serious problem in exploiting the genetic potential of improved dairy animals due to the lack of good quality year around feed at the farm level. Branded feed are very expensive and the small holders cannot make a profit by using them in their production. Therefore, most of small holders tend to use self-mixed feed or raw feed materials in order to gain a higher margin. Forage conservation as silage or hay is a limited practice among the Sri Lankan dairy farms mainly due to higher labour requirement. There is a need for convenient forage conservation method which require less labour and time. This study was designed to evaluate feasibility of

conserving roughages in dry pellet form and study the palatability, nutritive and keeping quality.

Methodology

The experimental were conducted using four main forage species; Hybrid Napier Grass (variety CO4 and CO3), *Gliricidia sepium* and *Leucaena leucocephala*. Selected forages were dried in in oven at 70°C (control), sun dried (T1) and in solar dryer (T2) and matter yield were estimated. Samples were reduced to 4mm to 5mm particle size and pelleted sizes using dry pelleting machine Dried forage were assessed for appearance, aroma density and proximate composition; crude protein, gross energy, and ash contents. Samples were packed and stored under room conditions to test keeping quality. Acceptability and palatability of each forage in fresh, dry and pelleted forms were tested with dairy cattle and intake of the preferred form of feed were estimated. T-tests were carried out using SAS 9.2 and SPSS to analyse the palatability and dry matter changes.

Results and Discussion

Fresh forage material could be dried up to 10% -12% moisture level in about 12 to 18 hours of continuous drying in solar dryer which had an average temperature of 52.9°C between 9.00 to 16.00 hours and in about 18 – 24 hours of sun drying. The order of drying of the fresh forages from highest to lowest were *Leucaena*, *Gliricidia*, CO-3 and CO-4 respectively and delay of drying in the CO-3 and CO-4 were evident. Colour of the dried material was dark green to straw and strong in aroma in *Gliricidia*, sweet grassy aroma in CO-3 and CO-4 and mild leguminous aroma *Leucaena*.

Open sun drying was found difficult for *Gliricidia* and *Leucaena* due to leaf, shedding and dry mass loss was very high. There is a significant different ($P<0.05$) of dry matter yield depending on method of drying. Sun drying leads to almost 40 to 50% more loss of dry matter in CO3 and CO4 compared to that in solar drying. *Leucaena* and *Gliricidia* when kept under the sun and with some turnings, shows poor quality and high dry matter loss due to their leaf fall. Dry matter loss added with protein and energy loss is critical based on drying methods. Alfalfa hays that remained under the sun were the worst quality with reduction in crude protein contents and increase in NDF, ADF, NDIN and ADIN. However, in vitro dry matter digestibility and cell wall digestibility did not suffer any alteration because of the different dehydration methods (Marcela *et al*, 2010). However, sun drying is the most convenient for the farmers in their opinion though dry matter yield and the relatively low product quality. Solar drier is efficient and results better drying of forages into very brittle material but require modifications for large scale use.

Acceptability of the pelleted forages were always higher compared to dry non-pelleted forages and the lowest acceptability was recorded for fresh forages when offered parallel to dry and pelleted forms. When offered all forage species animals accepted pelleted *Gliricidia* immediately and recorded the highest intake within 3 minutes. If unlimited amounts are presented over short test durations, animals can show an exclusive preference for one single feed (Kertz *et al*, 1982). Though solar dried meal pellets have relatively high palatability, there was no significant differences of palatability based on drying method. Palatability is obviously not a quantitative measure unless feed intake is measured per unit time (Church, 1979). An ideal measure of palatability will not be influenced by the consequences of previous ingestion of feeds (Matthews, 1983) nor by the post-ingestive consequences of intake (Grovmum and Chapman, 1988). Baumont describes that palatability usually designates characteristics of a feed that invoke a sensory response in the animal, and is considered to be the corollary of the animal's appetite for the feed. When only one feed is

given to animals fed indoor, palatability can be evaluated by the eating rate at the beginning of the meal (Baumont, 1996).

Dry forages in leafy form and meal form was observed getting fungal attacks and mould growth after 5-6 weeks and caking of meal was observed in store bags after 4-5 weeks of processing. Around 200 to 300kg of fresh grass can be harvested and handled for drying by standard man day. Requirement of fresh grass and legumes to produce 1kg dry forage and pellets varies vary between 3.06 to 9.08kg with an average of 5.45kg for grass and 3.57kg for legumes. At that conversion rate, the cost of production of 1 ton of dry grass meal pellet was around Rs. 32790/= and Rs. 18360/= for legume pellets.

Average weight of the legume pellet and grass pellet was 652 kg/m³ and 594 kg/m³ respectively. Therefore, the bulk density of both grass and legumes were high compared to leaf meal or hay. Therefore pelleted forages require less store space and were found easy for storage

Conclusion

The study indicated solar drying of forages is a cost effective and relatively fast conservation method for the selected four species of forages. Dried forage in pelleted form is acceptable, economical and high in nutritive quality. Drying and pelleting of forages is potential alternative method for forage conservation for small scale dairy farmers.

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***In Vitro* Nutrient Digestibility of *Chromolaena odorata*-Based Silage Treated with *Corypha gebanga* Meal and Rumen Content**

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Abstract

This study aimed at evaluating the effects of adding *putak* meal and freshly collected rumen content into chromolaena-based silage production on *in vitro* nutrient digestibility of the silage. Completely randomized design with 4 x 2 factorial pattern was employed. The first factor was addition of additives and the second factor was duration of fermentation silage (0 days and 21 days). Each treatment was repeated 4 times. The treatments used were: CO (*C. odorata* leaves), COP (*C. odorata* leaves + 10% *putak* meal), COPR5 (*C. odorata* leaves + 10% *putak* meal + 5% rumen content), and COPR10 (*C. odorata* leaves + 10% *putak* meal + 10% rumen content). The parameters measured were *in vitro* dry matter digestibility (IVDMD), *in vitro* organic matter digestibility (IVOMD) and *in vitro* crude protein digestibility (IVCPD). The result showed that silage with an additive rate of 10% *putak* meal and 10% rumen content increased IVDMD, IVOMD, and IVCPD by 10.51%, 8.77%, and 27.73% respectively compared with silage without additives. Fermentation for 0 day produced the highest IVDMD, IVOMD, and IVCPD by 15.68%, 15.51%, and 1.36% respectively compared to fermentation for 21 days.

Keywords : *C. odorata*, *in vitro* digestibility, *putak*, silage, rumen content

Introduction

A recent study has revealed that anaerobic fermentation can be used as an effective treatment method to reduce concentration of total tannins and anti-trypsin in Siam weed (*Chromolaena odorata*) (Mulik, 2016). These researchers documented that total tannins concentration dropped from 2.47% in untreated samples to 0.94% in aerobically fermented ones. This is an important finding in chromolaena research since this plant is a potential source of feed biomass (up to 70 ton DM/ha/year) and protein (17.43% - 35%) for livestock (Bamikole et al., 2004; Mullik, 2012; Mulik et al., 2015) but possesses various anti-nutrient compounds (Akinmoladun et al., 2010; Onkaramurthy et al., 2013) which discourage its usage as animal feed. This suggests that silage making could be an appropriate processing technology to convert chromolaena to a more palatable feedstuff with a high biological value. In silage making, provision of readily fermentable carbohydrates and/or enzymes will boost ensilage process toward acidic state. *Putak* (*Coriphagebanga*) is a source of carbohydrate commonly used by farmers in East Nusa Tenggara province. One source of enzyme is rumen content which can be used to replace commercial enzymes (Budiansyah et al., 2010) in silage production. The use of rumen content will increase population of microbes, hence fermentation process toward acidic condition. However, ideal combination of *putak* meal and

rumen content need to be quantified in chromolaena-based silage. This study was designed to examine the effect of *putak* and freshly collected rumen content combination on *in vitro* nutrient digestibility of chromolaena silage.

Methodology

The experiment was conducted at Nutrition and Dairy Cattle Laboratory of Faculty of Animal Science, Bogor Agricultural University. The experimental design employed was completely randomized design, with 4 x 2 factorial patterns. The first factor was the additives and the second factor was duration of silage fermentation (0 day and 21 days). Each treatment unit was repeated 4 times. The treatments were: **CO** (*C. odorata* leaves), **COP** (*C. odorata* leaves + 10% *putak* meal), **COPR5** (*C. odorata* leaves + 10% *putak* meal + 5% rumen content), and **COPR10** (*C. odorata* leaves + 10% *putak* meal + 10% rumen content). The parameters measured were *in vitro* dry matter digestibility (IVDMD), *in vitro* organic matter digestibility (IVOMD) and *in vitro* crude protein digestibility (IVCPD). The *in vitro* technique used was Tilley and Terry (1963). Data were statistically analyzed using general linear model. The treatment differences were set at α value of 0.05%. Data were analyzed using SPSS version 23. The *C. odorata* leaves were harvested by pruning and the leaves were then weighted and assigned to the treatments. *Putak* meal obtained from a *gewang* tree (*Coryphagebanga*; robx). The cow rumen content was obtained from the slaughterhouse. Chromolaena leaves were withered to reduce water content, then desired quantity of *putak* meal and cow rumen content were added into Chromolaena leaves according to treatment. The container used for fermentation was 5 liter glass jars. The incubation processes took place at room temperature for 21 days.

Result and Discussion

In vitro dry matter digestibility (IVDMD), *in vitro* organic matter digestibility (IVOMD) and *in vitro* crude protein digestibility (IVCPD) shown in Table 1. Results of statistical analysis showed that the *putak* meal and rumen content was highly significant ($P < 0.01$) for IVDMD, IVOMD, and IVCPD of *C. odorata* silage. Duration of fermentation has significant effect on IVDMD and IVOMD but absent for IVCPD. There are an interaction between additive addition and time of fermentation in IVDMD, IVOMD, and IVCPD. Fermentation tended to depress *in vitro* digestibility compare with 21 days of fermentation. It might relate to the hydrolysis of organic compounds in the samples during ensilage processes. This likely to happen since organic compounds, particularly proteins, in chromolaena is known to be readily fermentable (Mullik, 2012). The highest value of the IVDMD silage *C. odorata* was higher for COPR10 treatment (62.83%) and lowest for CO treatment (57.28%). The highest IVDMD in COPR10 treatment due to a reduction in tannin (Mullik et al, 2016), decrease activity of *trypsin inhibitor*, and increased protein (*unpublished data*) thereby increasing digestibility profiles. The content of crude fiber in the treatment of COPR10 for 0 day was higher (*unpublished data*) compared to other treatments. Jayanegara et al. (2009) also reported that the digestibility is influenced by the levels of ADF in the diet. In addition, the composition of proteins and soluble carbohydrates will help to stimulate rumen microbial growth, which allows them to work more efficiently in fiber degradation during ensilage processes.

The highest IVOMD was shown by COPR10 treatment (68.39%) and the lowest was for CO treatment (63.87%). Low IVDMD for CO could be addressed to negative effect of secondary metabolic compounds in chromolaena. Comparison between duration of fermentation (0 vs 21 hari) suggests that IVOMD was higher in 0 day than 21 of fermentation. This was expected because loss of organic materials during fermentation hence

more proportion of minerals in the total samples. The ash content will slow down or inhibit dry matter digestion. For IVC PD, the lowest value was recorded for CO treatment (62.79%) and the highest was for COPR10 treatment (75.68%). These results can be related to reduction in tannins and trypsin inhibitor (Muliket *et al*, 2016). Reduction of anti-nutrient compounds will allow a maximum digestion of chromolaena materials.

Table 1. *In vitro* nutrient digestibility of *Chromolaena odorata*-based silage with no additive (CO) or given 10% *Coryphagebanga* meal as carbohydrate source (COP) or 10% *Coryphagebanga* meal + 5% freshly collected rumen content (COP5) or 10% *Coryphagebanga* meal + 10% freshly collected rumen content

Parameters	Additive treatments				SE M	P-value		
	CO	COP	COPR5	COPR10		Day	Additive	Day * additive
IVDMD (%)	57.28 ^a	59.53 ^b	62.40 ^c	62.83 ^c	1.01	0.001	0.001	0.033
IVOMD (%)	63.87 ^a	64.62 ^a	67.65 ^b	68.39 ^b	1.09	0.001	0.001	0.030
IVCPD (%)	62.79 ^a	73.10 ^b	74.41 ^b	75.68 ^b	0.10	0.844	0.001	0.020

Conclusion

C. odorata silage with the addition of 10% *putak* meal and 10% freshly collected rumen content can increase the value of *in vitro* nutrient digestibility of *C. odorata* silage compared with those received no additives.

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Production, Characterization and Purification of Xylanase From *Staphylococcus aureus* Mbxi-K4

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Abstract

Pollard is a by-product from dry milling wheat into flour and contains 16,49% of crude fiber. The addition of xylanase in wheat-pollard diet is necessary to reduce viscosity of digesta. Thus could be easily absorbed in intestinal gut. The objectives of this research are to produce xylanase in batch system bioreactor, to characterize and purify xylanase from *Staphylococcus aureus* MBXi-K4. Maximum enzyme production was reached after 72 hours of cultivation with specific enzyme activity of 10,5 U/mg protein. Biomass specific growth rate (μ) was 0,107 per hour, yield of product of 2,255 (g product/g substrate). The optimum temperature and pH was 70°C and 6 respectively. The xylanase maintained its stability for 30 minutes at 70°C and over pH range 4 – 8. The Km and Vmax value at 70°C on oat spelt xylan was 1,086 (mg/ml) and 3,195 (μ mol xilose/min.ml) respectively. Xylanase was purified from the culture supernatant of *S.aureus* MBXi-K4. The purity of xylanase increased 11,69 fold than those of the crude enzyme. The specific activity after purification was 383,9 U/mg. Three kinds of xylanase activities was visualized by zymogram technique with estimated molecular weights of 45,6 kDa, 28,1 kDa and 21,6 kDa. The purified xylanase had one band protein with molecular weight of 47,9 kDa. Xylanase from *S.aureus* MBXi-K4 is a moderate thermostable enzyme and a good candidate as feed additive on feed industry with an improvement on its productivity and thermo stability.

Keywords : xylanase, *S.aureus*, production, characterization, purification

Introduction

Poultry production in Indonesia fulfill more than 50 percent of meat demand of the Indonesian community including chickens and ducks (Statistik Peternakan, 2015). In order to improve food security, the government still continues to improve availability of meat from chickens and ducks in sufficient quantity, high quality and affordable by the public. The feed is a major component and contributes about 60% - 70% of the total production costs in animal husbandry. Therefore it is very important to provide supply of cheap, easy and sustainable feed raw material without competing with human needs. Fine wheat bran (pollard) is one by-product of wheat processing that is available throughout the year in the country with a stable quality. Production of wheat processing industry in Indonesia reached 3.3 million tons per year (Aptindo, 2004). Pollard utilization as monogastrics rations is limited by high crude fiber content (16.49%), Neutral Detergent Fiber / NDF (38.4%) (Pantaya, 2003) and low energy content (1300 kcal EM / kg) (NRC, 1994). The use of pollard in poultry rations is generally not more than 30%.

Consumption of high crude fiber by the chicken broilers can increase the viscosity of the contents of small intestine (digesta), eventually interfere the absorption of energy and protein of rations (Adam, 2000) and thereby reducing the growth of the animals. To improve the nutritional value of diets containing high crude fiber ingredients, one of the methods is utilization of enzyme as feed supplement to hydrolyze crude fiber components into simpler products, which can be absorbed directly by livestock. The addition of xylanase enzymes into diets based on wheat bran (pollard) can decrease the viscosity of digesta and increased body weight of broiler age 6 weeks to 14.72% and 2.6% (Chiang *et al.*, 2005). Xylanase can reduce viscosity of digesta by hydrolyze arabinoxylan into arabinose and xylose, so can easily be utilized by poultry.

The microbes were isolated from corn cob which produce xylanase. Isolate obtained (MBXi-K4) was grew optimally at 37°C and pH 7 (mesophilik), whereas the xylanase produced has an optimum temperature of 70°C and stable at wide pH range (4 - 10) with optimum pH of 6. The objectives of this research are to obtain pure enzyme from indigenous isolate *Staphylococcus aureus* MBXi-K4 and obtain information about the characters of xylanase produced.

Methodology

Media Preparation and regeneration of the media to grow bacteria thermophilic refers Richana *et al* (2000). Substrate used was 0.7% pollard, which mixed with growth media and media production. *S.aureus* MBXi-K4 regenerated in the LA medium (Luria Agar). Then grown in medium containing 0.7% oatspelt xylan with the same composition as the growth media. Inoculum was taken as many as 10% (v / v) and added to the media production with substrate of 0.7% oatspelt xylan and pollard xylan (Dung *et al*, 1993). Propagation of the cell culture was carried out in 250 ml erlenmeyer and production of xylanase to study of growth kinetics in Bioreactor 2L. Fermentation occur at optimum temperature and pH, agitation of 160 rpm and aeration 1 vvm, for 96 hours. Purification was carried out by ammonium sulfate precipitation, dialysis in a membrane dialysis with Molecular Weight Cut-off (MWCO) 12kDa in 0.1 M Tris-HCl buffer pH 7.5 overnight. The results of this enzyme concentration used for the purification method of gel filtration chromatography using matrix of Sephadex G- 100. SDS-PAGE method (Laemmli, 1970) can be used to predict the molecule weight of the protein, determine the number of protein components in the sample and determine the distribution of protein fraction in the sample and for the purification of proteins.

Results and Discussion

The maximum enzyme activity obtained of 2.26 U/ml at 72 hours of fermentation and specific activity of 10.5 U / mg protein. The rate of biomass, the use of substrate and product formation are presented in the Figure 1 below.

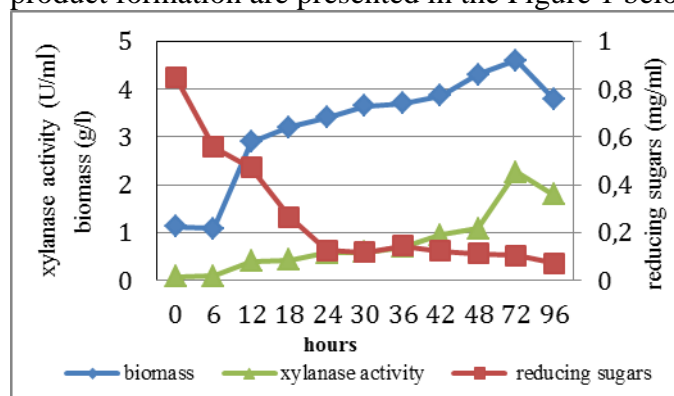


Figure 1. Graph the rate of biomass, the use of substrate and product formation.

S.aureus MBXi-K4 growth in pollard xylan substrate concentration value of 0.7% obtained $X_{maks} = 4.44$ g / l. Data cell growth in exponential phase are plotted with the logistic model based on Monod equation, obtained form a linear relationship with the equation $\ln(X) = 0.107x + 0.134$. The slope of the line (slope) is the value of specific growth rate (μ) of 0.107 / hour. Product yield (Y_p/s) obtained by mapping the value ($P-P_0$) which is the data from xylanase enzyme activity (U/ml) against the use of substrate (S_0-S) Y_p/s obtained was 2.255 (U / mg substrate). Biomass yield (Y_x/s) is obtained by mapping the value ($X-X_0$) against the use of substrate (S_0-S). The slope of the line is the value of Y_x / s , ie for 0.004 (g biomass / g substrate), it means in each gram of substrate consumed obtain 4 mg of biomass. The purification process are summarized in Table 1 below.

Table 1. Purification of xylanase from *S.aureus* MBXi-K4

Step	Volume (ml)	Total Protein (mg)	Total Xylanase activity (U)	Enzyme spesific activity (U/mg)	Recovery (%)	Fold
Crude Extract	81	3.32	109.01	32.82	100	1
Amm.sulfate precipitation	10	0.48	18.06	37.39	16.57	1.14
Dialysis	5	8.81	8.81	32.59	8.08	0.87
Sephadex 100	G- 3	0.012	4.69	383.90	4.30	11.69

Conclusion

Xylanase from *Staphylococcus aureus* MBXi-K4 is classified as moderate thermostable where its maximum activities at 70°C and still be maintained its activity more than 70% for 30 minutes. This enzyme can work at a pH range from 4 to 8 with optimum pH value of 6 and optimum temperature of 70°C. Based on the character of xylanase obtained despite having a chance to be applied to the feed industry but needed some improvements, especially in its resistance to high temperature and its productivity.

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To Estimate Intestinal Truly Absorbed Protein of Alfalfa Hay and Alfalfa Silage Using New Dutch System (DVE/OEB)

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Abstract

Marigold flower extract (MFE), a natural source of carotenoid (lutein), was added to the diets of quails at different concentrations (0, 50, 100, and 150 mg/kg of diet) to determine the effects of MFE on quail performance, egg quality and carotenoid content of the egg yolk of quails housed in enriched cages. This experiment was arranged in a completely randomized design (CRD) with four dietary treatments and five replications (10 quails per treatment). 200 laying quails *Coturnix coturnix Japonica* (7 week of age) for 2 months fed MFE in the diet. Variables measured were quail production performances and egg quality. Results of the experiment indicated that quail production performances and egg quality were affected ($P < 0.01$) by feeding Marigold flower extract in the diet. Feed intake, hen day production, egg mass, egg yolk colour, egg lutein in D treatment (used 150 mg/kg MFE) was the highest than other treatment, but the lowest on egg cholesterol and feed conversion. The conclusion of this experiment that up to 150 mg/kg MFE improved egg performance, reduced egg cholesterol 20.62%, increased egg yolk colour 33.12% and increased egg lutein 25.13%.

Keywords: *Marigold flower extract, quail production performance, egg quality*

Chitosan Protection To Saga Leaves Extract (*Abrus Precatorius* Linn) And Lingzhi Mushroom (*Ganoderma Lucidum*) From Rumen Microbial Degradation

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Abstract

The purpose of research was study the use of 2% chitosan as a protector of herb saga leaves extract (*Abrus precatorius* Linn) and lingzhi mushroom (*Ganoderma lucidum*) from microbial degradation in the rumen in vitro. Randomized block design with five ration treatments and three times collection of rumen fluid as a block. The treatments were R0 (control) = basal ration (35% forage and 65% concentrates), R1: R0+ saga leaves extract, and R2: R0+ saga leaves extract protected by 2% chitosan, R3: R0+ lingzhi mushroom extract, and R4: R0+ lingzhi mushroom extract protected by 2% chitosan. Parameters observed were total population of rumen microbes (protozoa and bacteria), concentrations of total VFA and NH₃, dry and organic matter digestibility (DMD and OMD). The results showed chitosan protection to both extracts were not influence the population of bacteria and protozoa as well as NH₃ concentration, but decreased 16,4% VFA total (P<0.05) and 35% average digestibility (P<0.05) in saga leaves extract and also decreased 20% VFA total (P<0.05) in lingzhi mushroom extract without interfere the digestibility. As conclusion, 2% chitosan can be used as protector to lingzhi mushroom extract than to saga leaves extract from degradation of rumen microbes due to its ability maintaining the digestibility.

Keywords: *chitosan, digestibility, in vitro, lingzhi mushroom (Ganoderma lucidum)*

Introduction

Improvement of animal productions can be triggered by feed additive addition into the ration. The use of synthetic additives is common in the farm due to their continue availability, although they still left the residue in the animal products. Nowadays, as the development of health knowledge, the kind of residue has potency as carcinogenic factor for human who consume that kind of animal products. To reduce that risk, the investigation of save feed additives as an alternative should be done continuously.

Many herbs and mushroom have capacity as feed additives for anti bacteria, antioxidant, anti mastitis and anthelmintic. The use of them in animal ration is restricted by their anti nutrition content, which interferes the fermentation process in the rumen, for example saponin reduced the growth of protozoa (defaunation), hence impacts decreased the methane production (Guo *et al.*, 2008). Rahminiwati *et al.* (2010) said that kemuning and saga leaves extracts could be as prebiotic because their ability to reduce non-pathogenic

bacteria such as *Lactobacillus rhamnosus*, *L. agilis* and *L. amylophilus*. Moreover, addition of saga and kemuning leaves meal in goat lactation rations caused reducing only some amount of somatic cell count and EPG as well as the use of lingzhi mushroom meal in ration of dairy cow lactation (Evvvyrnie *et al.* 2012; Tresia *et al.* 2015). Although those finding results showed that herbs and mushroom have potency as anti mastitis and anthelmintic on dairy goat and cow, but the use of them were not more than 1% in ruminant ration due to their role as anti bacteria will kill the microorganisms in the rumen. So that, in this present research, herbs and mushroom in high level were used after they protected by chitosan. Chitosan is a natural biopolymer derived from the deacetylation of chitin and is not degraded in the rumen (Fadel El-Seed *et al.* 2003).

The purpose of research was study the use of 2% chitosan as a protector of herb saga leaves extract (*Abrus precatorius* Linn) and lingzhi mushroom (*Ganoderma lucidum*) from microbial degradation in the rumen in vitro.

Methodology

This research used randomized block design with 3 (three) kinds of ration as a treatment and 3 (three) times collection of fresh dairy goat rumen fluid or inoculums as a block. The treatments were: R0 (control) = basal ration; R1: R0+ saga leaves extract, and R2: R0+ saga leaves extract protected by 2% chitosan, R3: R0+ lingzhi mushroom extract, and R4: R0+ lingzhi mushroom extract protected by 2% chitosan. The basal ration contained 35% forage and 65% concentrate which fulfill the requirement of dairy goat lactation 55% TDN and 12% crude protein. The forage was consist of 25% Napier grass and 10% Indigofera spp, and the concentrate was consist of coconut meal, tempoh waste, dates fruit waste, rice bran, premix, DCP and CaCO₃ (Yuniarti *et al.* 2014). Extraction of saga leaves and lingzhi mushroom used infuse method with water as a solvent. Spray dry method was used to protect the both extracts using 2% chitosan.

The variables measured for in vitro studies were: protozoa and bacteria total populations (Ogimoto and Imai 1981); VFA total concentration (General Laboratory Procedure 1996), NH₃ concentration (General Laboratory Procedure 1996), dry matter digestibility (DMD) and organic matter digestibility (OMD) (Tilley and Terry 1963). Data were analyzed using ANOVA and contrast orthogonal (Steel dan Torrie 1993).

Results and Discussion

The rumen microbes and their products by feeding rations contain saga leaves or lingzhi mushroom extracts with or without 2% chitosan protection is provided in Table 1. There were no differences among population of protozoa and bacteria rumen of all treatment rations compared to control. That means addition of herb or mushroom extracts not interferes the growth of rumen microbes in this research.

In 4 (four) hours rumen fermentation in vitro, production of VFA total decreased around 18% when saga leaves and lingzhi mushroom were protected by chitosan (R2 Table 1. Rumen microbes and their products by feeding rations contain saga leaves and lingzhi mushroom extracts with and without chitosan protection

Variables	Treatments				
	R0	R1	R2	R3	R4
Protozoa total (log cell ml ⁻¹)	6.97 ± 0.07	6.78 ± 0.28	6.66 ± 0.20	6.85 ± 0.08	6.85 ± 0.11
Bacteria total (log CFU ml ⁻¹)	7.11 ± 1.30	7.18 ± 1.36	7.43 ± 1.46	6.95 ± 1.49	7.12 ± 0.98
VFA total	151.07b ±	164.62a ±	137.68c ±	164.97a ±	131.34c ±

(mM)*	12.76	11.33	12.89	11.79	10.94
NH ₃ (mM)	11.25 ± 4.23	9.91 ± 2.80	12.78 ± 1.24	13.05 ± 4.91	12.73 ± 2.90
DMD (%)*	74.50a ± 1.92	74.69a ± 2.30	51.86b ± 2.34	74.06b ± 1.19	71.75b ± 0.52
OMD (%)*	69.87a ± 2.56	70.18a ± 2.77	42.24b ± 2.49	69.61a ± 1.21	66.76b ± 0.41

Notes : R0: Control, R1: R0+ saga leaves extract, and R2: R0+ saga leaves extract protected by 2% chitosan, R3: R0+ lingzhi mushroom extract, and R4: R0+ lingzhi mushroom extract protected by 2% chitosan. VFA = volatile fatty acids concentration, NH₃= ammonia concentration, DMD= dry matter digestibility, OMD= organic matter digestibility.*) significance in the same row

and R4) compared to R1 and R3 (P<0.05). The NH₃ concentration of R2 increased around 29%, but R4 decreased around 2%. Chitosan is alkaline due to high NH₂ content. Chitosan can solve in organic solvent like formic acid, acetic acid and glutamic acid by protonation NH₂ content to be NH₃ (Rinaudo, 2006). Through this mechanism, VFA production (especially formic acid and acetic acid) from the chitosan protected-rations (R2 and R4) could be used to solve the chitosan and caused increasing the NH₃ concentration in R2, but almost not affected NH₃ concentration of R4 due to lingzhi mushroom content. However, the digestibility of R2 drastically decreased around 35% as consequently of alkaline ecosystem in the rumen (the fermentation process of digestion was 48 hours) (P<0.05). The average decreasing of R4 digestibility was only slightly around 4%, because rumen ecosystem almost the same to R3 after chitosan was solved by acid from VFA, where it might be caused by lingzhi mushroom content such as polysaccharide, peptidoglycan, beta-D-glukan, that have capacity to stabilized pH or rumen ecosystem.

Conclusion

As conclusion, 2% chitosan can be used as protector to lingzhi mushroom extract than to saga leaves extract from degradation of rumen microbes due to its ability maintaining the digestibility.

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Effects of Different Types of Cakes in Rations on the Performance of Culled Cyprus Shami does in Half Elgageda, Kassala State, Sudan

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Abstract

Fifteen culled Cyprus Shami does were used to study effects of some cakes in rations on their performance in Halfa Elgageda, Kassala State, Sudan. The goats were divided into three groups and allocated at random to three iso-nitrogenous and iso-caloric rations containing groundnut cakes, sesame cakes or sunflower cakes. They were fed the rations for 4 weeks *ad lib.* in two equal meals at 8am and 4pm and water was offered *ad lib.*. They were fastened for 12 hrs and weighed weekly before the morning meal. The data was statistically analyzed using the completely randomized design. Final BW, total weight gain and daily weight gain varied among rations, but not significantly ($P>0.05$). Final BW and total weight gain (kg) were 55.9 and 5.9, respectively for the groundnut cakes ration, 56.2 and 6.7, respectively for the sesame cakes ration and 54 and 5.1, respectively for the sunflower cakes ration. Daily weight gain (g) was 306, 318 and 279, respectively for rations containing groundnut cakes, sesame cakes and sunflower cakes, respectively. Daily feed intake varied significantly ($P<0.05$) among rations and was 1.63kg, 1.48kg and 1.34kg, respectively. Feed conversion ratio varied among rations, but not significantly ($P>0.05$). It was 5.33, 4.65 and 1.34, respectively. Feed intake and FCR were highest in animals fed the groundnut cakes ration and least in animals fed the sunflower cakes ration. Final BW and total and daily weight gains were highest in animals fed the sesame ration, All parameters, except FCR were least in animals fed sunflower.

Introduction

Meat demand and prices increased substantially in the Sudan due to increased local and foreign demands (Ahmed, 2014). Per capita meat consumption was 41kg (AOAD, 2011). It is important to produce cheap and high quality meat and exploit less utilized types of meat to meet demands and reduce prices. Sheep meat is the most preferred and expensive in the Sudan and Arab countries and goat meat is the least preferred in the Sudan (MAWF, 2011) and mainly consumed in rural areas as kids meat. Goat meat is preferred in Arabia, Gulph countries, Asia, Africa and south Europe (Devendra and Mc Leroy, 1982). The demand for goat meat is increasing in developed countries mainly due to immigrants and the disputed correlation between cholesterol and saturated fatty acids and cardiovascular diseases. Goat meat has high nutritive value and muscles and low fat and cholesterol (Elimam and Ombabi, 2007; Elimam *et al.*, 2010).

Goat production is important in the Sudan due to high goat population, wide distribution and production of high quantities of high quality milk, meat and skin (MAWF, 2011). Sudan ranked 6th in world goat population and 5th in world goat meat production, but

is not among the main world goat meat exporters (FAOSTAT, 2011). Goat meat production is mainly traditional in the Sudan based on rangeland and are generally neglected with low inputs and outputs (Devendra and Mc Leroy, 1982). Improving goat meat production will make it competitive locally and abroad and increase demands, exports and national income. There are many goat breeds and Nubian is the main dairy breed and other breeds are considered meat producers (Devendra and Mc Leroy, 1982). Many exotic breeds are imported to improve goat milk production including Saanen and Shami (Damascus). Cyprus Shami goats were recently imported to improve animal production in Kassala State and culled males and females are used for meat production due to the large size. Carcass characteristics are improved by improving the nutrition of culled animals before slaughter.

Nutrition is one of the main constraints for goat production in Halfa Elgageda area due to rangeland deterioration for many reasons (Yagoub, 1998; Abusuwar and Darrag, 2002) and seasonal variations in feeds quantity and quality associated with seasonal rainfall leading to serious shortages and effects on animals health and performance, especially in the dry season (Elhag, 1992). Crop residues are important in filling the nutritional gap, but generally have low nutritive value due to low CP and high CF limiting feeds dry matter intake and animals performance (Hamed, 2007). Concentrates are not commonly used and improved animals performance (Anyanwu, 2008; Sahu, 2013). Different cakes are used in concentrates with variations in feeds nutritive value. Groundnut cakes DM and CP degradation were higher than cottonseed cakes and sunflower cakes and the latter had the least values (Turki and Atcham, 2011). Sunflower cakes had higher molecular weight amino acids concentration followed by cotton seed cakes and then groundnut cakes and it was postulated that is why groundnut cakes was unstable protein and the other two cakes were stable. There is no available information on effects of different cakes in rations on the performance of culled Shami goats in Halfa Elgageda area. Consequently, an experiment was conducted to study effects of groundnut, sesame and sunflower cakes in rations on the performance of culled Cyprus Shami goat in Halfa Elgageda area.

Methodology

The study described below was conducted in the goat pens in the animal production farm in the Faculty of Agriculture and Environmental Sciences, Kassala University in Halfa Elgageda, Kassala State, Sudan in February and March 2013.

Animals

Fifteen culled Cyprus Shami does at 4 years old were used in this experiment. They were housed in individual pens and treated against external and internal parasites. They were divided into three groups according to body weight and then allocated at random to three experimental rations.

Feeds and feeding

Three isonitrogenous and isocaloric rations containing groundnut cakes, sesame cakes or sunflower cakes were used in this experiment. Table 1 shows the ingredients and calculated CP and ME of the rations fed to culled Shami does. The animals were fed the rations *ad lib.* for a 10 days preliminary period and then the experimental rations for 4 weeks. The rations were fed in two equal meals at 8am and 4pm. Fifty grams Clitoria hay were fed daily before the morning meal to maintain normal gut functions and for vitamins. Clean drinking water was available all time.

Daily feed intake was determined by offering preweighed rations and collecting and weighing the refusals before the morning meal in the following day. Weight gain was determined by weighing the animals before the morning meal after fasting for 12 hrs to avoid variations in gut contents, at the beginning of the experiment and then weekly to the experiment end.

Calculations and statistical analysis

Feed intake was calculated as the difference between offered rations and the refusals. Total weight gain was calculated as the difference between initial and final BW. Daily weight gain was calculated as the difference between successive BW divided by the days between them. Feed conversion ratio was calculated by dividing the total feed intake by total weight gain.

The data was statistically analyzed according to Snedecor and Cochran (1980) using the completely randomized design and Duncans Test was used to split means differences.

Results and Discussion

Table 2 shows effects of different types of cakes in rations on the performance of culled Shami does.

Table 1. The ingredients of rations with different cakes fed to culled Cyprus Shami does in Halfa Elgadedda, Kassala State, Sudan.

Ingredients(%)/ Rations	A	B	C
Sorghum grains	52.0	52.0	39.0
Sesame cakes	17.0	00.0	00.0
Groundnut cakes	00.0	16.0	00.0
Sunflower cakes	00.0	00.0	49.0
Groundnut hulls	19.0	15.00	05.0
Wheat bran	10.0	15.0	05.0
Dicalcium phosphate	01.0	01.0	01.0
Salt	00.4	00.4	00.4
Lime stones	00.5	00.5	00.5
Vitamins	00.1	00.1	00.1
Calculated CP	17.56	17.49	17.57
Calculated ME (Mj/ kg DM)	11.30	11..0	11.30

A= Groundnut cakes ration; B= Sesame cakes ration; C= Sunflower cakes ration.

Table 2. Effects of different types of cakes on the performance of culled Shami does in Halfa Elgadedda, Kassala State, Sudan.

Parameters	Rations			SE	Significance
	A	B	C		
Initial BW (kg)	50.00	49.50	48.90	0.85	NS
Final BW (kg)	55.90	56.20	54.00	0.44	NS
Total weight gain (kg)	05.90	06.70	05.10	0.89	NS
Daily weight gain (kg)	306	318	279	0.046	NS
Daily feed intake (kg)	1.63 ^a	1.48 ^{ab}	1.34 ^b	0.053	*
FCR	5.33	4.65	4.80	0.00	NS

A= Groundnut cakes ration; B= Sesame cakes ration; C= Sunflower cakes ration.

BW= Body weight; FCR (kg feed|kg weight gain)

NS= Non significant differences at P<0.05; *= Significant differences at P<0.05; Different letters within a row denote significant differences at P<0.05.

Final BW, total weight gain and daily weight gain varied among animals fed different rations, but not significantly (P>0.05). They were highest in animals fed the sesame ration and least in animals fed the sunflower ration.

Feed intake varied significantly (P<0.05) among rations and was highest in animals fed the groundnut cakes ration and least in animals fed the sunflower cakes ration. Feed

conversion ratio varied among rations, but not significantly ($P>0.05$). It was highest in animals fed the groundnut ration and least in animals fed the sesame ration.

The increased final body weight was due to weight gain. Similar results were found in Tagger goats (Elimam *et al.*, 2010) and Nubian kids (Yagoub and Babikir, 2008). Culled Shami goats BW was within the breed range in Cyprus (Keskin, 2002) and lighter than the breed males and females above 3 years old in Kassala State (Musa, 2013). They were generally heavier than endogenous Sudanese breeds including Nubian (Elnaim, 1979; Gall, 1986), Desert (Ombabi, 2006), Nilotic (Gall, 1996), Ingessana (Abdalla, 2004) and Tagger (Elbukhary, 1998; Ombabi and Elimam, 2011).

The variations among rations in weight gain and daily weight gain in culled Shami goats were also found in young West African goats (Anyanwu, 2008) and Nubian kids (Yagoub and Babikir, 2008). This was mainly due to variations in elements and vitamins in different cakes and hence associated effects and feeds nutritive value. Turki and Atcham (2011) found variations among cakes in composition, rumen degradation and molecular weight amino acids concentrations. Culled Shami goats daily weight gain was higher than Nubian goats (Khalifa, 2002).

The significant variations in feeds intake among rations were mainly due to the variations in cakes composition and effects on rations nutritive value. The highest feed intake in animals fed the groundnut cakes ration was due to the high CP and improved feeds nutritive value, digestibility and rates of outflow through the alimentary tract. It also had higher degradation than sunflower cakes (Turki and Atcham, 2011). The least feed intake in animals fed the sunflower cakes ration was mainly due to the least CP among cakes in this study and hence the least nutritive value and performance. The variations in feed intake among rations were reported in young West African goats (Anyanwu, 2008) and Nubian kids in Sudan (Yagoub and Babikir, 2008).

The variations in FCR among rations with different cakes were mainly due to variations in feeds nutritive value, feed intake and weight gain. The highest FCR in animals fed the groundnut cakes ration reflected that it was poorly utilized for weight gain although it had the highest feed intake and ranked second in weight gain. The least FCR in animals fed the sesame cakes ration was mainly due to elements and vitamins enhancing feeds nutritive value. The sesame cakes ration had the highest final BW and the highest weight gain and ranked second in feed intake and had beneficial effects. The highest performance in animals fed the sesame cakes ration was similar to that for wheat offal ration in West African goat (Anyanwu, 2008). The least parameters, except FCR, in animals fed the sunflower cakes ration indicated that sunflower cakes were inferior to groundnut and sesame cakes in composition and degradation as found by Turki and Atcham (2011). Similar effects were reported in West African goats fed grasses (Anyanwu, 2008). Shami goats feed conversion ratio was better than Nubian female kids fed different energy rations (Yagoub and Babikir, 2008).

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Changes in Nutrition and Fibre Silage Water Hyacinth (*Eichornia Crassipes*) as Ruminant Feed Fermented with Some Fermentative Materials

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Abstract

Ruminants have the ability to consume a type of hay or forage type which has a low digestibility such as water hyacinth. Water hyacinth beside as bioakumulator, water hyacinth has the potential to become animal feed, fish feed and organic fertilizer because it contains nutrients. Data analysis was conducted in the Laboratory of Chemistry and Nutrition Feed, Hasanuddin University, Makassar. Fermentative materials used were liquid organic supplement, feed burger sauce, microbacter alfaafa-11 and effective microorganism-4. This study used completely randomized factorial design with three factors and four replications. The variables measured were the content of nutrients and fiber content after fermented water hyacinth. Crude protein value increased an average of 2.5% - 3.5%, crude fat percentage increased by an average of 0.4% - 0.8%, the percentage of crude fiber decreased by an average of 2% - 4%, extract ingredients without nitrogen increased by an average of 4% - 5% and the percentage of ash decreased by an average of 2% - 3%. Crude protein increased at 5.4%, crude fiber decreased at 5.6% and BETN increased at .6%.

Introduction

Water Hyacinth, *Eichornia crassipes* (Mart.) Solms (family pontederiaceae) is one of aquatic weeds that have adaptability and high reproductive ability (Wolverton & McDonald, 1999). In some countries, water hyacinth recorded disrupt shipping activities, killing of fisheries, increased incidence of disease caused by a mosquito that is growing faster in waters covered with water hyacinth, and change the composition of the biota of aquatic ecosystems (Toft et al., 2003). In Indonesia, this plant soon became a problem in the waters, such as lakes and rivers. In addition to several lakes on the island of Java, Limboto Lake is one of the lake is quite big and famous with gondoknya hyacinth, and control efforts is difficult. Efforts to control water hyacinth has been done, using either a means of controlling the mechanical, chemical, and biological (Opande et al., 2004). Chemical control is done with the use of herbicides, but this will cause pollution on aquatic biota are higher. In addition to the adverse impacts of water hyacinth on the ecosystem, some research suggests that this weed have some beneficial role ecologically and economically. According to Brix and Schierup (1999), macrophyte water, one of which is the water hyacinth, can be used as the water pollution control. According to Agunbiade et al (2009), water hyacinth can be used as an accumulator of pollutants, especially heavy metals in the water due to the properties of their biology, including reproduction speed. Other studies prove that water hyacinth can accumulate heavy metals Pb, Cr, Zn, Mn, and Cu (Tiwari et al., 2007). The facts show that the water hyacinth has great potential as bioakumulator the polluted waters of pollutants, so that its presence does not need to be destroyed. Potential hyacinth as ruminant feed and fish feed can be maximized by way of fermentation. To improve the nutritional value and lower

crude fiber, water hyacinth plants, fermentation needs to be done. Until now, this has been a lot of fermentative material created by nutrition experts forage fodder in order to improve the nutritional value and ingredients microorganisms in the fermentation process.

Methodology

This research was conducted at the Laboratory of Department of Animal Husbandry, Faculty of Agriculture in June to August 2016. Analysis of the results of research conducted at the Laboratory of Chemistry and Nutrition Feed, Hasanuddin University, Makassar. The materials used are water hyacinth fresh and 4 types of materials fermentative namely: Supplements liquid organic (SOC), Sauce Burger Feed (SBP), microbacter Alfaafa 11 (MA-11) and Effective Microorganism 4 (EM-4) as a comparison. The study design used was completely randomized factorial design with three factors and four replications each. The first factor (A) is using four kinds of materials of fermentation that SOC (A1), SBP (A2), the MA-11 (A3) and EM-4 (A4). The second factor is the long fermentation time is 1 week (B1) and 2 weeks (B2). The third factor is 3 doses of material which is 5 ml (C1), 10 ml (C2) and 15 ml (C3) for every 3 kg of material. The variables measured were: 1) the nutritional components are: crude protein, crude lipid, crude fiber, extract materials without nitrogen and Abu method proximate analysis. 2) fiber components, are: neutral detergent fiber, acid detergent fiber, hemicellulose, and lignin cellulosa analysis method of Van Soest.

Result And Discussion

Table 1. The values of crude protein, fat, crude fiber, extract materials without nitrogen (BETN) and ash.

No	Treatments	% Protein	% Fat	% Crude Fiber	% BETN	% Ash
1	A1 B1 C1	10.45	3.78	25.20	47.40	13.15
2	A1 B1 C2	10.99	3.62	24.99	47.86	12.54
3	A1 B1 C3	11.74	3.85	23.79	46.16	13.12
4	A1 B2 C1	11.73	3.02	24.77	47.06	13.42
5	A1 B2 C2	9.55	3.56	25.72	47.44	13.73
6	A1 B2 C3	9.50	2.94	25.99	48.86	12.71
7	A2 B1 C1	10.42	2.70	23.79	49.95	13.14
8	A2 B1 C2	10.49	2.83	24.45	49.25	12.98
9	A2 B1 C3	9.64	3.01	24.56	49.17	13.62
10	A2 B2 C1	10.76	3.08	24.68	47.74	13.74
11	A2 B2 C2	11.16	3.20	23.92	48.71	13.01
12	A2 B2 C3	10.06	2.91	25.10	49.03	12.90
13	A3 B1 C1	9.18	2.55	25.69	49.10	13.48
14	A3 B1 C2	10.29	2.83	24.09	49.67	13.12
15	A3 B1 C3	10.58	2.59	25.55	48.38	12.98
16	A3 B2 C1	11.13	2.60	24.20	48.49	13.58
17	A3 B2 C2	10.07	3.14	25.55	47.73	13.81
18	A3 B2 C3	10.62	3.09	24.70	47.36	14.23
19	A4 B1 C1	7.55	2.74	28.20	46.93	14.58
20	A4 B1 C2	8.23	2.74	28.47	46.42	14.14
21	A4 B1 C3	8.57	2.92	27.42	46.68	14.41
22	A4 B2 C1	8.29	2.44	28.61	45.58	15.08
23	A4 B2 C2	8.01	2.81	27.80	46.68	14.70
24	A4 B2 C3	8.80	2.74	27.60	45.73	15.13
25	Control	8.38	3.32	28.10	45.06	15.14

A1 = SOC, A2 = SBP, A3 = MA-11, and A4 = EM-4; B1 = 1 week and B2 = 2 weeks
 C1 = 5 ml, C2 = 10 ml and C3 = 20 ml, each 3 kg materials

The results of the analysis of the nutritional value of the use of various materials fermenter indicate the nutritional value of a fluctuating and inconsistent. The percentage value of protein and fat obtained in SOC, either at all doses and in all fermentation, protein and fat values are very significant compared to the other three fermentation ingredients including control. Values lower percentage of crude fiber, BETN high percentage indicates a value nearly equal to all the fermenting material, at all doses and on a long fermentation 1 and 2 weeks, except in percentage of ash impaired, though not significantly. Comparing with the control, the fermenting material (SOC, SBP, MA-11) has increased very significantly to all of the nutritional value. Although overall showed a fluctuating value changes, but specifically on the fermentative material SOC (A1), the linear protein fermentation time increased at 1 week and 2 weeks linear decline in line with the increased dose of 5 ml - 20 ml. Crude protein value increased an average of 2.5% - 3.5%, crude fat percentage increased by an average of 0.4% - 0.8%, the percentage of crude fiber decreased by an average of 2% - 4%, extract ingredients without nitrogen increased by an average of 4% - 5% and the percentage of ash decreased by an average of 2% - 3%. It showed that the process of fermentation or ensilaged going well and fermenting material used mainly SOC can be recommended to change the structure of nutrients and crude fiber hyacinth. The result of changes in the value of nutrients in the water hyacinth (fermentation using SOC) can be compared to the changes of nutrients in rice straw fermented with EM-4 and compared with elephant grass.

Table 2 showed that the water hyacinth plant before the fermented nutrient content better than rice straw, and is a significant change after fermented. Increase nutritional value is very high in water hyacinth using SOC compared to rice straw using EM4. Value was very significant improvement. In crude protein, rice straw increased by only 2.4% while in the water hyacinth increased by 5.4%. In crude fiber, rice straw decreased only 0.9% and the water hyacinth decreased 5.6%. Likewise with BETN, the rice straw increased by only 1.7%, while the water hyacinth increased 12.6%. This shows that the quality of the water hyacinth nutritional value than rice straw so it is better to be a ruminant feed. Comparing the nutritional value hyacinth with elephant grass is fresh, it appears that, the nutritional value of water hyacinth is also better than the nutritional content of elephant grass, although the water hyacinth should not be considered to replace grass as fodder fibrous ruminants because of the material that has been fermented use limited.

Table 2. Comparison of changes in the nutritional value of rice straw fermented with EM-4 and hyacinth fermented with SOC as well as elephant grass as a comparison.

Nutriens	Elephant Grass ¹	Rice Straw		Water Hyacinth	
		Before Fermentation ₂	After Fermentation ₃	Before Fermentation ⁴	After Fermentation ⁵
Crude Protein	10.1	5.31	7.70	6.31	11.74
Crude Fat	2.5	3.32	2.40	2.66	3.85
Crude Fiber	31.2	32.14	30.90	29.30	23.79
BETN	46.1	36.68	38.36	33.45	46.16
Ash	10.1	22.25	20.21	6.26	13.12

1= Hartadi *et.al.* (1993), 2 and 3 = Sarwono and Arianto (2003), 4 = Nina M. (2001), 5 = Mukhtar, M. (2016). BETN = extract materials without nitrogen

Changes in the water hyacinth fiber (NDF, ADF, Hemicellulosa, cellulosa and Lignin) on average increased compared with the controls even though the value is not consistently good from the fermentation and the dose given material. At the material occurs and the component values increased linearly on NDF and ADF, but on the other hand are experiencing the value of components and other materials will fluctuate but the fluctuating value is higher than the value of the component as well as a linear increase. Namunpun therefore recommended that all types of fermenting material capable of changing the water hyacinth fiber component where the value is the limit of tolerance and that can be consumed by ruminants.

Nutritional characteristics hyacinth fermentation fermented with various materials (SOC, SBP, MA-11 and EM-4) showed an increase in the quality of organic material that is very significant compared to the control. Lignin degradation would release the bound compound lignocellulose complex bond hyacinth ie nitrogen, minerals, cellulose and hemicellulose, thus increasing the content of dry matter and crude protein nutrients EGF. But the growth and degradation of lignin faster than the decline in organic matter and nutrients cellulose.

Conclutions

Fermentation hyacinth using liquid organic supplements at a dose of 20 ml per 3 kg material provides excellent nutritional value that has increased very significant nutrients. Crude protein hyacinth increased 5.4%, crude fiber decreased 5.6%, extract materials without nitrogen increased by 12.6%. Comparing hyacinth fermented rice straw fermentation, water hyacinth fermentation is still better to be a ruminant feed for nutritional value and fiber content comply ruminant feed even equal the nutritional value of elephant grass, although the water hyacinth should not be considered to replace grass as food fibrous ruminant livestock because of the material that has been fermented use is limited.

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Effect of *Phanerochaete chrysosporium* to Enzymatic Activity and Lignin on Fermentation Process of Cocoa Pod (*Theobroma Cacao*)

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Abstract

The study was conducted to determine the enzyme activity ligninolitik and lignin content in the fermentation process of cocoa pod. The substrate used was the cocoa pod while the fungi use *Phanerochaete chrysosporium*. Preparation of cocoa pod was chopped, finely ground and then dried. Preparation of fungi by growing fungi in liquid medium. Research methodology was the optimization of fermentation is fermentation conducted with long cocoa pod different days are 5, 7, 9, 11 and 13 days at a temperature of 37⁰ C and pH 7 using five treatments and five replications. T0 = fermentation of cocoa pod for 5 days, T1 = fermentation of cocoa pod for 7 days, T2 = fermentation of cocoa pod for 9 days, T3 = fermentation of cocoa pod for 11 days, T4 = fermentation of cocoa pod for 13 days. Fermentation using a perforated plastic containers for the aerobic process. Variables observed enzyme activity LiP, MnP, and lignin. This study was designed using research design completely randomized design with a unidirectional pattern analysis of variance (ANOVA oneway). Significant variables followed Duncan's multiple range test (Duncan Multiple Range Test / DMRT). The results showed fermentation for 7 days LiP highest enzyme activity of 0.527 ± 0.04 units / ml and MnP amounted to 0.063 ± 0.00 units / ml, low lignin content of $26.30 \pm 0.35\%$. The conclusion from this research that the fermentation by using fungi *Phanerochete chrysosporium* well in fermentation for 7 days.

Keywords: *day, fermentation, cocoa pod, Phanerochete chrysosporium*

Introduction

Waste food crops and plantations have an important role and potential in the supply of green feed for ruminants such as cattle, goats, sheep and buffalo, especially in the dry season. In the dry season forage grasses are stunted, so the forage available is less in terms of both quantity and quality. Even in certain areas of fodder grass will dry up and die, causing a crisis forage. In addition, ruminant rearing system is still largely dependent on forage such as grass and other forage feed with little or no additional feed.

Cocoa pod, have an important role and potential in the supply of ruminant feed especially goats, especially during the dry season. Utilization pod husks as animal feed can be given in the form of fresh or in the form of flour after processing. Judging from the composition, pod husks containing 7.75% protein and energy amounted to 3900 kcal / kg which exceeded the composition of elephant grass of 6.9% and a total energy of 3800 kcal / kg (Puastuti et al., 2009).

Cocoa pod are an agro-industrial waste generated cacao plant (*Theobroma cacao* L.) fruit cocoa consisting of 74% rind, 2% of the placenta and 24% seed. The results of proximate analysis contains 22% protein and 3-9% fat (Nasrullah and Ella A., 1993).

Phanerochaete chrysosporium is a microorganism that has the ability to selectively degrade lignocellulose (Tuomelo et al., 2000) that degrades the lignin component first followed by the cellulose component. Cellulose and hemicellulose utilized by fungi as a carbon source. Fungus also has the ability to grow at a relatively high temperature is 36-40° C so suitable for use in fermentation processes that produce a lot of heat (Tuomelo et al. 2002). High lignin degradation efficiency and minimal in utilizing cellulose polymers compared to other white rot fungi Phanerochaete chrysosporium make the best choice in the treatment of lignin degradation.

Fungi degrade lignin are most active white-rot fungi such as Phanerochaete chrysosporium and Coriolus versicoloryang able to remodel hemicellulose, cellulose and lignin from plant waste into CO₂ and H₂O (Paul, 1992; Limura, 1996). In general, white-rot basidiomisetes synthesize three kinds of enzymes, ie Lignin-peroxidase (LiP), manganese-peroxidase (MnP) and laccase. All three of these enzymes was instrumental in the degradation of lignin (Srinivasan et al., 1995).

Methodology

The fermentation process was on a laboratory. Cocoa pod fermented in plastic box measuring 30 x 18 x 10 cm and aeration maintained the piercing of the side and bottom of the plastic box. One kg cocoa pod used for any plastic boxes, sown in a plastic box on the first layer, then the same treatment for the second and third treatment. After fermentation was complete, the cocoa pod aired removed and dried for 6 hours. Weighing cocoa pod after the fermentation was in all treatments. Drying the sample in oven at 55° C for 5 days. Cocoa pod was dried using a Thomas-Wiley (type 4) with a diameter of 1 mm sieve.

Cocoa pod fermentation by using fungi Phanerochaete chrysosporium done with different long day at 5, 7, 9, 11, and 13 days. Temperature and pH are used equally in all treatments, at a temperature of 37° C and pH 7. These trials are designed with completely randomized design pattern is in line with 5 treatments and 5 replicates that formed 25 experimental units. The treatment group as follows : T0 = fermentation cocoa pod for 5 days, T1 = fermentation cocoa pod for 7 days, T2 = fermentation cocoa pod for 9 days, T3 = fermentation cocoa pod for 11 days, T4 = fermentation cocoa pod for 13 days.

Result and Discussion

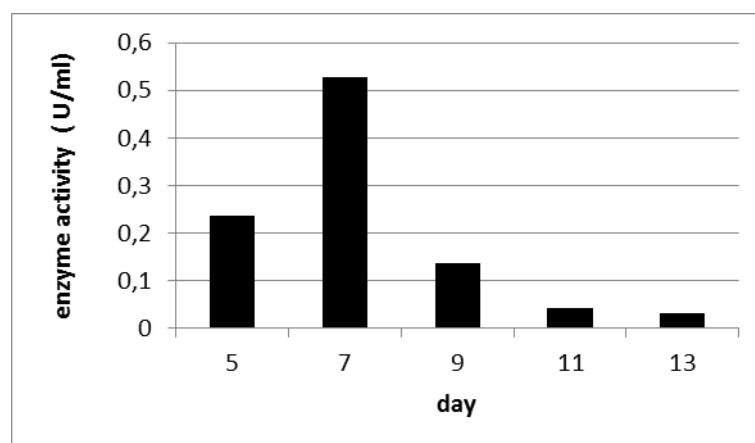
A. Lignin Peroksidase

Table 1. Mean of LiP activity on fermentation pf cocoa pod (U/ml)

Replication	Treatment				
	T0	T1	T2	T3	T4
1	0,219	0,521	0,223	0,054	0,025
2	0,223	0,562	0,126	0,036	0,046
3	0,265	0,460	0,114	0,049	0,018
4	0,238	0,567	0,081	0,033	0,040
Mean	0,236 ^c ± 0,02	0,527 ^d ± 0,04	0,136 ^b ± 0,06	0,043 ^a ± 0,01	0,032 ^a ± 0,01

The results mean the enzyme activity Lignin peroxidase (LiP) are listed in Table 1. Average consecutive five treatments namely T0 = 0.236 ± 0.02, 0.04 ± T1 = 0.527, T2 = 0.136 ± 0.06, T3 = 0.043 ± 0, 01 and T4 = 0.032 ± 0.01 showed highly significant results (P <0.01).

In order to clarify the following graph depicted LiP enzyme activity



Looking at the research that has been conducted that was fermented with a different day long seen the highest enzyme activity was indicated in the treatment of P1 = 0.527 ± 0.04 U / ml was treated ferment for 7 days.

The results of this study was similar to Puspita study (2007) showed that the fungus *Pleurotus* sp. 1 has the highest LiP enzyme activity on the 6th day of incubation in the amount of 0.430 U / ml. LiP enzyme activity highest in 7 days due to the peak of the growth of mold occurs on the seventh day that LiP enzyme release also reached the highest point. After seven days of mold growth tends to stagnate and even tended to decrease so it is also an effect on the enzyme activity of LiP were also down.

LiP was a major catalyst in the process ligninolisis by mold because it can break down the non-phenolic units which make up 90 percent of the structure of lignin (Srebotnik et al., 1998). LiP catalyzes an oxidation of aromatic compounds to form non-phenolic lignin aryl radical cation. In addition, because LiP was a strong oxidant that this enzyme also has the ability to oxidize phenolic compounds, amines, ethers aromatic and polycyclic aromatic compounds. Lignin substructure oxidation catalyzed by LiP begins with the separation of the aromatic ring electron donor substrate and produces radical cations aryl, which then undergo various reactions postenzymatic

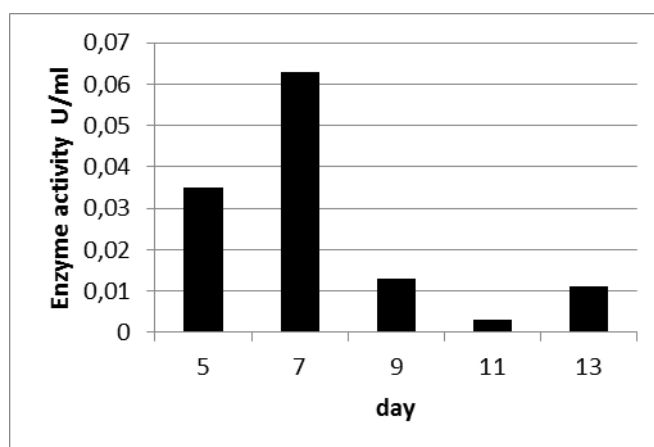
B. Mangan Peroksidase

Table 2. Mean of MnP activity on fermentation of cocoa pod (U/ml)

Replication	Treatment				
	T0	T1	T2	T3	T4
1	0,041	0,062	0,022	0,005	0,002
2	0,032	0,066	0,012	0,003	0,004
3	0,036	0,060	0,011	0,004	0,001
4	0,033	0,067	0,008	0,003	0,040
Mean	$0,035^b \pm 0,00$	$0,063^c \pm 0,00$	$0,013^a \pm 0,00$	$0,003^a \pm 0,00$	$0,011^a \pm 0,01$

The results mean the enzyme activity Mangan peroxidase (LiP) are listed in Table 2. Average consecutive five treatments namely T0 = 0.035 ± 0.00 , T1 = 0.063 ± 0.00 , T2 = 0.013 ± 0.00 , T3 = 0.003 ± 0.00 and T4 = 0.011 ± 0.01 showed highly significant results ($P < 0.01$).

In order to clarify the following graph depicted MnP activity



Looking at the research that has been conducted that was fermented with different looks old days MnP highest enzyme activity indicated in the treatment of P1 = 0.063 ± 0.00 U / ml was treated ferment for 7 days.

MnP highest enzyme activity at 7 days due to the peak of the growth of mold occurs on the seventh day that LiP enzyme release also reached the highest point. After seven days of mold growth tends to stagnate and even tended to decrease so it was also an effect on the enzyme activity MnP were also down.

MnP enzyme oxidizes Mn^{2+} to Mn^{3+} and H_2O_2 as a catalyst to generate the peroxide group (Camarero et al, 1996). Mn^{3+} produced diffuses in to the substrate and activate the oxidation process. This was supported also by the activity of the radical cation of veratril alcohol and enzyme-producing H_2O_2 . This process will conclude with the merger of O_2 into the structure of lignin (de Jong et al, 1994).

According Pelczar and Chan (2005) The main function of an enzyme was to reduce the activation energy barrier in a chemical reaction. The enzyme was known there are two types of extracellular and intracellular enzymes. The main function of extracellular enzymes was to carry out changes in the vicinity of nutrients thus allowing the nutrients to enter cells. Intracellular enzymes synthesize cellular material and also outlines the nutrients to provide the energy needed by the cell.

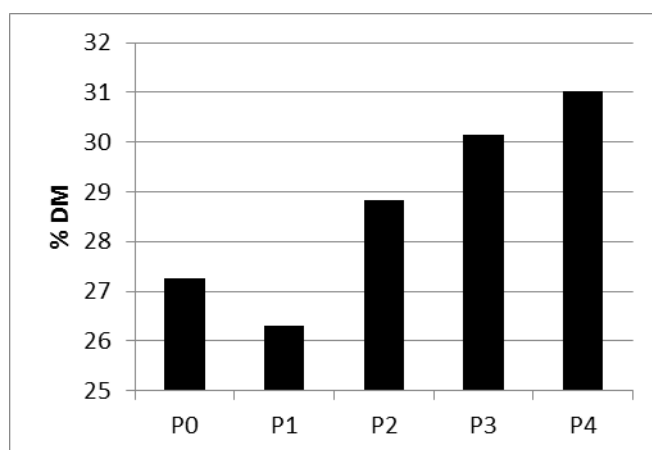
C. Lignin

Table 3. Mean of lignin on fermentation of cocoa pod (%)

Replication	Treatment				
	T0	T1	T2	T3	T4
1	27,26	26,11	28,21	29,97	31,69
2	27,77	26,29	28,11	29,44	30,46
3	26,58	26,81	29,34	30,29	30,93
4	27,39	26,01	29,67	30,95	31,04
Mean	27,25 ^b ± 0,49	26,30 ^a ± 0,35	28,83 ^c ± 0,79	30,16 ^d ± 0,63	31,03 ^e ± 0,50

The mean content of lignin in a row that P0 = 27.25 ± 0.49%, P1 = 26.30 ± 0.35%, P2 = 28.83 ± 0.79%, P3 = 30.16 ± 0.63% and P4 = 31.03 ± 0.50% showed highly significant results (P < 0.01).

In order to clarify the following described lignin content



Looking at the research that has been conducted was fermented cocoa pod for 7 days was so obvious that the lignin significantly different in T1 lower than T0, T2, T3 and T4. The low content of lignin in T1 when compared with T0, T2, T3 and T4 due to the time difference fermentation.

Fermentation pod husks for 7 days showed the lowest lignin content due to fermentation for 7 days is the culmination of the growth of molds so that the production of the enzyme produced was also high that affect lignin degradation in the cocoa pod on fermentation process.

Lignin was a component of plant cell walls that had been developed after experiencing roses crop maturation. Pod husks as old crop waste has lignified advanced stages. The magnitude of the lignin content is strongly influenced by the length of fermentation. Changes in lignin content of the substrate occurs due to overhaul the structure of lignin into simpler components.

The content of lignin in T1 which is 26.30 ± 0.35 shows the lowest among other treatments. This suggests that the drop in lignin occur on the seventh day of fermentation. This is like the opinion of Shi et al. (2009) which states that most of the lignin degradation occurs in 4-10 days after fermentation. Gupte et al. (2007) also reported that the maximum loss of lignin by *Phanerochaete chrysosporium* occurs on the tenth day after incubation.

The content of lignin in the old fermentation enzyme associated with the production of ligninase. Jager et al. (1985) reported that the highest enzyme production ligninase occurred on the sixth day after inoculation. The lignin degradation will pave the way for an overhaul of cellulose and hemicellulose.

Conclusion

Cocoa pod fermented with different lengths of time indicates fermentation for 7 days gives the best result. Cocoa pod fermentation for 7 days showed the highest enzyme activity LiP of 0.527 ± 0.04 units / ml and MnP amounted to 0.063 ± 0.00 units / ml. Cocoa pod fermentation for 7 days showed the lowest lignin content of $26.30 \pm 0.35\%$.

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Oral Presentation 5 Focus Session:

Feed and Nutrition (3)

Friday, 21 October 12:30-13:50

Room: Semeru

Effect of Fish Oil and Its Combination with Tomato Powder Supplementation on Laying Performance of Native Chicken

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Abstract

The aim of this research was to investigate the effect of dietary supplementation of fish oil and its combination with tomato powder on laying performance of native chicken. One hundred twenty 30-week-old native chicken with initial egg mass of 25.59 ± 1.97 g/bird/day (coefficient of variation was 7.69%) were randomly distributed into four dietary treatments, namely, T0: basal diet (control), T1: basal diet + 2.5% fish oil, T2: basal diet + 2.5% fish oil + 0.5% tomato powder, or T3: basal diet + 2.5% fish oil + 1.0% tomato powder. Each dietary treatment was formulated to provide similar metabolizable energy (2700 Kcal/kg) and crude protein content (17.30%). Variables measured were feed intake, hen day production (HDP), egg weight, egg mass, and feed conversion ratio (FCR). Data were analyzed using one-way Anova in a completely randomized design and differences among means were subjected to Duncan Multiple Range Test. Results showed that dietary treatments did not significantly affect ($P > 0.05$) feed intake, egg weight, and egg mass of native chicken. Birds on T1 had lower ($P < 0.05$) HDP and FCR compared to those on T0, T2, and T3. The addition of tomato powder (T2 and T3 groups) had similar trends on HDP and FCR when compared to control group (T0). It can be concluded that tomato powder supplementation could alleviate the negative effect of fish oil-containing diet on HDP and FCR of native chicken.

Keywords: *antioxidant, egg, omega-3 PUFA, oxidation, poultry*

Effect of Substitution of Meat Bone Meal with Protein Concentrate of Mealworm (*Tenebrio molitor L*) on Performance of Broilers

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Abstract

Mealworm (*Tenebrio molitor L.*) contains high protein that can be used as the alternative of meat bone meal (MBM). The protein content prior to extraction of fat by 45.87%, then increased to 54.73% after the fat is taken. The aim of this research was to study the effect of substitution of MBM with protein concentrate obtained from extraction of mealworm fat on performance of broiler. This research uses a T-Test to analyze data. The treatments were R0 = ration containing 5% MBM and R1 = ration containing 5% protein concentrate of mealworm. The variables observed was feed consumption, final body weight, body weight gain, feed conversion and mortality of broilers. The results show that broiler fed diet containing 5% protein concentrates of mealworm (R1) had better performance than broiler received MBM. Final body weight of broiler received R1 was 2.92% higher and feed conversion was better than those of broiler received R0. It is concluded that protein concentrates of mealworm has be better quality than MBM and it could replace MBM in broiler diet.

Key words : broiler, mealworm, meat bone meal, performance, protein concentrate

Introduction

Meat bone meal (MBM) and/or fish meal (FM) have been known as protein sources that always include in poultry ration. The demand of MBM increased tremendously as increasing the number of poultry produced. High prices of FM also responsible for increasing the demand of MBM. Meat bone meal are 100% import, and therefore it is essential to look for alternative MBM. Mealworm (*Tenebrio molitor L*) may be used as alternative MBM.

Mealworm (*Tenebrio molitor*) contains 37.5 - 47.2 % crude protein, 31.1-43.1% crude fat, 7.4-15% carbohydrate and 1.0-4.5% ash (Makkar et al. 2014). The reproduction and grow of mealworm is very fast with low nutrient requirement. In Europe, the insect has been used not only as animal feed but also human consumption, whereas in Thailand, insect production has been started to be widely used as chicken feed (Durst and Hanboonsong 2015).

The use of *Tenebrio molitor* as many as 0, 5 and 10% to substitute soy bean meal did not give negative effect on broiler performance (Ramos-Elordury et al. 2002). More over Desiree et al. (2013) reported that the addition of *Tenebrio molitor* as feed supplement in the ration improved performance of broiler chicken. In our previous research, we found that meal

worm could substitute MBM till 50% without affecting performance. However, the use of protein concentrates of mealworm as a source of protein to substitute MBM in broiler diet has not been reported yet.

Methodology

200 day-old Lohman chick were divided into twenty groups and assigned to one of the two dietary treatments, ie: R0 = ration containing 5% MBM and R1 = ration containing 5% protein concentrates of mealworm. The diets were formulated iso-calori and iso-protein according to the recommendation of Leeson and Summers (2008). Feed and water were given ad-libitum for 35 days. The variables observed was broiler performance, such as feed consumption, final body weight, body weight gain, feed conversion and mortality. Data were analyzed using a T-Test (Steel & Torrie, 1993).

Result and Discussion

The performance of broiler fed the diet treatment were presented in Table 1. The use of protein concentrate of mealworm did not significantly affect feed intake, final body weight, body weight gain, and feed conversion of broiler. However, feed intake of broiler fed concentrate protein of mealworm (R1) has a tendency ($P<0.50$) 1.47% higher compared with that of broiler received 5% MBM (R0). It is indicated that the use of protein concentrate of mealworm did not affect palatability of the broiler.

Table 1. Performance of broilers fed concentrate protein or meat bone meal during 35 days of research

Variables	Treatments	
	R0	R1
Feed intake (g/bird)	2804.94±126.37	2846.84±131.6
Final body weight (g/bird)	1596.4±97.8	1644.5±76.95
Body weight gain (g/bird)	1549.68±98.02	1597.78±76.93
Feed conversion ratio	1.81±0.06	1.78±0.06
Mortality (bird)	4	4

Note : R0 (ration containing 5 % MBM), R1 (ration containing 5 % protein concentrates of mealworm)

Final body weight of broilers fed protein concentrate of mealworm numerically was higher compared with that of broiler received 5% MBM. The difference between them was 48.1 g / bird. The difference in final body weight is mainly caused by the difference in feed intake (Table 1), which then affected nutrients intake. Protein consumption of broiler R1 is 551.8 g / bird, while protein consumption R0 is 543.93 g / bird. It is supposed that other nutrient intake including minor nutrients intake were also higher for concentrate protein of protein. De Foliart et al. 2009 reported that mealworm contains high grade protein, fat, carbohydrates, and vitamins, that may provide a possible of an alternative source of nutrition for broilers. Feed intake and final body weight of broiler chicken in this research is slightly lower when compared with Lohman strain broiler were produced by PT Japfa Comfeed Indonesia (2008), i.e feed intake by 2934 g / bird produce final body weight 1839 g / bird.

Feed conversion ratio (FCR) of broiler during the study ranged from 1.78-1.81. The FCR of broiler received R1 was better ($P<0.30$) than that of broiler received R0. Feed conversion ratio is influenced by several factors including feed composition, retention efficiency, and energy consumption for basic needs (Romero *et al.*, 2011).

Mortality in this research was caused by an appropriate temperature. Broiler was found dead at noon, indicating animal suffered heat shock. The environmental temperature during finisher periode was around 26-31 °C that too high for the broiler. Broiler chicken on starter phase can produce optimally at a temperature of 29-35°C and the periode finisher requires temperatures of 20-25° C (Borges *et al.* 2004)

This result is better than the previous studies, in which the performance of broiler in a previous study was lower for broiler received 5% mealworm compared with that of broiler received 5% MBM (Purnamawati 2015). The low performance of broiler received meal worm in a previous studies was supposed by the present of chitin. Mealworm contains 12.8% substance chitin on skin and it is hard to be digested by poultry (Budiutami *et al.* 2012). The presence of high or strong bond of chitin-protein calcium carbonate will lower the digesting power of protein from mealworm. Klunder *et al.* (2012) reported that insect contain chitin, fiber protein that is not water soluble, from the exoskeleton. It is estimated that the content of chitin substances in insects species is ranging from 11.60-137.20 mg kg⁻¹ in the dry ingredients (Finke 2007).

Conclusion

Protein concentrate of mealworm have better quality than MBM and it could replace MBM in broiler diet without affecting their performance

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Supplementation of Zn And Vitamin E on The Immune Responses and Performance of Broilers in a Tropical Environment

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Abstract

Indonesia known as tropical country, has ambient temperatures usually reach 34°C during daytime. Broiler chickens will be easy to stress and suffer from disease when they are exposed heat stress. Diseases can be derived from a virus or bacteria such as *Escherichia coli*. The purpose of this study to provide specific nutrient (Zn and vitamin E) that have role in improving the immune system of broiler chickens. This research used 288 Day Old Chick (DOC) male strain Lohman. This study used Completely Random Design with four treatments and six replication. The treatment diets were control feed (T0), control feed+80 Zn mg/kg (T1), control feed+250 vitamin E mg/kg (T2), control feed+80 Zn mg/kg+250 vitamin E mg/kg (T3). The parameters are: feed intake, final body weight, body weight gain, Feed Conversion Ratio (FCR), mortality, and response of tested bacteria. This study showed that T2 treatment, would give effect increasing final body weight, body weight gain, and feed intake than other treatment. Supplementation of Zn and VE (T1, T2, T3 treatments) in broiler chickens affect significantly ($P < 0.05$) on response of tested bacteria, it seen from improved immune response of broiler due to colony of *Escherichia coli* decreased after Clearance Test. Then, it could be concluded that feed supplementation with Zn and VE improves immune responses in broiler chicken.

Keywords : broiler chicken, *Escherichia coli*, immune, vitamin E, Zn.

Introduction

Broiler is kind of chicken which can grow rapidly in 4-5 weeks. The broiler also experienced increasing significantly body weight which it will be ready to be marketed or consumed. Breeding broiler is quite profitable due to short breeding time. Unfortunately, the broiler is very sensitive with ambient temperature. If the ambient temperature reaches up to 28°C, broiler will experience heat stress. Indonesia itself is a tropical country that the daytime temperatures could reach 34°C. Meteorology Climatology and Geophysics Council Indonesia (2012) stated the range ambient temperature in Indonesia from 23°C-34°C with humidity of 45%-97%.

Heat stress can affect the ability of broiler's consumption, growth of carcasses and body weight (Sahin and Kucuk 2001); decreasing of body's immune (Lamont *et al.* 1998); decreasing of response of antibody (Bartlett and Smith 2003); and causing of deaths (Khan *et al.* 2011). Heat stress will also cause broiler susceptible of disease. The disease usually derived from a virus or bacteria such as *Escherichia coli* (Yunis *et al.* 2002). Theses bacteria grow easily due the Indonesia's environment is tropical and humid. The growth of bacteria or virus can be reduced by providing specific nutrients such as Zn and VE on feed. These

nutrient also can improve immune system of broiler. Zn is a micro mineral that plays a role in the immune system (Bartlett and Smith 2003). While, VE is an antioxidant in a biological system that is used as a supplement to improve feed intake, weight gain, digestibility of nutrients, immune response and reduce heat stress in broiler (Khan *et al.* 2011). The purpose of this study to provide specific nutrient (Zn and vitamin E) that have role in improving the immune system of broiler chickens.

Methodology

The study was conducted in Poultry Nutrition Laboratory (Field Laboratory Block C), Faculty of Animal Science and Bacteriology Laboratory Faculty of Veterinary Medicine, Bogor Agricultural University. About 288 Day Old Chick (DOC) male of Lohman strain were used in this experiment. There are four feeding treatments in this study, one treatment without using supplement Zn and VE: T0 (control feed); while the three other treatments use Zn and VE with different amount, as follows: T1 (control feed + 80 Zn mg/kg); T2 (control feed + 250 VE mg/kg); and T3 (control feed + 80 Zn mg/kg + 250 VE mg/kg). Each treatment was repeated six times with 12 chicken in each treatment. Water and feed are available *ad libitum*. Feed intake and body weight gain were recorded weekly. Blood sampling was conducted at the end of study using one chicken on each treatment. Blood samples were used to Clearance test. The measured parameters are a) the performances of broiler, such as feed consumption, final-weight gain, body weight gain, Feed Conversion Ratio (FCR) and mortality; and b) response of tested bacteria. Data of response of bacteria was measuring with statistical analysis of variance test Completely Randomized Design (CRD), if the result indicates treatment, it will be continued with Duncan test analysis.

Result and Discussions

Data of response of tested bacteria (Clearance Test) are presented in Table 2. Broiler was feed with Zn and VE (T1, T2, and T3 treatments) challenged with the bacteria *Escherichia coli* on Clearance Test, will show mortality of bacterial colonies and decrease of broiler's mortality (Table 1), in comparison with T0 treatment. Thus, Zn and VE in broiler chickens affect significantly ($P < 0.05$) on Clearance Test.

Table 2. Response of Tested Bacteria (Clearance test)

Treatment	The initial amount of bacteria (cfu/mL)	The amount of bacteria final (cfu/mL)	Bacterial death (%)
T0	3.1×10^6	4.2×10^6	00.00d
T1	3.1×10^6	7.8×10^3	99.55b
T2	3.1×10^6	4.0×10^4	98.72c
T3	3.1×10^6	0	100.00a

T0: control feed, T1: control feed+80 mg Zn/kg, T2: control feed+250 mg vitamin E/kg, T3: control feed+80 mg Zn/kg+250 mg vitamin E/kg.

Zn will be the co-enzyme of biology process and can increase the immune response when the broiler experience heat stress. In immunity, Zn also could increase thymocyte and peripheral T-cell. Those cells can trigger the activity of bacteria killer cell, macrophages function, and antibody production. This result is in line with research of Kidd *et al.* (1994) and Park *et al.* (2004). They said that clearance test on broiler blood which was already supplemented with Zn and VE, will increase rate number mortality of *Escherichia coli*. Prakash *et al.* (2014) also said that supplementation of VE amounted 300 mg/kg, which is

above of recommendation of National Research Council, will increase the immune response and decrease mortality of broiler (that was caused by *Escherichia coli*).

Data of broiler performance with treatments are presented in Table 1. Table showed that supplementation Zn and VE affected in feed intake, final body weight, body weight gain and FCR in comparison with T0 treatments. This is in line with Mansoub *et al.* (2010), states that enriched feed with VE and Zn showed better performance of broiler.

Table 1. Broiler's Performance

Treatment	Feed Intake (g/poult)	Final Body Weight (g/poult)	Body Weight Gain (g/poult)	FCR	Mortality (%)
T0	2116.33±46.81	1287.90±57.36	1247.63±57.39	1.65±0.07	1.4
T1	2093.56±76.87	1220.83±105.65	1180.38±105.65	1.72±0.13	0
T2	2178.69±33.75	1310.83±33.68	1270.21±34.08	1.66±0.04	0
T3	2125.31±63.35	1287.78±37.77	1247.50±37.11	1.65±0.02	0

T0: control feed, T1: control feed+80 mg Zn/kg, T2: control feed+250 mg vitamin E/kg, T3: control feed+80 mg Zn/kg+250 mg vitamin E/kg.

T0 treatments increased broiler's mortality. This was caused by various influences, such as high ambient temperatures. According to Copper and Washburn (1998), high ambient temperature around broiler's cage was caused by broiler's metabolism. This high ambient temperature will cause heat stress on broiler which it can cause death of chickens.

Conclusion

Supplementation of Zn and VE (T1, T2, T3 treatments) in broiler chickens affect significantly on response of tested bacteria. The immunity response will be used to help broiler to reduce the impact of heat stress when the ambient temperature around broiler is high at the age of broiler is 21-35 days.

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Supplementation of zinc and vitamin E in the diet on performance and expression of HSP70 gene of broiler in tropical environment

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Abstract

The purpose of this study was to determine the effect of vitamin E and zinc on performance and expression of heat shock protein (HSP) 70 gene of broiler in a tropical environment. This study used 9 treatment was a combination of factor A was zinc level (A1: 0 ppm, A2: 40 ppm, A3: 80 ppm) and factor B are levels of vitamin E (B1: 0 ppm, B2: 125 ppm, B3: 250 ppm). The treatment given was: A1B1= basal diet + 0 ppm zinc + 0 ppm vitamin E; A1B2= basal diet + 0 ppm zinc + 125 ppm vitamin E; A1B3= basal diet+ 0 ppm zinc + 250 ppm vitamin E; A2B1= basal diet + 40 ppm zinc + 0 ppm vitamin E; A2B2= basal diet + 40 ppm zinc + 125 ppm vitamin E; A2B3= basal diet + 40 ppm zinc + 250 ppm vitamin E; A3B1= basal diet + 80 ppm zinc + 0 ppm vitamin E; A3B2= basal diet + 80 ppm zinc + 125 ppm vitamin E; A3B3= basal diet + 80 ppm zinc + 250 vitamin E. The variable observed were performances (feed consumption, weight gain, feed conversion and mortality) and expression of heat shock protein (HSP) 70 gene. The results showed that performance (feed consumption, weight gain and feed conversion) was not significantly influenced by supplementation of zinc and vitamin E. Supplementation of zinc 40 ppm-80 ppm significantly ($P<0.05$) increased the final body weight. Supplementation of zinc and vitamin E reduced the mortality rate to 50-100%. Supplementation of zinc at 80 ppm and vitamin E 250 ppm in basal diet (A3B3) significantly ($P<0.05$) decrease expression of heat shock protein (HSP) 70 gene. In conclusion supplementation of 80 ppm zinc in the diet improved final body weight, feed efficiency and reduced the expression of HSP70 gene.

Keyword : broiler, HSP70, performance, vitamin E, zinc.

Introduction

High ambient temperature is a problem in many country in the world. Indonesia is a tropical country that has temperature and humidity above thermoneutral zone for broiler chicken. This condition promote heat stress to the poultry. Heat stress has been associated with decreases in broiler weight gain, feed intake, feed efficiency, N retention, protein digestibility and total mineral retention (Sahin and Kucuk, 2003). Environmental stress has been shown to elevate lipid peroxidation products in serum and liver and to decrease serum and tissue levels of antioxidant vitamin (Sahin and Kucuk, 2003) and to decrease the immunity (Bartlett and Smith, 2003). Adverse effects of heat stress on broiler performance need to be study seriously. Dietary modification is the most preferable and practical methods to alleviate the effect of high environmental temperature in the tropical country. Many studies showed that antioxidant vitamins and minerals such as vitamin A, C E and zinc have been

used to ameliorate the effect of heat stress. Study on zinc and vitamin E as antioxidant agent in broiler diet related to the expression of heat shock protein (HSP70) gene is still limited. Therefore, the purpose of this experiment was to study supplementation of zinc and vitamin E on performance and expression of HSP70 gene of broiler in tropical environment.

Methodology

This research used 360 male day old chicks (*Lohman* strain, Japfacomfeed, Indonesia), and were raised in a cage of 1.5 x 1.5 m in size. The experiment was arranged in a 3 x 3 factorial scheme of completely randomized design (CRD) with 4 replications (10 birds each). Factor A was zinc (Zn) with 3 levels (none(A1), 40 ppm(A2) and 80 ppm(A3)). Factor B was vitamin E (VE) with 3 levels (none(B1), 125 ppm(B2) and 250 ppm(B3)). Diet and drinking water was provided ad-libitum. The broiler were fed experimental diet for 35 days. Parameters measured were performance of broiler (feed consumption, final weight, weight gain, feed conversion, mortality) and expression of HSP70 gene (Nolan *et al.* 2006). The data were subjected to analysis of variance followed by Duncan Multiple Range Test.

Results and Discussion

The effect of zinc and vitamin E supplementation on broiler performance was showed in Table 1. The results showed that there were no significant effect on broiler performance due to supplementation zinc and vitamin E.

Tabell1. The effects of supplementation zinc and vitamin E on broiler performance at 35 days of age

Parameters	Mineral	Vitamin E (B)			Mean
	Zn (A)	B1	B2	B3	
Feed intake (g/bird)	A1	2857.56±85.62	2718.52±72.50	2802.58±42.72	2792.89±86.58
	A2	2804.93±42.89	2849.25±112.93	2727.73±104.37	2793.97±98.50
	A3	2843.48±34.72	2730.34±192.70	2840.91±15.45	2804.91±116.43
	Mean	2835.2±58.05	2766.04±137.26	2790.41±77.09	
Final body weight (g/bird)	A1	1480.13±77.46	1528.11±51.83	1541.11±79.26	1516.45±69.52 ^b
	A2	1511.50±11.12	1587.81±145.35	1580.50±72.17	1559.94±92.23 ^{ab}
	A3	1628.78±128.18	1577.39±95.13	1580.11±57.88	1595.43±92.04 ^a
	Mean	1540±103.03	1564.44±98.50	1567.24±66.48	
Body weight gain (g/bird)	A1	1434.18±78.05	1482.39±50.33	1494.91±79.74	1470.49±69.53
	A2	1464.60±10.59	1542.43±145.05	1460.82±68.18	1513.83±92.41
	A3	1566.20±43.85	1534.44±72.60	1503.68±43.85	1533.69±90.40
	Mean	1566.20±98.49	1518.67±97.84	1511.01±63.32	
FCR	A1	1.92±0.13	1.82±0.08	1.88±0.09	1.87±0.10
	A2	1.92±0.04	1.85±0.10	1.83±0.13	1.87±0.09
	A3	1.82±0.14	1.79±0.12	1.89±0.06	1.83±0.11
	Mean	1.89±0.11	1.82±0.10	1.87±0.09	
Mortality (%)	A1	1.25	0	0	
	A2	0	0.63	0.63	
	A3	0.63	0	0.63	
IOFC	A1	7810.11±996.67	9148.54±701.75	8837.64±1079.91	8598.76±1039.28
	A2	8495.05±375.69	9304.84±1592.18	9768.85±1470.14	9189.58±1273.41
	A3	9981.08±1916.61	9722.87±1359.44	9054.97±886.12	9586.30±1373.36
	Mean	8762.08±1485.62	9392.08±1180.61	9220.49±1137.65	

Keterangan: A1= zink 0 ppm; A2= zink 40 ppm; A3= zink 80 ppm; B1= vitamin E 0 ppm; B2= vitamin E 125 ppm; B3= vitamin E 250 ppm. Superscript with different letter in the same colom, the value differ significantly (P<0.05)

However, final body weight increased significantly ($P < 0.05$) due to supplementation 40ppm-80ppm zinc in the diet. This was might be due to the function of zinc as precursor more than 200 enzymes, including precursor for SOD (super oxide dismutase) which act as antioxidant.

The expression of HSP70 gene significantly decreased ($P < 0.05$) due to supplementation 80 ppm zinc and 250 ppm vitamin E in the diet (Fig.1). Heat shock protein gene will be expressed when the animal stress. So, in control diet without supplementation, the expression of HSP70 was high. In our previous study, showed that supplementation 225 ppm vitamin E reduced the expression of HSP 70 gene significantly (Laras, 2014).

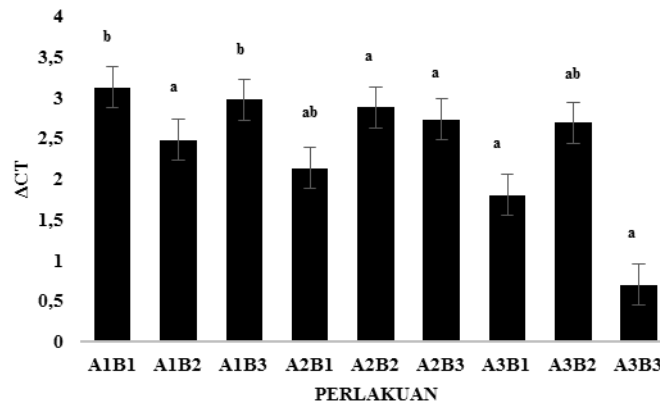


Figure 1. Expression of HSP 70 gene in delta Ct value ; A1= Zinc 0 ppm, A2= Zinc 40 ppm, A3= Zinc 80 ppm, B1= Vitamin E 0 ppm, B2= Vitamin E 125 ppm, B3= Vitamin E 250 ppm. Superscript with different letter showed the value differ significantly ($P < 0.05$)

Zinc and vitamin E as antioxidant protected cell damage due to free radical, this condition reduced heat stress effect as indicated by decreasing the expression of HSP70 gene.

Conclusion

Supplementation zinc 40 ppm - 80 ppm improved broiler performance as indicated by increasing final body weight, feed efficiency and reduced mortality and the expression of HSP70 gene. In a simple word, zinc has positive effect to reduce heat stress in broiler.

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Supplementation of Phytase and Mannanase in Diet with High Fiber and Phytic Acid on Quality of Quail Eggs *Coturnix – coturnix japonica*.

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Abstract

This research aimed to determine combination mannanase and phytase in diet containing palm kernel and rice bran to the quality of egg quail. The experiment involved 4 weeks *Coturnix – coturnix japonica* quails amount two hundred and forty. The experimental design used in this study was completely randomized design completely randomized design with 2 factors as treatments. The first factor was the high fiber: 3% and 6%, the second factor was the mannanase: 100 IU and 200 IU, the third factor was the phytase: 250 ppU and 500 ppU. The treatments were: T1= crude fiber 3% + 100 IU mannanase + 250 ppU Phytase; T2= crude fiber 3% + 100 IU mannanase + 500 ppU Phytase; T3= crude fiber 3% + 200 IU mannanase + 250 ppU Phytase; T4= crude fiber 3% + 200 IU mannanase + 500 ppU Phytase; T5= crude fiber 6% + 100 IU mannanase + 250 ppU Phytase; T6= crude fiber 6% + 100 IU mannanase + 500 ppU Phytase; T7= crude fiber 6% + 200 IU mannanase + 250 ppU Phytase; T8= crude fiber 6% + 200 IU mannanase + 500 ppU Phytase. Parameters measured were egg weight, the proportion of yolk and white egg, the proportion of eggshell, thick eggshell, yolk colour score, Haugh Units. This research showed that eggshell weight, HU and yolk colour score gives significantly influence on any treatment. Treatment on T7 and T8 showed the best results. The increase in crude fiber in diet of laying quail can eggshell weight, egg white and yolk colour score at the treatment of 6% crude fiber.

Keywords: crude fiber, mannanase, phytase, quality egg.

Introduction

The feed is a factor of production that cost most high (60-70%). One of the causes of the high prices ration in Indonesia is the lack of a local feed materials production mainly protein and energy sources, so still plenty of imported. In 2001 Indonesia import corn as much as 1,035,797 tons and 1,570,187 tons of soybeans for cake (FAO, 2003). To reduce such dependence is required optimally exploiting local feed resources that can be used as a poultry feed and one of them was rice bran and palm kernel. Rice bran and palm kernel easily obtainable, the price is relatively cheap and does not compete with human needs. The problem is the Rice bran and palm kernel contain high crude fiber, while poultry digestive tools are not able to digest high crude fiber because do not have crude fiber splitter enzymes.

Methodology

The experiment was conducted in Laboratory of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University. The experiment involve 4 weeks *Coturnix – coturnik japonica* quails amount two hundred and forty. The experimental design used in this study was completely randomized design completely randomized design with 2 factors as treatments. The first factor was the high fiber: 3% and 6%, the second factor was the manase: 100 IU and 200 IU, the third factor was the phytase: 250 ppU and 500 ppU. The treatments were: T1= crude fiber 3% +100 IU manase + 250 ppUPhytase; T2= crude fiber 3%+ 100 IU manase + 500 ppUPhytase; T3= crude fiber 3%+ 200 IU manase + 250 ppUPhytase; T4= crude fiber 3%+ 200 IU manase + 500 ppUPhytase; T5= crude fiber 6% +100 IU manase + 250 ppUPhytase; T6= crude fiber 6%+100 IU manase + 500 ppUPhytase; T7= crude fiber 6%+ 200 IU manase + 250 ppUPhytase; T8= crude fiber 6%+ 200 IU manase + 500 ppUPhytase. Parameters measured were egg weight, the proportion of yolk and white egg, the proportion of eggshell, thick eggshell, yolk colour score, Haugh Units. The data were analyzed using and ANOVA.

Result and Discussion

Supplementation of crude fiber in rice bran and palm kernel 6% with the addition 100 IU and 200 IU of enzymes Mananase and 250 ppU ppU 500 of enzymes pytase increase the weight of eggshell compared with 3% of crude fiber. the high weight of the eggshell effect on the weight of the eggs.

Table 1. Physical quality of egg

Parameters	Crude Fiber	Manase and Phytase				Means
		M1P1	M1P2	M2P1	M2P2	
Egg white weight (%)	R1	49,87± 1,60	50,48±0,33	51,16±0,33	50,59±0,82	50,52±0,60
	R2	50,48±0,47	50,48±0,59	50,91±0,45	51,24±0,44	50,82±0,07
	Means	50,18±0,80	50,48±0,18	50,89±0,08	50,92±0,27	
Egg yolk weight (%)	R1	34,52±0,61	35,68±0,74	35,05±1,20	34,96±0,41	35,05±0,34
	R2	34,23±0,60	34,60±0,90	33,35±0,35	33,09±0,94	33,82±0,28
	Means	34,38±0,01	35,11±0,11	34,20±0,60	34,03±0,37	
Eggshell weight (%)	R1	15,29±0,93	15,48±0,86	15,33±1,42	15,88±0,21	15,49±0,50a
	R2	16,30±0,06	15,70±0,32	16,76±0,47	16,67±0,61	16,21±0,24b
	Means	15,80±0,62	15,59±0,38	16,05±0,67	16,28±0,28	
Thick eggshell (mm)	R1	0,18±0,01	0,19±0,00	0,19±0,00	0,19±0,00	0,19±0,00a
	R2	0,20±0,00	0,20±0,01	0,19±0,00	0,19±0,01	0,20±0,00b
	Means	0,19±0,01	0,19±0,00	0,20±0,01	0,19±0,01	
Egg yolk color	R1	7,33±0,14	7,29±0,08	7,83±0,29	7,83±0,29	7,57±0,11a

	R2	8,00±0,00	8,00±0,00	8,00±0,00	7,83±0,29	7,96±0,14 ^b
	Means	7,67±0,10	7,65±0,06	8,00±0,00	7,83±0,0	
Haugh unit	RI	70,32±1,81	91,09±0,43	91,53±0,44	91,68±0,40	86,15±0,69
	R2	91,53±1,01	91,90±0,53	91,93±0,04	93,95±0,07	92,33±0,46
	Means	80,93±0,57	91,50±0,07	91,73±0,28	92,82±0,23	

R1= crude fiber 3%;R2= crude fiber 6%;M1P1=which fiber 100IU manase and 250 ppU phytase;M1P2=which fiber 100IU manase and 5000ppU phytase;M2P1=which fiber 200IU manase and 250ppU phytase;M2P2= which fiber200Iu manase and 500 ppU phytase, word which different at colum indicate p<0,05.

Keshavarz (2003) showed that an increase in the egg size or egg weight resulting in a decreased thickness of eggshell and weight eggshell (as a percentage of the weight of egg). Li-Chan *et al.* (2008) showed that the proportion of egg white is influenced by the type of livestock, the environment, the size of egg and the level of production. The percentage of the egg white in this study ranged from 45.15%-51.52% and this result in the normal range. Yuwanta (2010) showed that heavy white quail eggs are normal ranges from 2.5-6 g/egg with percentage egg white 52-60%, while according to Nys and Guyot (2011) showed that the quail has percentage of egg yolk 30%-33%, egg white 52%-62%, and eggshell 7%-9%. Rajkumar *et al.* (2009) showed that the egg size is more related to the size of egg yolk in comparison with albumen. Despite the fact that albumin is still important to determine egg size. Nys and Guyot (2011) showed that egg quail have egg yolk proportion 30%-33%.

The value of the haugh unit (HU) is a value that reflects the state of egg albumen which is useful for determining the quality of the eggs. The high of HU shows quality of eggs are also high (Hardianto et al. 2012). HU more than 72 categorized as egg quality AA, HU 60-72 as quality egg A, HU 31-60 as egg quality B and HU less than 31 categorized as egg quality C (USDA 2011). Eggshell consists of 96% of calcium carbonate and the rest was other organic components (Hincke et al. 2008). Quality of eggshell can be influenced by many factors including minerals, such as calcium, magnesium and phosphorus which is inorganis elements of eggshell (King'ori 2011). Kebreab et al. (2009) showed thtat the higher calcium intake can improve the quality of eggshell. The color of the yolk in this research by addition crude fiber 6% hav egg yolk color better than with crude fiber 3% was justified because the influence of feeding corn and cgm at a high crude fiber 6%.

Conclusion

The increase in crude fiber in diet of laying quail can eggshell weigh, egg white and yolk colour score at the treatment of 6% crude fiber.

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Production Performances of Broiler Chicken Fed on Diets Containing Different Levels of Crab (*Portunuspelagicus*) by- Product Meal

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Abstract

Crab (*Portunus pelagicus*) production in Indonesia steadily increases each year and the by-product has not been optimally utilized, even some of it pollute the environment. The objective of this study was to evaluate the effects of incorporating different levels of crab by-product meal (CPM) in broiler chicken diet on weight gain and feed conversion ratio (FCR), carcass and abdominal fat yield. A hundred of six days-old chicks were randomly allocated into four dietary treatments with five replications in which each replicate consisted of five chicks. The dietary treatments were formulated using corn, rice bran, concentrate, crude palm oils, vitamin/mineral mixture, and CPM at 0, 40, 60 and 80 g/kg. Feeds were provided *ad libitum* and drinking water was always available. Feed intake was measured daily and body weight was recorded weekly. At the end of the 5th week the chicken were slaughtered by cervical dislocation for measuring carcass and abdominal fat yield. The results showed that levels of CPM diets did not significantly ($P > 0.05$) affect feed intake, weight gain, and carcass weight. However the FCR of chicken fed on diet containing 60 g/kg CPM was not significantly different from control but the FCR of chicken fed on diet with 80 g/kg CPM was significantly higher ($P < 0.01$) and abdominal fat tended to be lower than others. The results indicate that crab by-product meal can be included in broiler diet up to 6%.

Keywords: Broiler, crab by-product meal, weight gain, carcass, abdominal fat

Introduction

Feed industry in Indonesia is highly reliant on imported raw materials, as local production is insufficient and typically available in remote areas located far from feed mills. Consequently, 50-80 percent of raw feed materials are imported, and this is very much influenced by exchange rate. As the exchange rate fluctuate so does the price of feed material. Therefore there is a need to find a cheap and locally alternative feed material for poultry feeding. One alternative to be explored is the use of crab by-product meal (CPM).

Indonesian crab production is estimated 200.000 tons annually which is 50-60% of total production consists of waste in the form of crab shell which has not been optimally utilized and some of it pollute environment. Proximate analyses in our laboratory showed that CPM contains approximately 21% protein, 1.5% fat, 55% ash, and 12.5% fiber (Wiryawan et al. 2015). Besides, it contains significant amount of chitin, an insoluble polysaccharide having ability to bind dietary lipids, thereby reducing intestinal lipid absorption (Koide 1998). The objective of this study was to evaluate the effect of incorporating different levels of CPM on weight gain, carcass percentage and abdominal fat yield of broiler chicken.

Methodology

A total of 100 six-days-old broiler chicks were randomly allocated into four groups of dietary treatments with five replications in which each replicate consisted of five chicks housed in wire cages at an average temperature of 30°C for 5 weeks. The diets were formulated using ground yellow corn, rice bran, concentrate, crude palm oils, vitamin/mineral mixture, and crab by-product meal (CPM) was included at 40, 60 and 80 g/kg (Table 1).

Table1. Ingredient and chemical composition of experimental diets

Ingredient (g/kg)	Levels of CPM (g/kg)			
	Control	20	40	80
Corn	540	530	530	530
Rice bran	100	90	80	60
Crude palm oil	20	20	20	20
Premix*	10	10	10	10
CPM	0	40	60	80
Concentrate	330	310	300	300
<i>Analyzed composition</i>				
Crude Protein (%)	18,89	18,74	18,65	18,85
ME (MJ/kg)**	12,29	12,17	12,15	12,14
Crude Fiber (%)	4,86	5,06	5,11	5,11
Ca (%)	1,00	1,86	2,29	2,74
P (%)	0,80	0,78	0,77	0,75
Crude fat (%)	5,87	5,76	5,70	5,63

*Mineral B12 produced by EkaFarma, per 1 kg contains Ca 48-50%= 13-15%, Fe + 40.000 mg, Mn=27.500 mg, Iodium = 500 mg, Cu= 2000 mg, Zn=25000 mg, Vitamin B12= 4.50 mg, Vitamin D3 =500.00 IU.;

**calculated value

Feed and water were provided *ad libitum* throughout the experimental period. Feed intake was recorded daily and body weight was measured weekly. At the end of experimental period, the chicken were fasted for 24 h with free access to drinking water, then killed by cervical dislocation and eviscerated. Carcass and abdominal fat yield were weighed.

All data were analyzed using the GLM procedure of the SAS[®] software (1990). The mean values were compared using the Least significant difference assay.

Results and Discussion

Feed intake and body weight gain were not significantly affected ($P>0.05$) by increasing levels of CPM up to 80g/kg (Table 2), but numerically weight gain of birds received diet with 40. 60 and 80 g/kg CPM were 2.6, 6.9 and 6.0% less than those received control diet. Although the birds given diet with 80 g/kg CPM numerically consumed more feed compared with birds fed on control diet or diet with 40g/kg CPM, their body weight gain were lower. This is in line with results of our study with quail in which egg production slightly decreased and feed conversion (FCR) increased when the birds were fed diet containing 8% CPM (Wiryawan et al. 2015) but the differences between control and birds received diet with 60g/kg CPM were not significant. Although FCR for birds consuming diet with 80g/kg CPM was significantly ($P<0.01$) higher than other treatments. FCR for birds received diets containing 40 and 60 g/kg CPM were not significantly different ($P>0.05$) from control.

Table 2. Feed intake, body weight gain and carcass of broiler given diets with different levels of CPM^{1,2}.

Parameters	Levels of dietary CPM				SEM
	0%	4%	6%	8%	
Feed intake (g)	1875.87 ^a	1891.11 ^a	1775.86 ^a	1985.58 ^a	63.92
Weight gain (g)	883.00 ^a	859.98 ^a	821.62 ^a	829.74 ^a	23.43
FCR (feed/gain)	2.12 ^b	2.19 ^b	2.17 ^b	2.39 ^a	0.04
Carcass (%)	68.04 ^a	69.16 ^a	67.84 ^a	67.20 ^a	0.87
Abdominal fat (% carcass)	2.00 ^a	2.27 ^a	1.95 ^a	1.35 ^a	0.28

¹Values are means of 5 measurements; ²Values in the same row with different superscripts are significantly different (P<0.05); SEM = pooled standard error of the mean

This indicates that CPM can be included in broiler diet up to 60 g/kg without adverse effect on feed efficiency. In terms of carcass and abdominal fat yield, results of this experiment showed that increasing levels of CPM in broiler diet did not significantly (P>0.05) affect carcass weight and the abdominal fat yield. However, the percentage of carcass and abdominal fat yield of birds received diet with 80 g/kg CPM tended (P=0.1774) to be lower than the birds given control diet.

The reduction of body weight gain and less efficient feed utilization in birds given diet containing 80 g/kg CPM in this study may be associated with chitin and high Ca content of CPM. Chitin, an insoluble polysaccharide has ability to bind dietary lipids, thereby reducing intestinal lipid absorption (Koide 1998; Jimenes-Morino & Mateos 2014). In addition, chitin may not only decrease digestibility of dietary lipid but also decrease digestibility of other nutrients by means of its low digestibility and/or by inhibition of digestibility of other nutrients (Zhang et al. 2008).

Conclusion

Feed consumption, weight gain, carcass and abdominal fat yield, and FCR of broiler chicken fed on diets containing 40 and 60 g/kg CPM were not significantly different from those fed on control diet. Increasing levels of CPM in broiler diet higher than 60 g/kg resulted in reduction of growth performance.

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Serum Lipid Profile and Egg Quality of Layer Fed Boiled Tomato Waste

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Abstract

An experiment was conducted to measure serum lipid profile (total cholesterol, LDL, HDL), and egg quality (egg yolks cholesterol, egg yolks fat, and egg yolks color) of two hundred Isa brown layers fed diet which was included boiled tomato waste powder. Experiment was performed in completely randomized design with five different levels of boiled tomato waste powder in diet (0, 3, 6, 9 and 12 %), and each treatment was replicated four times. Measurement of parameters was done for total cholesterol, LDL, HDL of blood serum, and total cholesterol, yolk color, and fat content of egg yolks. Result of the research showed that the total cholesterol, LDL, HDL of layer blood serum, and fat content of egg yolks were not significantly ($P > 0.05$) affected by boiled tomato waste powder in diet. While, the treatments affected significantly ($P < 0.05$) total cholesterol and egg yolks color. In conclusion, inclusion of 12% of boiled tomato waste powder in layer diet was the best level for lowering total cholesterol and improves egg yolk color.

Keywords: *boiled tomato, layer, serum, egg yolks color, egg yolks cholesterol*

Introduction

Diversification and feed substitute with agro-industry waste is an attempt to address the scarcity of feed and reduce the price of the ration. Our previous study showed that juice waste mixture can be used as an alternative feed in replacing a part of corn in broiler diet (Rizal *et al.*, 2010; Mahata *et al.*, 2012; Mahata *et al.*, 2013). In several time, tomato was produced in over production in some places in Indonesia, and tomato price become cheaper and farmers so loss. In some tomato production centers, there is still no tomato processing industry, so that fresh tomato become waste when over-production time, and discarded by farmers around their fields, because farmer do not have skills for processing tomato. Tomatoes contain high lycopene that can act as anti-oxidants, and inhibits cholesterol synthesis. According to Furman and Aviram (1997), the mechanism of lycopene in inhibiting of cholesterol synthesis is by inhibiting the activity of enzyme 3-hydroxy-3-methylglutaryl-CoA reductase (HMGCR). Lycopene produced by plants in the trans form structure, and is poorly absorbed. Heating the tomatoes will affect the lycopene in tomatoes. Boiling tomatoes at a temperature of 100°C for 8 minutes will damage the cell wall of tomato thereby increasing the availability of free lycopene without damaging its structure (Thompson *et al.*, 2000). Our previous research showed that, the inclusion of boiled tomatoes to 7% in broiler diet is highly effective in the regulation of lipid metabolism in a positive manner. Furthermore, we conducted research by including boiled tomato in layer diet to see its effect on serum lipid profile and quality of eggs.

Methodology

The experiment was conducted at layer farm in Padang Pariaman, West Sumatera Province, Indonesia, by using of two hundred Isa brown layers with 80 % hen day egg production (HDEP) condition, and observation length was 30 days. Boiled tomato waste powder was prepared by boiling fresh tomato waste in boiled water (100°C) for 8 minutes (Thompson *et al.*, 2000), and then directly drying under sunlight before grinding become powder. The experiment was performed in completely randomized design with five different levels of boiled tomato waste powder in diet (0, 3, 6, 9 and 12 %), and each treatment was replicated four times. Diet was arranged iso-protein (16 %), and iso-calory (2990 kkal/kg). Measurements: total cholesterol, LDL, and HDL, of blood serum by enzymatic colorimetric (Elitechgroup, 2012), total cholesterol of egg yolks by Liebermen and Burcard (1980), egg yolks fat content by proximate analysis, AOAC (1990), and egg yolks color by roche yolk color fan. Data obtained were statistically analyzed by analysis of variance. The different among treatments were determined by using Duncan Multiple Range Test (DMRT) according to Steel and Torrie (1990).

Results and Discussion

The mean value of total cholesterol, LDL, HDL of layer blood serum, and total cholesterol, fat content, and color of egg yolks were depicted in Table 1.

Treatment	Cholesterol total in layer blood serum (mg/dl)	LDL total in layer blood serum (mg/dl)	HDL total in layer blood serum(mg/dl)	Egg yolks cholesterol in dry matter basis (mg/100g)	Egg yolks fat content in dry matter basis (%)	Egg yolks Color
B.Tomato (0 %)	150.13	44.25	37.75	662.09 ^d	54.93	6.98 ^c
B.Tomato (3%)	158.92	45.00	46.50	621.85 ^{bc}	55.13	9.12 ^b
B.Tomato (6%)	110.08	42.25	37.75	643.03 ^{cd}	56.24	9.57 ^b
B.Tomato (9 %)	106.39	36.00	38.67	585.15 ^{ab}	54.58	10.41 ^a
B.Tomato (12 %)	118.28	40.33	48.67	560.92 ^a	56.21	10.35 ^a
Sign	Ns	Ns	Ns	**	Ns	**

B. Tomato: Boiled tomato, Ns: not significantly different, **: Significant different

Data in Table 1 showed that total cholesterol, LDL and HDL of Layer blood serum were not significantly ($P>0.05$) affected by all levels of boiled tomato in diet. It appeared that increasing boiled tomato waste powder in diet lowering total cholesterol and LDL tremendously, while for HDL increased. We predicted that cis-lycopen concentration in boiled tomato could decrease the cholesterol and LDL in this experiment, but we suspected the observation period was not longer (only 30 days), we predicted prolonged observation will affect total cholesterol, LDL and HDL significantly. Total cholesterol of layer blood serum (106.39 to 158.92 mg/dl) found in this experiment was almost imitate with total cholesterol of layer blood serum value (115.50 to 126.60 mg/dl) reported by Ramesh *et al.* (2009), while the LDL (17.33 to 28.50 mg/dl), and HDL (78.98 to 86.76 mg/dl) were higher than LDL and HDL value found by Ramesh *et al.*(2009) as much as 36.00 to 45 mg/dl, and HDL 37.75 to 48.67 mg/dl respectively. Egg yolk cholesterol affected by boiled tomato waste significantly ($P<0.05$). Increasing of tomato boiled waste level in diet lowering cholesterol total in egg yolk, and tomato boiled waste 9 and 12 % in diet affected egg yolks cholesterol similarly, this shown that cis-lycopen in boiled tomato affected cholesterol synthesized

especially for cholesterol disposition in egg yolk. The scoring of egg yolks color increased by increasing of boiled tomato waste in diet. Boiled tomato waste contain cis-lycopen that coloring the egg yolk, and the inclusion of 9 to 12 % boiled tomato waste in layer diet were higher coloring effect on egg yolk pigmentation in comparing with the other level of boiled tomato waste in diet. According to Kang *et al*, (2003), the addition of lycopene above 4 µg/g meal significantly improved yolk color after four days of supplementation.

Conclusion

The inclusion of 12 % tomato boiled in layer diet is the best treatment for lowering cholesterol and improving egg yolks coloring.

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Optimalisation Usage of Feed Additives on Low Protein Diet for Broiler Raised in the Tropical Region

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Abstract

The objectives of this research was to investigate the effects of low dietary crude protein on chicken broiler performance (weight gain, feed consumption, and feed conversion ratio).. The experiment method was used 3 x 3 x 2 factorial arrangement. 270 broiler chicks were allocated to 18 treatments with 3 replicates of 5 chicks/replicate. Basal diets are typical local diets from East Nusa Tenggara Province of Indonesia. The experimental diets were diet with crude protein 20% as control, crude protein 18% and crude protein 16%. In each treatment added lysine 1.10%, 1.20% and 1.30%.. Then every treatment there is a given enzyme protease and without being given a protease enzyme. Birds fed the low-protein diets (18%) supplemented with enzyme and lysine showed significantly better performance than those without feed additive.

Keywords : broiler, low protein, enzyme, lysine

Introduction

Poultry farms in the tropical regions, especially in east Nusa Tenggara Province Indonesia have a very important role in the supply of meat, because the demand for meat from year to year is continuously increasing. However, poultry production in the tropical region is still need to be improved. One of the constraints in the development of the poultry industry in eastern part of Indonesia is the high price of feed. The use of high-protein feed will also result in increased cost of production. Because protein feed materials is the most expensive ingredient. To reduce the feed cost, it is necessary to study the use of a low protein but sought improved efficiency. One effort to increase the feed efficiency is the use of enzymes in the diet as a feed additive nonnutritive (Choct, 2006). Farmers and feed industry still needs a lot of information about the application of poultry feed additives to improve the quality of local feed ingredients in tropical regions. Anti-nutritive substances contained in some of the local raw materials become a barrier for farmers to take advantage of the abundant local resources. Given this research, is expected that feed additives can improve the quality of local feed ingredients, which in turn can improve chickens performance. In the tropical regions with an average daily temperature of more than 27°C, the use of high protein chickens feed during grower phase is relatively less efficient. This is due to the high protein will increase heat production in the chicken's body due to increased heat stress results from the process of protein digestion. Chicken fed low protein feed have been shown to dissipate less heat (Aftab et al, 2006).

Methodology

Broiler chickens were transported from the Poultry Shop at day-old to the Poultry Unit at the University of Nusa Cendana. From day 1 to day 21, the chicks were fed *ad libitum* on commercial broiler starter crumbles prior to commencement of the experiment. From day 21 up to 42 days of age the birds were given experimental diets. Experimental diets were mixed one day before experiment. All diets were optimized to the same ME level (12.7 MJ/kg feed) and to the same nutrient content. The experiment method was used 3 x 2 x 2 factorial arrangement. 270 broiler chicks were allocated to 18 treatments with 3 replicates of 5 chicks/replicate. Basal diets are typical local diets from East Nusa Tenggara Province of Indonesia. The experimental diets were as follows:

1. Diet with crude protein (CP) 20% as control
2. CP 18%
3. CP 16%

In each treatment added lysine 1.10%, 1.20% and 1.30%. Then every treatment there is a given enzyme protease and without being given a protease enzyme. So in total there are 18 feed treatment. The selection and allocation procedure was such that the mean group weights were the same and contained a similar range of body weights; birds with extreme low or high body weight were discarded as were sick birds. Birds were monitored several times each day for the duration of experiments. Mortality was recorded daily and the weight of dead birds was recorded.

Statistical analysis

Data were subjected to ANOVA procedures appropriate or completely randomized design by using the General Linear Model (GLM) procedure of SAS software. The significant level was set at $P < 0.05$ and, if the F-ratio indicated significance, the differences between the means were separated using the Least Significant Difference test..

Results and Discussion

The result of the experiment indicated that low protein diet supplemented with enzyme had significant effect ($P < 0.05$) on broiler average weight gain, feed consumption, and feed conversion ratio. The results show that low protein diet with feed additive supplementation improved the growth performance of broiler chickens in comparison to formulation on low protein diet without feed additive supplementation. Similar results has been obtained by Ramesh and Devegowda. (2009) in their study, when birds fed low crude protein diets supplemented with protease (*Bacillus licheniformis*) at dose 200 mg/kg and more have better growth performance results as birds fed control diets. The final body weight was higher and FCR was lower in groups of chickens fed diets with protease supplementation compare to control diet. On the other hand, Kaczmarek and Rutkowski (2009) observed that there was a partially improvements in FCR and higher weight gain in low protein diets supplemented with exogenous protease compare to normal protein level diet. Some other authors that used a protease from *Aspergillus niger* showed higher feed intake and weight gain. These improvements in growth performance parameters can be due to improve digestibility in ME and crude protein.

Conclusion

In conclusion, growth performance of broiler chickens fed low protein diet supplemented with enzyme protease gave better performance than those fed standard protein level without feed additive supplementation.

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Oral Presentation 5 Focus Session:
Livestock Production System
Friday, 21 October 12:30-15:00
Room: Anjasmoro

Estimating Yield Grade by Using Body Measurements and Body Condition Score in Thin-Tailed Sheep

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Abstract

This research was aimed to determine the relationship between body measurements (chest girth, body length, height of shoulder) and body condition score (BCS) with yield grade on 73 Thin-tailed sheep aged about 0-2 years. The results revealed a moderate correlation between chest girth ($y = 0.0028x + 0.2997$; $r = 0.5041$), body length ($y = 0.0027x + 0.3326$; $r = 0.4693$) and height of shoulder ($y = 0.0028x + 0.3120$; $r = 0.4219$) with yield grade. The relationship between BCS with yield grade also resulted moderate correlation coefficient ($y = 0.0597x + 0.3204$; $r = 0.4123$). Estimating yield grade by using body measurements and BCS could therefore be a tool for production improvement without slaughter the sheep. Chest girth measurements would be the best to estimate yield grade value in Thin-tailed sheep.

Keywords: *body measurements, body condition score, yield grade, Thin-tailed sheep*

Introduction

Thin-tailed sheep are a local sheep that used as an important part of farming, especially by a traditional farmer because of low-cost maintenance and prolific characteristic. The farmer and livestock market usually determine live weight on management or marketing system. Properly measure of this trait is often difficult because of unavailability of weighing scale (Bello and Adama, 2012). In addition, body measurements could be used to predict live weight fairly well in the situation where weighing scale is not available (Afolayan *et al.*, 2006).

Carcass weight has positive correlation with live weight and could be estimated by carcass percentage. Male Thin-tailed sheep fed by soybean curd waste had carcass percentage about 43.85-49.81% of live weight (Rianto *et al.*, 2014). Higher live and carcass weights, higher yield grade value (Adeyinka and Mohammed, 2006). Yield grades reflect the quantity of retail cuts that can be expected from a carcass. Lower yield grade value, higher the amount of retail cuts from the leg, loin, rib and shoulder (Burson and Donae, 1983). The yield grade is important to producers because it can affect animal value and the overall economic returns from the animal (Holland and Loveday, 2013). Yield grade could be calculated by measuring fat thickness between the 12th and 13th ribs over both ribeyes at the midpoint of the ribeye (Burson and Donae, 1983). But, this estimation of yield grade needs some stages of calculation and only can be applied in dead sheep. Alternatively, body measurements could be used to reach carcass quality target without slaughter the sheep.

Body measurements and body weight for a ewe from a large breed may be identical to that of a ewe from a small breed, but the level of body fatness will be very different. So, body condition score (BCS) is a useful tool of comparing one sheep to another (Fernandez, 2012) based on a simple indicator closely associated with the body composition (Nsoso, 2003).

Therefore, the objective of the present study was to determine the relationship between body measurements (chest girth, body length, shoulder height) and body condition score with yield grade in Thin-tailed sheep.

Methodology

The data for this study were obtained from 73 female Thin-tailed sheep aged about 0-2 years in Bustaman slaughterhouse, Semarang, Indonesia. Instruments used in this study were a metric tape rule, measuring stick, labeled tie and a caliper.

Sample data were collected by incidental sampling, where all of female Thin-tailed sheep recorded as the data. Labeled tie was set on right back leg of the sheep for identification. Chest girth was measured by wrapping metric tape rule in the back of the scapula. Body length was measured by placing measuring stick start from tuber ischii until tuberous humeri. Height of shoulder was measured by placing a measuring stick at the top of the shoulder straight to the ground. Body condition score (BCS) was determined by feeling the muscle and fat along the backbone between the last rib and the front of the hip bones (Fernandez, 2012). BCS was rated in 5-point scale (ranging from 1 for skinny to 5 for fatty, representing emaciated, poor, acceptable, fat or obese animals, respectively) (Yakubu *et al.*, 2013). Measured fat thickness by using a caliper between the 12th and 13th ribs. Yield grade was calculated by using the formula (Burson and Donae, 1983): $0.4 + (10 \times \text{adjusted fat thickness in inch})$. The data were analyzed by correlating body measurements (chest girth, body length, height of shoulder) and BCS with yield grade. The formula was equated as $Y = ax + b$, where every increment of x will increase Y as much as a . Based on Sugiyono (2014) interpretation correlation coefficient are very low (0.000-0.199); low (0.200-0.399); moderate (0.400-0.599); strong (0.600-0.799) and very strong (0.800-1.000).

Results and Discussions

The data distribution of chest girth, body length, height of shoulder, BCS and yield grade from 73 female Thin-tailed sheep are summarized in Table 1.

Table 1. Data Distribution of Chest Girth, Body Length, Height of shoulder, BCS and Yield Grade of Thin-tailed Sheep

Parameter	Range	Mean	Standard Deviation	CV (%)
N	73			
Chest girth (cm)	43.00-72.00	56.05	5.99	10.69
Body length (cm)	33.00-62.00	45.67	5.74	12.57
Height of shoulder (cm)	42.00-68.00	51.99	5.04	9.69
BCS	1.70-3.10	2.30	0.23	10.00
Yield grade	0.44-0.56	0.46	0.03	6.52

The data above show that body length had the highest coefficient varian (12.57), followed by chest girth (10.69), BCS (10.00), height of shoulder (9.69) and yield grade (6.52). All the coefficient varian were less than 15%, so the animals used in this study were similar.

Correlation between body measurements and yield grade

Correlation between body measurements (chest girth, body length, height of shoulder) and yield grade is shown in Figure 1. Chest girth had the highest correlation coefficient ($r = 0.5041$; $y = 0.0028x + 0.2997$; $R^2 = 0.2541$), followed by body length ($r = 0.4693$; $y = 0.0027x + 0.3326$; $R^2 = 0.2203$) and height of shoulder ($r = 0.4219$; $y = 0.0028x + 0.312$; $R^2 = 0.1780$).

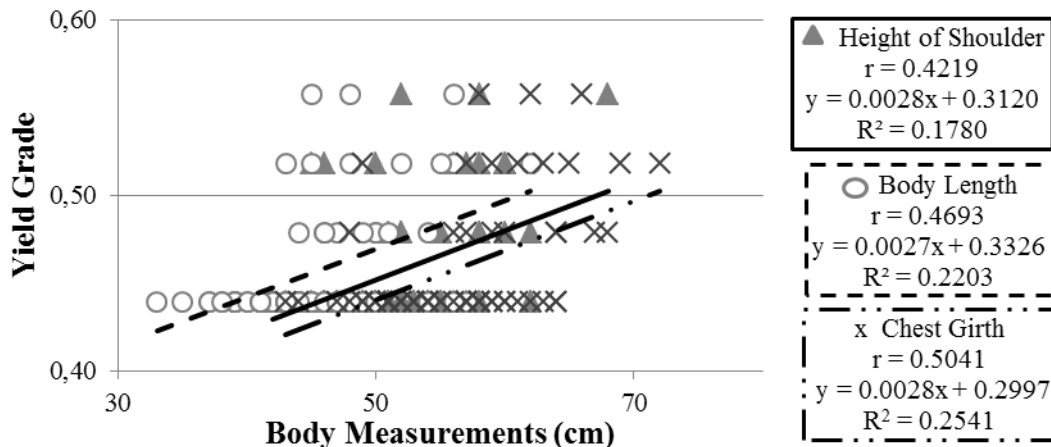


Figure 1. Correlation Between Body Measurements (cm) and Yield Grade

Increment of body measurements will increase live weight, carcass weight and fat thickness that could represent yield grade value. High feed consumption causes higher live weight and bigger fat deposition (Purbowati *et al.*, 2007). When the nutrition are fulfilled, excess protein and energy would be deposited as fat. High concentrate feeding would lead fat deposition especially subcutan fat. Long time fattening also give real impact to the fat thickness because of accumulation of fat deposition would increase time by time (Khasrad *et al.*, 2005).

Chest girth and yield grade became the best correlation because chest girth could figure sheep's body volume. Chest girth as the best predictor in small ruminant also been reported by Bello and Adama (2012) in Savanah Brown goats; Adeyinka and Mohammed (2006) in Nigerian red Sokoto goats.

Correlation between BCS and yield grade

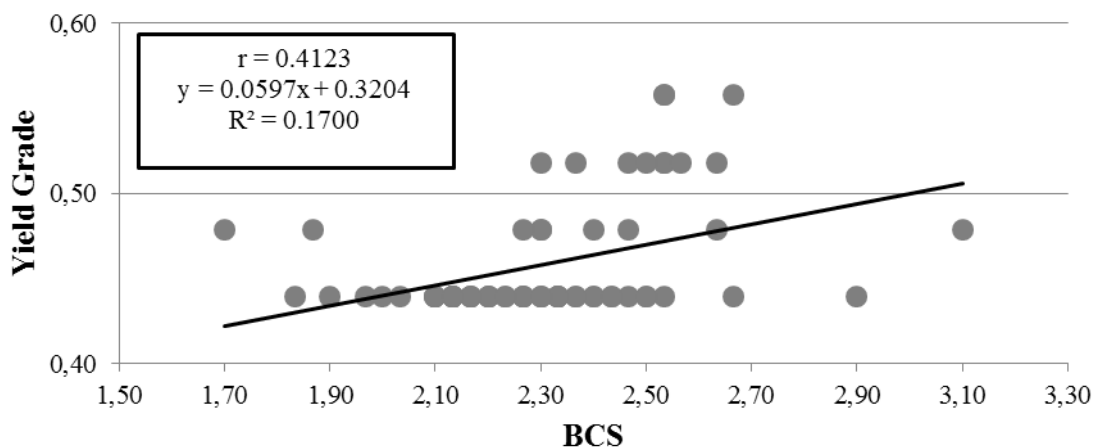


Figure 2. Correlation Between BCS and Yield Grade

Figure 2 shows correlation between BCS and yield grade ($r = 0.4123$; $y = 0.0597x + 0.3204$; $R^2 = 0.1700$). BCS could be used to estimate yield grade because it had moderate coefficient correlation. BCS is a potential tool to increase production efficiency and more accurate than a simple eye appraisal. BCS is based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region. (Thompson and Meyer, 1994).

BCS is correlated with the proportion of fat or a direct measurement of backfat depth. It is providing a better estimation result rather than body weight alone (Yakubu *et al.*, 2013).

Conclusion

According to the results of this study, there were moderate correlation between body measurements and body condition score with yield grade. Therefore, it was concluded that the estimation of yield grade from body measurements and BCS could be a tool for production improvement without slaughter the sheep. Chest girth measurements would be the best to estimate yield grade value in Thin-tailed sheep.

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Exploration of Fecal Physical Test to Estimate Weaning Age of Kids

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Abstract

This research was carried out to assess the correlation of kid's age and fecal characteristic as a method to identify rumen development. Ten doe with fifteen kids (male and female) aged less than ten weeks were used in this study. The parameter observed was fecal extended level. Fecal extended level was measured from 3 pieces feses of each kid, and they were placed in the modified FEL equipment. The data were analyzed using correlation-regression to find the correlation between fecal characteristic and kid's age. The result showed that there was a strong but negative correlation (-0.822) between kid's age and fecal characteristic, following the equation of $Y = 2.5261X^2 - 49.868X + 285.06$. As the kid getting older, the percentage of fecal extended was decreasing, but from age of 9 to 10 weeks the result tended to remain constant. From age of 3 weeks to 8 weeks of age, the fecal extended was decreased by more than 110% (from 158% to 47.8%), but from 8 to 9 and 10 weeks of age, the fecal was only decreased by 7.0 and 1.8% or from 47.8 to 40.8 and 39.0%, respectively. It can be concluded that the percentage of feces extended is decreasing linearly with the age of kids. The prediction of weaning age of kid based on percentage of fecal extended was the best on 8-10 weeks with average of 9 weeks of age.

Keywords: *kids, fecal, weaning age*

Introduction

Goat is one of the animal farms that raised traditionally as a side business. The nutrient requirement of goat was not fulfilled. Therefore, their productivity cannot be optimized. So, to assess the productivity of doe, can be seen from litter size.. The more number of kids, more benefit for farmer. Increasing the number of kid, can be done by shorten the kidding interval. Kidding interval can be shortened by shortening the weaning age. The weaning age is correlated with rumen development of kid. Kid's rumen will evolve gradually. At the beginning of the birth, the kid's requirement can be fulfill from milk. But as time passes, doe's milk cannot fulfill the nutritional requirement of kid. Therefore, the kid starts consume forage and concentrates. The kid's rumen is not fully developed before the seventh week, so the kid dependency on doe's milk until the kid reached the age of seven or eight weeks (Sitorus, 2004). This change of feeds source may affect on rumen development and change on fecal characteristic. Since the weaning period is critical point for successful animal farmer, knowing the appropriate weaning period is important.

Generally, weaning age on kids done at a hundred days (Sulastri, 2003). Weaning process correlates with rumen development. Rumen development will affect on digestibility process, so it will affect the shape of feces particles. Theoretically, the more degradable feed, the particle became smaller. This condition could affect on shape and size of feces particles.

Therefore, allegedly the feces shape and characteristics can be used as a method for predict appropriate weaning age.

Experimental Animal and Diet

Ten doe with fifteen kids (male and female) aged less than ten weeks were used in this study. The goats were placed in individual cage and fed forages and concentrates. Concentrate was given once a day. Forage and fresh water were given ad libitum. Concentrate was given in early morning before forage.

Fecal Characteristic Measurement

Total collection method was used in this study for collecting feces during 7 days collection. Fecal sample was used to determine feces characteristic. Feces characteristic were measured using fresh feces. Each measurement was done using 3 pieces of feces as replication. Feces extended level was measured by placing the feces on modified fecal extended level (FEL) equipment. The working procedures of this study were, firstly, the FEL equipment pulled up for 300 g and it loaded to the height of 7 cm from the bottom, then the feces were placed on the point vertically of the load (it was already covered with milimeter block) and they released (without pressure) so that they already fell down and the feces got flattened and the surface of feces became more wide. The value of FEL was determined by subtracting the wide area after flattened with the wide area before flattened, then value of FEL was calculated in the percentage.

$$X = \frac{\Delta \text{fecal diameter post-flatened (mm)} - \text{diameter feces intact (mm)}}{\Delta \text{diameter of feces intact (mm)}} \times 100\%$$

Statistical Analyses

The data observed was used to find the correlation between the age of kid and the percentage of feces extended using the regression correlation method. The dependent variable (Y) was the feces extended, while the independent variable (defined by X) was the age of kid. A coefficient correlation (r) was used to determine the strength of correlation in range 0 to 1.

Results and Discussion

The result of best correlation between kid's age (week) and fecal extended (%) was found quadratic linear regression which is presented in Figure 1. The correlation value was found strong but negative (-0.822) following the equation of $Y = 2.5261X^2 - 49.868X + 285.06$. The figure showed that increasing age of kid resulted in decreasing percentage of flatness, but from age of 9 to 10 weeks tend to constant. From age of 3 weeks to 8 weeks, the fecal extended was decreased by more than 110% (from 158% to 47.8%), but from 8 to 9 and 10 weeks only decreased by 7.0 and 1.8%, being from 47.8 to 40.8 and 39.0%, respectively.

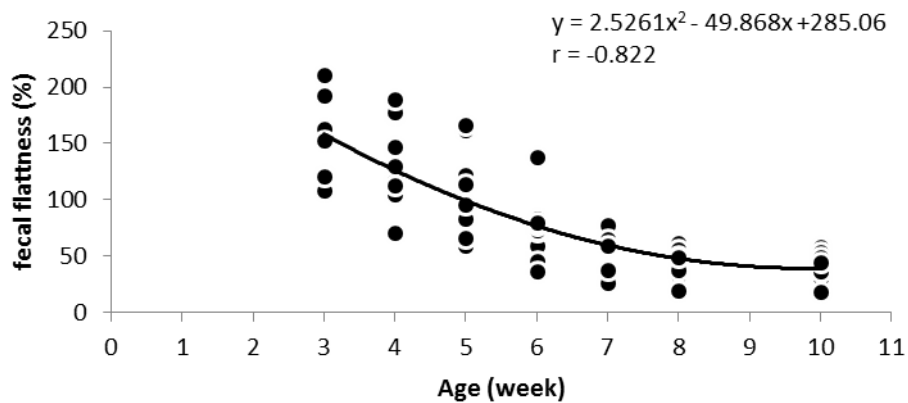


Figure 1. Correlation of age with percentage of flatness of kid feces

The decrease of fecal extended percentage is influenced by the texture of kid feces. Santoso *et al.* (2015) stated the harder texture of feces the lower the level of fecal extended, or on the other hand, soft texture makes the level of feces extended higher. This condition might be considered related to the rumen development, which starts to work properly when a kid reach 8 weeks old Widiyono *et al.* (2003). When the rumen started working properly then the kid's digestion system working optimally, therefore only in harder indigested solid feed that being excreted. Thus, it causes the decrease of feces extended percentage. However, there is another possible reason relating to the kids grow, the nutrient requirement will increase while the milk production of doe is not enough for kids that lead the kids to consume solid feed (roughage) provide for the doe. Therefore, the fecal texture will change to be harder. Wodzicka-Tomaszewska (1991) stated that milk is the highly digestible energy source with high quality protein. According to Hafez and Dyer (1969) the level of roughage in the ration affects the quantity of water in feces.

From the equation developed using correlation of age (week) and percentage of fecal extended, it can be predicted that the proper time for weaning is 8-10 weeks due to those week the fecal extended is already stable and at the lowest point. Low percentage of fecal extended showed that a kid was started to eat solid feeds and not dependent on mother's milk. The result of the research was not far from the research of Maryadi *et al.* (1985) who reported that Domas I and Suffas I sheep could be weaned at the age of 60 days (equal to 8 weeks), and have higher daily body weight gain after weaning than those being weaned at age of 90 days (13 weeks).

Conclusion

From the result of the research, it can be concluded that the percentage of feces extended is decrease linearly with the age of kids. The prediction of weaning age of kid based on percentage of fecal extended was 8-10 week with average of 9 weeks.

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Lactation Curve Pattern and Milk Production Performance of Crossbred Friesian Holstein in Pasuruan Regency, Indonesia

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Abstract

The aim of this research was to study about lactation curve pattern and milk production performance of crossbred Friesian Holstein (PFH) in Pasuruan Regency. The milk production data from 160 cows at different parities was record using once a week and analyzed using descriptively. Result show that total milk production in the 1st, 2nd, 3th, 4th and 5th lactation were 3649.05 lt; 4513.70 lt; 5539.61 lt, 4451.20, 4451.20 lt and 4105.11 lt respectively. The peak production in 1st, 2nd, 3th, 4th and 5th lactation were 15,46 lt, 20 lt, 24.1 lt, 22, 2 lt and 17,8 lt. For all lactation period peak production were achieve in 4 weeks lactation. Gestation more than five month decreasing milk production (persistency) 9,25%, while gestation less than five month decreasing milk production 8.72%. It was concluded that milk production in Nongkojajar, Pasuruan Regency is good enough for Indonesia standar, due to average milk production is more than 15lt/ days.

Keyword: *Friesian Holstein, milk production, curve lactation*

Correlation of Protein Level in the Diets on Yield Grade and Rib Eye Muscle Area of Post-Weaning Lamb

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Abstract

This study was set up to investigate the correlation between crude protein (CP) levels on yield grade and rib eye muscle area in post-weaning lamb. Twelve post-weaning lambs aged ± 3 months and body weight ± 25.82 kg (CV=13.71%) were used in this study. The lamb was grouped into three for the levels of CP (12, 14 and 16%) of the feed. Total digestible nutrients (TDN) of the feed was 60% which given *ad libitum*. The lambs were slaughtered after three months rearing period. Parameters measured were yield grade and rib eye muscle area. Yield grade was determined by using backfat thickness at the 12th rib (surface area LD muscle) following the formula of $0.4 + (10 \times \text{backfat thicknesses in inches})$. Rib eye muscle area measurements was on the rack of ribs of 12nd and 13rd by using millimeter block and glass. All data were analyzed using correlation analysis. The results showed that protein levels in the diets has low correlation with the yield grade value and the rib eye muscle area, being 0.136 and 0.166, respectively. It can be concluded that protein levels in the feed has low correlation on the yield grade and rib eye muscle of post-weaning lambs.

Keywords: weaning lamb, yield grade, rib eye muscle area.

Introduction

Thin tailed sheep had been known as the local sheep in Indonesia which has an advantage in adapting to the tropical climate conditions (Marniati, 1989). The thin tailed sheep expected to solve the problems of meat production in Indonesia. Fattening weaning lambs can be a solution to fulfill meat needed and its productivity can be expected sooner so that the meat production in carcass also can be increased.

Based on the problem, feeding management important to note that quality and quantity of meat can be produced as expected. One of the ways to increase feed quality is increasing protein content (Prakoso et al., 2009). The feed with great protein content is needed in young ruminants to grow rapidly (Soeparno, 2005).

Yield grade is indicated as meat produced on the main pieces of carcass (Soeparno, 1998). Yield grade can be measured by taking backfat thickness in the 12th of ribs or in the surface area of the muscle Longissimus Dorsi (LD). The magnitude of rib eye muscle area can describe the large of meat so that can affect the tenderness of meat, also can increase the economic value (Purbowati et al., 2013).

The purpose of this study was to determine correlation between protein levels and the yield grade and rib eye muscle of weaning lambs. The benefits of this research was to provide information of correlation between protein levels and the yield grade and rib eye muscle of weaning lambs.

Methodology

Materials used were 12 male thin-tailed weaning lambs aged ± 6 months and ± 25.82 kg of slaughter weight. Materials feed were sugarcane top, soybean meal, rice bran, fish meal, cassava peel, cassava meal, molasses and minerals. The complete feed was in pellet form. Feed composition of each treatment can be seen in Table 1. The devices were an analytical scale with 1 gram of precision, cutters, saws for splitting carcass, glass, millimeter blocks and calliper.

Table 1. Composition of feed treatment

Uraian	Perlakuan		
	T1	T2	T3
	-----%-----		
DM	85,41	83,56	84,56
CP	12,00	14,00	16,00
TDN	60,00	60,00	60,00

DM= Dry Matter; CP= Crude Protein; TDN= *Total Digestible Nutrient*

Research Methods

The research has been conducted over 12 weeks. Feed was given in ad libitum. Lambs were fasted for 6 hours before slaughtered. Fasted lambs have been weighed to obtain the slaughter weight. Slaughtered lambs have been separated their head, viscera, metatarsus, tail, and dressed them to get a fresh carcass weight. Fresh carcass has been saved for aging for 10 hours at 17°C in room. Lambs was slaughtered symmetrically from the neck to tail, and weighed the left and right side. The carcass was cut into eight commercial cuts included neck, shoulder, breast, foreshank, rack, flank, loin and leg. The commercial cuts have been weighed and measured the backfat thickness to calculate the yield grade and rib eye muscle area.

Rib eye muscle area was measured at the 12th and 13th of ribs rack by using millimeter blocks and glass. The backfat thickness was measured at the 12th of rib (the surface of LD muscle area). Subcutaneous fat thickness was measured perpendicularly with fat surface and in the quarter of LD muscle by using a caliper. The backfat thickness was calculated by Romans et al. (1985) equations which was $0.4 + (10 \times \text{backfat thickness in inches})$. All data was analyzed using correlation analysis.

Results and Discussion

The correlation between protein levels with yield grade and rib eye muscle area at thin-tailed weaning lambs can be seen in Figure 1 and 2.

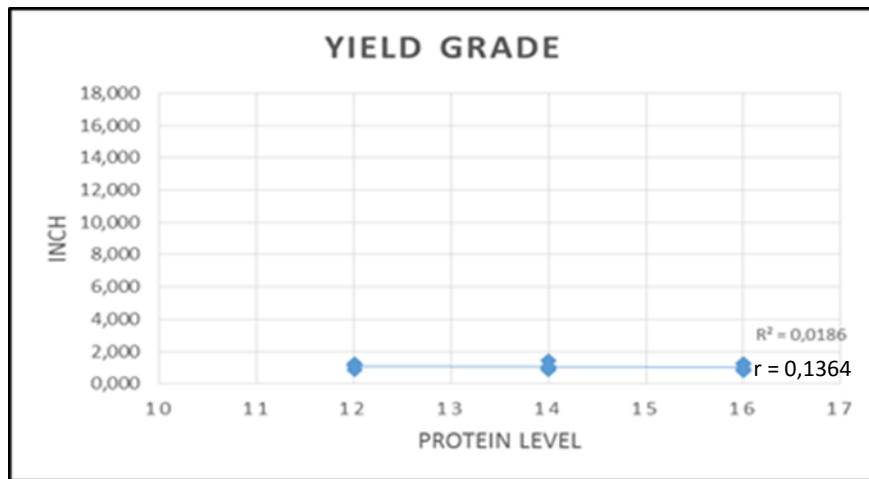


Figure 1. Correlation between protein levels and yield grade

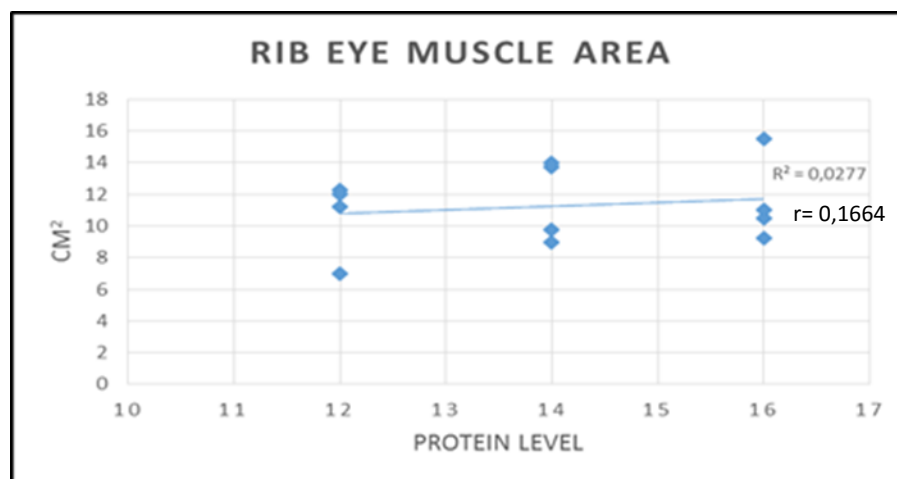


Figure 2. Correlation between protein levels and rib eye muscle area

The results showed that level of crude protein (CP) 12-16% have a low correlation to the value of the yield grade ($r = 0.166433$) and rib eye muscle area ($r = 0.136382$). The increasing of feed protein levels was slightly followed by increasing of yield grade and rib eye muscle area. Yield grade was measured by carcass backfat. The protein of feed used to growth of muscle and still haven't excess for fat. The results of this study showed that increasing of protein level could slightly increase the backfat thickness. The speed growth of head and bone lambs was higher than fat. It was caused that the lambs still in growth acceleration. According to Soeparno (1994), young age was still in organs growth acceleration as well as an increasing in the percentage of other components.

The correlation of protein levels and yield grade and rib eye muscle area was low. It could be influenced by the age of lambs so that growth has not reached the maximum point in the loin or Longissimus Dorsi (LD) muscle. According to Shackelford et al. (2003), the yield grade and rib eye muscle area can be used to analyze the results of carcass produced. The growth rate of cattle has several stages of the bones, meat and fat. The young animals were estimated that they were still in acceleration growth of non-carcass parts including head and

foot bones metatarsus. According to Owens et al. (1993), the young animal was still in the low growth of muscle and fat so that gave affect lower values in the fat thickness on the back and muscle on longissimus dorsi (LD), yield grade and rib eye muscle area..

Conclusion

It can be conclude that protein level has a low correlation to the value of the yield grade and rib eye muscle area. One of the factors affecting the low correlation was the age of lambs, because age can affects the growth rate fat and muscle tissue of lambs.

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Effects of Different Combination of Water Hyacinth (*Eichornia crassipes* Mart.) Leaves and Sapu sapu Fish (*Hypostomus plecostomus*) on Growth Performances of Local Ducks In Lombok

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Abstract

The main problem faced by duck farmers especially in Lombok Island is a high price of commercial feed. Water hyacinth (*Eichornia crassipes* Mart.) leaves (=WHL) and sapu sapu fish (*Hypostomus plecostomus*) (=SSF) are not used by human, but they are potential and low cost local feed sources. A study was conducted to investigate the effectiveness of combinations of WHL and SSF for growth performance of local ducks. One hundred and eighty four-weeks-old female local ducks were randomly allocated into nine combinations of WHL and SSF with five replicates each and four ducks /replicate according to factorial 3x3 arrangement. The experimental diets were: E1S1 (without WHL and SSF), E1S2 (with 20 % SSF), E1S3 (with 30% SSF), E2S1 (with 5% WHL), E2S2 (with 5% WHL and 20% SSF), E2S3 (with 5% WHL and 30% SSF), E3S1 (with 10% WHL), E3S2 (with 10% WHL and 20% SSF), E3S3 (with 10% WHL and 30% SSF). Observation was done for 6 weeks. The Results showed that the use of combinations of water hyacinth and sapu-sapu fish did not significantly affect final body weight and weight gain, but significantly affect ($P < 0.05$) feed consumption and feed conversion ratio. The results indicate that water hyacinth and sapu sapu fish are potential feed sources for ducks feeding.

Keywords: *Water hyacinth, Sapu sapu fish, weight gain, Local ducks*

Introduction

Ducks farming has a good prospect to be developed because their meat and egg consumption is steadily increasing. The main limitation experienced by traditional duck farmers in Lombok are in providing sufficient amount of good quality feed because of high price of commercial feed. Therefore, alternative locally available feed sources should be explored for sustainability of duck production in this Island.

Water hyacinth (*Eichhornia crassipes*. Mart.) is one of the most noxious water weeds in tropical and subtropical regions, and many attempts have been made to eliminate it because its rapid development is economically very harmful. However, a part from its harmful effect, the weed biomass can be fed to poultry as source of carotenoid (Lareo and Bresani 1982; Sharma et al 2016) and other nutrients. Its chemical composition is comparable to rice bran (Hossain et al 2015). The replacement of 5 to 25% of a complete diet with water hyacinth in growing ducks was reported to decreased performance but was economically profitable due to the lower feed cost (Men and Yamasaki. 2005). However its optimum use in ducks feeding has not been established.

Other feed sources which is locally available in Lombok is sapu-sapu fish (*Hypostomus plecostomus*) (=SSF), whose availability is also quite abundant because it is not

consumed by humans. Purnamasari et al. (2011) reported that this fish contains 33,32 – 41.75% crude protein and 3,59 – 4,26% Ca and 0,29 – 0,99% P. In addition, feeding this fish to ducks given water hyacinth leaves (=WHL) may result in better fiber digestion due to its content of the some fiber degrading enzyme (German and Bittong, 2009 cited by Asnawi et al. 2014). The objective of this study was to evaluate the effects of different combination of water hyacinth and sapu-sapu fish on growth performances of local ducks in Lombok.

Methodology

A total of 180 four-weeks-old-female local ducks were randomly assigned into nine dietary treatments made of different combinations of WHL and SSF with 5 replicates each and 4 ducks per replicate according to 3 x 3 factorial arrangement. The composition of experimental diets are presented in Table 1. Feed was provided *ad-libitum*, mixed with water at a ratio of 2:1 and offered three times a day and the observation was done for 6 weeks. Feed consumption was measured daily and the ducks were weighed weekly. Data were subjected to analyzes of variance using Proc GLM (Sas, 1990) followed by Duncan Multiple Range Test.

Table 1. Ingredients and chemical composition of dietary treatments

Ingredients (%)	E1S1	E1S2	E1S3	E2S1	E2S2	E2S3	E3S1	E3S2	E3S3
Concentrate*	40	20	10	40	20	10	40	20	10
Rice bran	60	60	60	55	55	55	50	50	50
WHL	0	0	0	5	5	5	10	10	10
SSF	0	20	30	0	20	30	0	20	30
Total	100	100	100	100	100	100	100	100	100
<i>Chemical composition</i>									
Crude Protein (%)	19.80	20.61	19.92	19.57	20.38	20.38	19.33	20.15	20.55
ME (Kkal/kg)**	2596.8	2614.9	2377.8	2609.1	2627.2	2636.3	2621.4	2639.5	2648.6
Crude Fiber %	10.40	9.18	7.38	11.13	9.91	9.31	11.86	10.65	10.04
Crude fat %	3.70	6.27	7.21	3.67	6.24	7.53	3.64	6.21	7.49
Ca %	4.44	2.34	1.28	4.46	2.36	1.31	4.48	2.38	1.33
P %	1.30	1.14	0.90	1.26	1.09	1.01	1.22	1.05	0.97

*Produced by PT Japfa Confeed Indonesia, TBK, **calculated value

Results and Discussion

Feed intake, final body weight, weight gain, and Feed conversion ratio of ducks fed on diets with different combination of WHL and SSF is presented in Table 2.

Table 2. Effects of combination^A of different levels of WHL and SSF on feed intake, final weight, weight gain and FCR of local ducks

Treatment	Feed Intake (g)	Final Weight (g)	Weight Gain (g)	FCR
0% WHL	2359.8 ^a	1069.8 ^a	303.5 ^a	7.9 ^a
5% WHL	2116.5 ^a	1079.7 ^a	314.9 ^a	6.9 ^b
10% WHL	1956.9 ^b	1086.7 ^a	324.4 ^a	6.3 ^b
<i>P value</i>	0.002	0.874	0.665	0.006
0% SSF1	2346.8 ^a	1113.1 ^a	333.0 ^a	7.3 ^{ab}
20% SSF2	2179.1 ^b	1078.2 ^a	294.4 ^a	7.5 ^a
30% SSF3	1907.2 ^b	1045.0 ^a	315.4 ^a	6.3 ^b
<i>SEM*</i>	73.79	23.03	16.29	0.34
<i>P value</i>	0.001	0.127	0.258	0.042
<i>P value WHL*SSF</i>	0.644	0.924	0.433	0.311

*SEM = pooled standard error of the means

Feed intake and FCR of ducks given diet with 10% WHL was significantly lower than those given control and diet with 5% WHL, but final weight and weight gain were not significantly affected by levels of WHL. Similar patterns were observed for effect of feeding

diet containing 20 and 30% SSF replacing the concentrate. Feed intake and FCR were observed to be significantly lower in the group diet with 30%SSF compared to the control. Higher feed intake of control group might be associated with higher dietary fiber content compared to diet with 30%SSF (Table 1). The ducks fed on diet with high fiber content increase their intake to satisfy their nutrients need (Fadil et al. 2014). This study demonstrates that WHL can be incorporated in ducks diet up to 10% without negative effect and inclusion of 30% SSF in ducks diet improve FCR. Results of this study is in line with those reported by Men and Yamasaki (2005).

Conclusion

Water hyacinth leaves and sapu sapu fish are potential feed sources for ducks production in Lombok. Water hyacinth leaves can be incorporated up to 10% to replace rice bran and sapu-sapu fish is a good source of dietary protein which can be used up to 30% as an alternative to commercial concentrate.

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Identification of Sonok Cattle Characteristics as Local Genetic Resources in Madura Island

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Abstract

Sonok cattle is cow with good body condition which is a product of the culture of Madurese in showing off a nice cow. The aim of the research is to (1) analyze phenotypic variance both qualitative and quantitative, (2) to determine the selection criteria of Sonok cows as local genetic resources in Madura, (3) and to design the strategy to improve Madura cows, especially Sonok cows. Location of the research is Waru subdistrict, Pamekasan district. Observation was made on 8 mo's – 20 mo's age cows, and was grouped into 2 age groups, that was group 1 (< 12 mo's) and group 2 (> 12 mo's). There quantitative variations in color of bottom and leg, and head indexes. Quantitative variations were Body weight (BW), Chest Girth (CG), Body Height (BH), Body Length (BL), BCS (Body Condition Score). Sampling technique is *accidental sampling*. Data was analysed with descriptive statistic, correlation and regression analysis. Results showed that for qualitative character Sonok cattle was characterized with the characteristics of pure Madura cattle, with small head indexes. The correlation and regression equation showed that CG has positive and strong correlation with body weight, so that it was concluded that the best Sonok cows can be selected based on the CG than other measurements.

Keywords : *qualitative character, quantitative character, Sonok cattle, Body Condition Score (BCS)*

Background

In accordance with the Research Master Plan of University of Brawijaya where one focus is food security (LPPM UB, 2012), then the data source of cattle in Indonesia is important to be held. This is especially the data performance of Local cattle in Indonesia which have received less attention. In the aspect of adaptability, local beef cattle have the ability efficient in converting feed into production as the production of meat, the meat and produce children. Thus the Local cattle feeding data performance needs to be collected for future development.

Beef cattle population in Indonesia is currently in a state that is worrying, because the production of cattle or meat that is lower than the demand, cutting bulls and females that are not controlled, and the unavailability of good quality seeds. The existence of the beef cattle population has declined also due to cuts productive cows, because these cows should be used to produce child cattle or feeder cattle but precisely cut to meet the needs of the meat. Buffalo Beef Self-Sufficiency Program (PSDSK) 2014 is difficult to met. It is shown by the increasing difficulty of obtaining cattle and beef prices become more expensive. National cattle breeding program is currently still rely on conventional methods performed by farmer. Besides, coupled with the nation's cross between local cattle with cattle imports

(crossbreeding) superior produce meat (Limousin, Simental, Anggus, etc.), so that the resulting offspring have a greater weight than local cows. Crosses is preferred by farmers-ranchers because body weight birth of a bigger, faster growth, good adaptation to the environment and the food is simple, the achievement of body weight and body size grown larger and look exotic and desirable, and the sale value is higher. However, research Putro (2009) states that this crossbreeding resulted in decreased reproductive performance, among others, the decreasing number of conception (conception rate = CR) and increasing the number of inseminations per pregnancy (services per conception = S / C). Busono (2012) also stated that the results of the field observations of the cow than the result of cross pollination PO shows the S / C higher, longer birth interval, and the growth is not in line with expectations. Ashari, Busono, Nuryadi, Nurgiartiningsih research (2013) also show the same thing on the performance and results of Bali cattle cross-bred with Simental. The reproductive performance it will cause losses to farmers because it would lead to the threat of extinction of the nation's local cows. If this is not considered thoroughly, then the beef cattle population decline is inevitable, whereas in fact the business in the field of beef cattle is promising. In 2006 the Central Bureau of Statistics noted that the livestock subsector accounted for Rp. 33 309.9 billion (12.75 percent) of the total national agricultural GDP (Pradana, 2012).

Madura Island is an island that is very special, both society and the environment and natural resources that support them. Madura island community is a resilient farmers, due to the natural support is dry with low rainfall, the community Madura Madura cattle were able to maintain very well. Raising cattle for Madurese not only as related to technical aspects of biological, but related to the socio-economic and cultural aspects. In Madura there are two types of cows that serves as an asset in the socio-cultural aspects, namely Cattle Kerapan and sonok. Sonok cow in its development is not only the glue of social relationships, but also has the meaning of culture and technology. For Pamekasan sonok cow has an important status. The existence sonok cow in line with the socio-economic conditions in Indonesia is an agricultural country. Livestock, especially cattle, are an integral part of the agricultural system in Indonesia. Besides its role as a provider of animal protein, cows also acts as a savings and characterize the social status of the owner. The livestock sector is one of the sources of growth, especially for the agricultural sector and the national economy in general.

Objective of the research

Is to to analyze the diversity of phenotypic characteristics of production (quantitative) and qualitative on Sonok cattle as the basis for development of cattle Sonok cattle as germplasm in the future, as well as for the determination of the source area of Sonok cattle on the island of Madura.

Research Method

Research Location

The research was located in the center of Sonok cow keeping at Pamekasan, namely at the district Waru.

Material of the research

The research material in the form of Madura cattle females aged <12 months, 12-24 months,> 24 months. The variables measured were body weight, chest circumference, body length and height Gumba. Besides, it also qualitative variables such as color of skin / hair, presence of horns, white color distribution.

Research design:

(1) The beginning stage of research is to conduct measurements in the field by using accidental sampling method that measures the cow is at the location of measurement, while observing the qualitative character and age groupings. Madura cow measurements and

observations made by filling forms for registration as a cow card. Reference data, which is recorded in Annex 6. (2) Next will be the grouping of measures that have been acquired by age group. (3) Next data analysis, form analysis deskriptif calculate the mean and standard deviation, coefficient of diversity, correlation and regression analysis between linear measurements with weight. (4) Estimate the selection response in villages raising cattle in the district sonok Waru namely Batu village Kerbui (north coast), and Waru village, with the formula:

$$\Delta G = i h^2 \sigma P \text{ (Udo, 1991)}$$

Where i is intersitas selection, h^2 is heritability observed variables, σP is the standard deviation of the population in villages surveyed.

Research stage

1. Fieldwork

Sonok cow performance data collection in villages raising of Sonok cattle.

2. Analysis of the data, by performing the descriptive statistical analysis, regression and correlation, and analysis Performance Rank of cow.

Observation the research

Observations were made entirely in the field on a farm people who become members of the program Village Breeding Center (VBC). Variable observed were body weight, chest circumference, height Gumba, body length, qualitative variables such as color of skin / hair, horns and distribution of white color

Results and Discussion

General Condition

Generally in an area of cattle raising in Pamekasan Madura, with the purpose of maintenance as Sonok cattle or Kerapan cattle and also beef cattle, an ordinary cattle keeping to be *sayur cow*, the characteristics of these three types differ according to their maintenance purposes. Especially for Sonok cows, which are cows that are very well maintained so as to have the posture and good body condition, which is different from Kerapan bull.

Madura cow maintenance is not only has a technical and biological aspects, but also from the social and cultural aspects. Sonok cow is ornamental cows. The maintenance is a part of the contest where the two cows were assembled with a connector into a pair of wood. Besides the cattle have been trained to be able to show themselves and walked into a gate, the cows are kept in particular maintenance in order to have the posture and the ideal size and good growth (Anonymous, 2015). Figure 1 shows the ideal size of a Sonok cow which is the result of a good maintenance.



Figure 1. Sonok cows with a good body size

To be a Sonok cow, Madura cattle must be trained since from weaning, which is the age of five months to mature, so as to have good BCS (Body Condition Score)

Qualitative Characters

The observation of the characteristics typical sonok cow that is in the district which is a Sonok cattle region (in districts of Waru), then the cow sonok generally characterized by traits such as body color dominant fawn bright with the color of the lower leg and white but with boundaries less clear (can be compared with the white border of Bali cattle), they do not have hump. Then the area around the eyes is black. With short horns curved upward direction and lead to the outside. The dominant color brown rump and a lack tail tip. The back line looked thin and short. Qualitative characteristics are very dominant. Almost no deviation of these characteristics. This is possible because in the initial selection, the characteristic of this very firmly held by the Madurese, and is one of the selection criteria for Sonok cattle.

- Index of Head

Head index average in the cattle population in the district of Sonok cattle Waru are divided into two different age groups, namely the age group I (10-12 months) and age group II (over 12 months). When compared with the index of the Head of the results of other studies, namely in cattle Simpo (Simmental-PO), Limpo (Limousine-PO) and PO (Peranakan Ongole), then the index head on Madura Sonok cattle in this study is small (see Table 1).

Table 1. Comparison of head index of Sonokcattle, Simpo, Limpo and PO cattle

Breed	Age group/ generation	Head index	Source
Sonok cattle	< 1 year	3.68 + 0.68	Data of this research
Sonok cattle	> 1 year	3.89 + 0.4	Data of this research
Simpo	F1	0.48 + 0.07	Trifena, Budisatria, and Hartatik (2011)
Limpo	F1	0.46 + 0.07	Trifena, Budisatria, and Hartatik (2011)
PO	-	0.40 + 0.04	Trifena, Budisatria, and Hartatik (2011)

The table indicates that the Madura cow has a smaller index than cow's head of Simpo, Limpo and PO. This is because cattle of Madura included in the class of small type.

Besides these characteristics, it was observed also other characteristics of a Sonok cow, such as the body color, white on the legs and buttocks, as well as black bars on the back.

Quantitative Character

Characteristics of quantitative characters are body weight (BW), chest circumference (LD), Height, Long Board (PB), as well as the BCS (Body Condition Score), measured at the two age groups of less than 1 year and more than 1 year. Table 2 below presents the average size of these variables.

Table 2. Body weight (BW), chest girth (CG), Body Height (BH), Body Length (BL), and the BCS (Body Condition Score) in two group of ages

Variable	Age group	Mean + SD	Significance level	Number of measurement
Body weight	< 1 year	125.75 ± 23.73	1 %	24
	> 1 year	182.86 ± 30.21		

Chest girth	< 1 year	116.10 ± 9.72	1 %	24
	> 1 year	133.41 ± 9.88		
Body height	<1 year	98.51 ± 7.67	1 %	24
	>1 year	108.69 ± 5.29		
Body length	<1 year	95.44 ± 8.0	1 %	24
	>1 year	110.81 ± 8.01		
BCS	<1 year	3.60 ± 0.52	1 %	24
	>1 year	4.14 ± 0.36		

The table above shows that the age effect on all variables were significant. This indicates that the selection in cattle sonok carried out by age, according to the results of field interviews in Sonok cow began to be selected and trained by the age at 5 months.

Best Criteria for selection of Sonok cow.

Many of the criteria in selecting the Sonok cow. Most are based on good physical, health, smooth skin, is also based on the agility and graceful to walk at a certain distance. Based on the interview, in this study the selection criteria formulated of Sonok cow, which is based on the BCS and body weight. Based on that idea above, at Table 3 shows the correlation between the various body weights of cows, BCS and vital statistics (CG, BL, BH). Table 3. Correlation between variables measured in Sonok cattle for describing the condition as Sonok cattle.

Dependent Variable (X)	Independent Variabel (Y)	Correlation coefficient (r)	Significance level
CG	BW	0.96	1%
	BCS	0.429	5%
BL	BW	0.897	1%
	BCS	0.36	Ns
BH	BW	0.81	1%
	BCS	0.25	Ns

Based on the calculation of simple linear correlation analysis shows that BH and BL is a bad indicator for the BCS (for non-significant), but a good indicator for BB. Nevertheless, for sonok cow criteria, the selection criteria are not solely B, but good body condition is an important criterion for Sonok cow. Thus as the selection criteria for cattle sonok, for all age groups, it is best based on the circumference of the chest (CG). To predict the BCS based BW and CG can be seen in Table 4.

Table 4. The linear regression line to predict Body Weight and BCS based on CG

Variabel tak bebas	Garisregresi linier (predictor = LD)	Level of significance
BW	$BW = - 211 + 2.93 CG$	1%
BCS	$BCS = 1.82 + 0.0167 CG$	5%

Based on the analysis of data as in the Table 4, then CG is a strong indicator for both BW and BCS, so it can be recommended that the selection in Sonokcattle can be done using CG as a predictor.

Conclusion and Suggestion

Conclusion

Qualitative characteristics of Sonok cow generally illustrate the characteristics of the pure Madura cattle, with a small head index. Quantitative characteristics Sonok cow is characterized with body weight, chestgirth, body length and body height that is to be strongly influenced by age. Vital statistics (chest girth, body length, body height) and also the BCS can be used as indicators of a cow with the best growth and the good management. With the regression line of $BW = -211 + 2.93 CG$ and $BCS = 1.82 + 0.0167 CG$, the cow body weight and BC of Sonok cow can be estimated based on the CG

Suggestion

In accordance with the continued preservation of the culture of keeping Sonok cow, the Sonok cow selection needs to be implemented. This can be done by using estimation both body weight and BCS as the selection criteria for quantitative traits, on the other hand for qualitative traits, the pure Madura cattle characteristics can be used as criteria for qualitative trait.

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Physiological Responses and Milk Qualities of Holstein Friesian During Dry Season at High Altitude

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Abstract

The objectives of this study were to explore physiological responses and milk qualities of Holstein Friesian (HF) cattle during long dry season at Cikole DD Station in Lembang West Java. Cattle as research sample were identified by purposive sampling method. Components of microclimate observed were ambient temperature, relative humidity (RH), air velocity, solar radiation and temperature-humidity index (THI). While physiological responses were observed for rectal-, skin-, and body temperature, as well as respiration- and pulse rate. Milk qualities were studied for total solid, fat, and protein. Mean THI (73.93 ± 5.51) showed dairy cows suffered heat stress. Mean of rectal-, skin-, and body temperature were $37.94 \pm 0.20^\circ\text{C}$; $32.15 \pm 1.25^\circ\text{C}$; $37.13 \pm 0.32^\circ\text{C}$, while those for respiration- and pulse rate were 39.13 ± 3.00 and 79.74 ± 6.19 respectively. Fresh milk were identified in good qualities, i.e. total solid, fat-, and protein content were $10.19 \pm 0.72\%$; $2.14 \pm 0.38\%$ and $2.50 \pm 0.32\%$. High ambient temperature and low relative humidity affected significantly on physiological response than normal and affected also on milk qualities.

Keywords: long dry season, milk qualities, physiological responses

Introduction

Dry season is one of the obstacles in the dairy cattle development. In dry season temperatures hotter than wet season, including in upland areas who usually have lower temperature. In 2015, these obstacles become more severe because dry season in Indonesia last longer. In general, dry season in Indonesia runs from April to October, but in 2015 the dry season lasts until November (BMKG 2015). The long dry season, increasing the average ambient temperature and relative humidity (BMKG 2016).

High ambient temperatures during the dry season causes changes in dairy cows physiological responses (Purwanto *et al.*, 1993). These changes occur because body heat accumulates as a result of heat process production is not balance with heat release to the environment (Correa-Calderon *et al.*, 2004; Atrian and Shahryar, 2012). In the heat exposure conditions, cows will experience body temperature increase accompanied with heat loss increase through evaporation in the form of respiration rate increased (Esmay 1982; Kumar *et al.*, 2011). When livestock exposed to extreme heat, they will undergo blood vessels and reduction of blood supply to the organ system that is offset by an increase in heart rate (Atrian and Shahryar, 2012; Tyler and Enseminger, 2006; Rastogi, 2007).

Long dry season causes heat stress on dairy cows last longer. Heat stress affected on dairy cows physiological responses. Studies to evaluating the physiological response of dairy cows at the end of long dry season in the highlands should be done. The objectives of this study were to explore physiological responses of Holstein Friesian (HF) cattle during long dry season at.

Methodology

The study was conducted in the Cikole DD Station in Lembang West Java, which has an altitude of 1200 meters above sea level. The research was conducted in October 2015. The sampling timing is based on the dry season condition with the lowest rainfall and highest ambient temperature. Sample were identified by purposive sampling method. Observation of the environmental conditions include altitude and microclimate conditions consisting of temperature, humidity, wind speed, solar radiation, annual rainfall and THI (themperature Humidity Index). Microclimate data obtained from measurements every 2 hours from 06.00 - 16.00. Parameter physiological responses observed were rectal-, skin-, body temperature, heart rate, and respiration frequency who measured every 4 hours starting at 8.00 to 16.00 pm. Data were analyzed with descriptive statistics and T test to determine differences in physiological responses on each measurement. Regression and correlation analysis was conducted to determine the effect of THI on physiological responses.

Results and Discussion

The measured of micro climates aspec consisting of ambient temperature, relative humidity, wind speed, solar radiation and THI (Table 1).

Table 1. The average of the microclimates element in Cikole DD Station Lembang, West Java.

Weather elements	Time of Observation (WIB)						Mean
	06.00	08.00	10.00	12.00	14.00	16.00	
THI	63.4±1.0	73.1±1.92	76.7±1.41	77.9± 1.58	77.8±1.19	74.7± 0.62	73.9±5.51
Ta	16.8±0.5	25.4±1.29	28.4±0.82	29.6±1.19	29.5±0.87	26.5±0.50	26.0±4.82
Rh	83.3±3.4	52.0±8.76	47.8±5.04	43.5±3.66	42.4±2.19	53.8±7.45	53.8±15.13
Av	0.0±0.00	0.1±0.11	0.5±0.44	0.9±1.03	0.3±0.22	0.9± 0.68	0.42±0.37
Rs	0.0±0.00	17.5±7.64	19.1±10.04	24.5±12.23	20.5±9.16	14.2±11.20	17.0±9.07

Ta(°C) = ambient temperature in Celcius; Rh = relative humidity persentase; Av= air velocity mper second; Rs = solar radiation in Watt per m². The mean value of THI, air temperature and relative humidity (73.9 ± 5:51; 26.0 ± 4.82 and 53.8 ± 15:13) generally indicates dairy cows are in heat stress. THI value shows cows in a state of mild stress. The mean daily temperature and relative humidity are outside the comfort zone so it is not suitable for dairy cows.

Physiological parameters of dairy cows were observed consisting of a rectal-, skin-, body temperature, respiration- and heart rate. The results of the measurement of physiological parameters shown in Table 2.

Table 2. Physiological response of dairy cow in Cikole DD Station Lembang, West Java

Parameter	Time of Observation (WIB)		
	08.00	12.00	16.00
THI	73.12±1.92 ^a	77.96± 1.58 ^b	74.65± 0.62 ^a
Respiration rate per second	35.67±3.89 ^a	40.89±2.92 ^a	40.83±2.88 ^a
Heart rate per second	75.08±5.26 ^a	77.37±3.21 ^a	86.77±5.23 ^b
Rectal temperature (°C)	37.71±0.20 ^a	38.00±0.24 ^{ab}	38.10±0.12 ^b
Skin temperature (°C)	30.97±0.91 ^a	33.46±0.69 ^b	32.02±0.34 ^a
Body temperature (°C)	36.77±0.17 ^a	37.36±0.27 ^b	37.25±0.15 ^b

Description: different letters in the same row indicate significant differences (P<0.05)

Results of correlation analysis shows that the THI effect on rectal-, skin- and body temperature, but not at the frequency of respiration and heart rate. Rectal temperature is an indicator of response to dairy cows on the environment (Rejebet *al.*, 2016). The body temperature showed the same pattern changes with THI. Mean daily rectal-, body-, skin- and ambient temperature showed gradual deterioration ($T_r > T_b > T_s > T_a$). The decline shows that in the flow of heat from the body of dairy cows headed to the environment. This indicates adaptation response of dairy cows to adjust to the ambient temperature changed. In accordance with the conditions Ulvshammar (2014) which states that the warm-blooded animals can maintain body temperature greater than the ambient temperature.

Conclusion

High ambient temperatures during long dry seasons in the highlands causing heat stress conditions. Mean THI (73.93 ± 5.51) showed dairy cows suffered heat stress. Environmental temperature changes at the end of a long dry season causes changes in physiological responses in the form of an increase in rectal-, body- and skin temperature but does not affect to heart rate and respiration. This indicates that the dairy cows in the highlands adapted to mild stress condition.

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Correlation Between Body Weight, Body Condition Score and Vital Statistics of Madura Cattle in Pamekasan, Madura

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Abstract

This research was aimed to analyze the correlation between body weight, BCS (Body Condition Score), and vital statistics of female Madura cattle. This research was conducted in Waru sub-district, Pamekasan on April 6 – May 6, 2016. The measurement was done to 58 female cattle consisting of 26 female cattle at the age of <1 year (PI₀) and 32 female cattle at the age of >1 year (PI₂). The measured variables were age, body condition score (BCS), vital statistics (chest girth, body length, body height, withers height, hip height) and body weight. Chest girth had significant correlation with BCS and the body weight of PI₀, the value of correlation coefficient was 0.86 and the coefficient of determination was 0.75. Then, the correlation coefficient of BCS and body weight was 0.42 and the coefficient of determination was 0.178. Chest girth also had significant correlation with the body weight of PI₂, the value of correlation coefficient was 0.88 and the coefficient of determination was 0.611. Chest girth was the best variable with body weight because it had close correlation with Madura cattle at the age of <1 year (PI₀) and >1 year (PI₂).

Keywords: *Body Condition Score, body height, body length, hip height*

Background

Madura cattle have a potential role in meat supply in Indonesia, especially in Madura island. The Livestock Service of East Java (2013) explains that in 2011 there are 787,424 Madura cattle or 21.02% from the total population of beef cattle in East Java; there are 316,571 cattle in Sumenep, 176,076 cattle in Sampang, 164,201 in Bangkalan, and 130,576 cattle in Pamekasan. Madura cattle is considered as one of the native Indonesian cattle, it has been selected and maintained its originality in Madura island and other surrounding areas. Madura is claimed to be a closed area; the area which prohibits a crossbreeding activity with male beef cattle from outside Madura. Deciding Madura island as a closed area is intended to maintain the originality of Madura cattle, Madura cattle is one of the local cattle Germ plasm in Indonesia (Siswijono, Nurgiartiningsih and Herman, 2013).

Local cattle farm is one of the common farming activities performed by local farmers as their secondary or primary business. The local cattle which are mostly bred by the farmers are Madura cattle. Madura cattle as the indigenous beef cattle germplasm are the national resource which need to be preserved. The female cattle which received well treatment in order to join cattle exhibition are called *Sapi Madura*, while the male cattle which are used in a race are called *Sapi Karapan* (Hartono, 2012).

Body Condition Score (BCS) is a score which is based on visual estimation of body fat under the skin around the tail head, spine, rib and hip. BCS can be used to predict the weight of beef cattle (Conservation, Yuniardi and Widodo, 2002). Farmers in Indonesia

commonly rely on the result of vital statistics and body fat to measure the cattle body weight. Wulandari (2005) states that BCS evaluation is done by looking at the condition of body fat. The measurement of body fat condition is done by looking at fat deposits in the cattle's backs, ribs, tail heads, chests and stomachs. The differences of BCS evaluation results can be affected by different conditions and potency of areas in Indonesia. Various conditions and potency of areas in Indonesia such as environment, rearing system, feed consumption, and types of cattle contribute to the different result of BCS.

The advantages of Madura cattle such as its genetic ability to survive in hot climate, survive from ticks attack, easily adapt to low quality feed can be a big potency for cattle development; Madura cattle also has lower feed consumption than import cattle (Nurgiartiningsih, 2011). Madura cattle are reared well by the farmers, the rearing period in Madura island is relatively different from other areas in Java. Warusub-district in Pamekasan is a dry land area, the farmers' abilities in cattle rearing and cultivating are quite reliable (Aryogi and Romzali, 2010).

Animal body weight can be determined by weighing the cattle; however some difficulties are still found in determining body weight of cattle such as scale availability and scattered cattle, thus an alternative way for estimating body weight is still needed. According to Kadarsih (2003), cattle body weight is one of the indicators of livestock productivity and it can be estimated based on the cattle linear sizes such as chest girth, body length, height and BCS. Vital statistics are the body measurements which are helpful to perceive the characteristics of cattle. Therefore, vital statistics can be used to estimate cattle body weight.

Materials and Method

The materials used in this study were 58 Madura cattle consisting of 26 female cattle at the age of <1 year (PI₀) and 32 female cattle at the age of >1 year (PI₂). The cattle ages were distinguished based on PI₀ and PI₂ permanent incisors replacement which was based on ISO standard.

The method used in this study was a direct survey in the field. It was done by measuring the vital statistics and observing the BCS (Body Condition Score). Purposive sampling technique was involved in this research. According to Arikunto (2002), a purposive sampling method is a sampling technique with certain considerations. This technique could be interpreted as a sampling process, the process was started from determining the number of samples. Then, the sample selection was done based on certain objectives as long as it did not deviate the characteristics of the samples.

The cattle body weight weigh was measured by using a digital scale with a capacity of 1,100 kg and its accuracy level was 0.5 kg. The data collection was performed by weighing each cow on the digital scale.

In order to determine the cattle age, an interview with the owner was conducted. Then, a general interpretation was done during the observation of incisors replacement. The interpretation of cattle age was done after the vital statistics measurements. It was performed by opening the cow's mouth in order to observe the teeth replacement.

Chest girth (cm) was measured by putting the measuring tape around the chest girth right behind the shoulder so it could pass the withers. Then, body height was measured from the highest part of the body to the ground following a vertical line by using a measuring stick made from stainless steel. Next, hip height was measured from the highest point of the hip bone to the ground by using a stainless steel measuring stick. Withers height was also measured from the highest point to ground by using the same tool. While the body length was measured by looking at the distance between the *Tubercullum humeralis lateralis* and *Tubercullum ischiadium* by using a measuring stick.

BCS (Body Condition Score) measurement was performed by standing at the back, in the right and the left side of cattle. It was done to assess the spines, ribs, hip bones and tail bone. BCS was used to interpret body fat stockpile. BCS measurements could be indicated by using a range from 1 to 5. One indicated that the animal body was very thin. Two indicated that the animal body was skinny. Three indicated that the animal body was medium. Four indicated that the animal body was fat. Five indicated that the animal body was very fat. All of the data were analyzed by using correlation analysis and simple linear regression.

Results and Discussion

Vital Statistic Measurement, BCS and Body Weight of Madura Cattle

The results of vital statistic measurement, BCS observations and body weight measurement of Madura Cattle indicated that the vital statistic measurement and BCS values varied. The different values of vital statistics, BCS and body weight might be caused by a cattle that a farmer, in one place, did not have so that the cattle management differed among the farmers in terms of the feed given concerning nutritional content, treatment to the livestock by the farmers, cowshed factor or the environment where the cattle lived. The average of the measurements of vital statistics, BCS and the body weight of Madura Cattle can be seen in Table 1.

Table 1. Results of Vital Statistic, BCS and Body Weight of Madura Cattle Observation

Variable	PI	Quantity	Average \pm SD
Body Weight(kg)	0	26	181,192 \pm 37,85
	2	32	256,188 \pm 49,36
Withers Height (cm)	0	26	114,23 \pm 6,10
	2	32	124,719 \pm 8,029
Body Height (cm)	0	26	110,5 \pm 6,628
	2	32	119,063 \pm 6,319
Body Length (cm)	0	26	112,615 \pm 7,365
	2	32	126,719 \pm 9,99
Hip Height (cm)	0	26	110,42 \pm 6,694
	2	32	119,406 \pm 6,43
Chest Girth (cm)	0	26	136 \pm 11,68
	2	32	157,43 \pm 11,96
BCS	0	26	2,653 \pm 0,48
	2	32	2,625 \pm 0,49

Note: PI₀ (Aged <1 Year), PI₂ (Aged >1 Year)

Table 1 shows the average size of vital statistics of the cattle on the PI₀ age group, for the measurement of body weight it was obtained an average result of 181.192 \pm 37.85 kg, for the withers height measurement an average result of 114.23 \pm 6.10 cm was obtained, for the body height measurement it was obtained an average result of 110.5 \pm 6.628 cm, for the body

length measurement it was obtained an average result of $112,615 \pm 7.365$ cm, for the hip height measurement it was obtained an average result of 110.42 ± 6.694 cm, for the chest girth measurement an average result of 136 ± 11.68 cm was obtained, and for the BCS measurement it was obtained an average result of 2.653 ± 0.48 . The average of vital statistic measurements of Madura cattle on the PI_2 age group is as follows; for the measurement of body weight it was obtained an average result of 256.188 ± 49.36 kg, for the withers height measurement it was obtained an average result of 124.719 ± 8.029 cm, for the body height measurement an average result of 119.063 ± 6.319 cm was obtained, for body length measurement an average result of 126.719 ± 9.99 cm was obtained, for the hip height measurement it was obtained an average result of 119.406 ± 6.430 cm, for the chest girth measurement an average result of 157.438 ± 11.962 cm was obtained, and for the BCS measurement an average result of 2.625 ± 0.49 was obtained.

In Table 1 the varied results were obtained, such as; body weight, BCS and vital statistics. The magnitude of the variation was caused by several factors such as the different maintenance by different breeders, cattle age that was observed varied between PI_0 and PI_2 age groups. Like the other cattle, when the age is increasing, the body weight is increasing as well. The body weight of cattle in this study was divided into two different age groups, namely:

1. PI_0 (<1 year), in this range of age cattle experience a process of rapid growth and the reproductive organs are still developing.
2. PI_2 (>1 year), in this range of age cattle have reached puberty or sexual maturity.

This is supported by Sitidaon and Zurriyati (2013) who state that the age of the cattle at puberty ranges from 12-15 months, puberty is influenced by various factors such as genetics, growth and body weight. Another factor is the environment like the rainy season, feed, environmental temperature, duration of light exposure and health.

The results of a research conducted by Wijoyo and Setiadi (2004) reported that the body weight of Madura cattle had enormous variation; the high body weight (= 500 kg) and dominated by the low body weight (= 300 kg), the linear measurement of the body surface of Madura cattle is from small to moderate. The average body length of male and female Madura cattle aged 8 months, 12 months and 24 months respectively ranged from 105.60 ± 9.33 cm, $8.41 \text{ cm} \pm 107.80$ and 122.70 ± 6.94 cm, the Body Height ranged from 109.80 ± 9.70 cm, 115.90 ± 11.11 cm and 128.70 ± 9.37 cm. While the chest girth ranged from 128.20 ± 11.25 cm, 131.40 ± 8.37 cm, and $154.10 \pm \text{cm}$ (Ismudiana, 2010).

The mean of withers height of Madura cattle is as follows, at PI_0 it was obtained an average of 114.23 ± 6.10 cm, where the highest withers was 120.1 cm and the lowest withers was 108.13 cm. According to BSN (2013), Madura cattle aged 12 - <18 months have minimum height of withers of 116 cm for the class I, while for the class II is 111 cm, and for the class III is 106 cm. Each class then has their own category, such as; Class I (farm size), class II (medium size) and class III (small size). The mean of withers height of Madura cattle is as follows; in PI_2 it was obtained an average of 124.719 ± 8.029 cm where the highest withers is 132.748 cm and the lowest withers is 116.69 cm. According to BSN (2013), Madura cattle aged 18 - <24 months have minimum withers height of 120 cm for class I, 117 cm for class II, and 114 cm for class III. BCS can be done by palpation in the lumbar region just right behind the last rib (Ginting, 2007), there are also reserves of fat under the skin around the tail setting, spine, ribs and fat hip (Hayati et al, 2002).

The above table describes the measurement of the BCS value, based on the results of the study, the average BCS value of Madura cattle is as follows; at PI_0 it was obtained an average of 2.653 ± 0.48 , where the largest BCS value is 3.13 and the lowest BCS value is 2.17. Which means the BCS value is around 2.17 to 3.13 in PI_0 (<1 year). In PI_2 it was

obtained an average of 2.626 ± 0.49 , where the largest BCS value is 3.11 and the lowest BCS value is 2.13. This means that the BCS value is around 2.13 to 3.11 in PI₂ (<1 year).

Relationship between Body Weight with BCS and Vital Statistics

The correlation between body weight with BCS and vital statistics on Madura cattle in this study was analyzed using simple linear regression analysis which resulted a regression equation, correlation coefficient (r) and the coefficient of determination (R²). Simple linear regression analysis results a regression equation in which the variables used were the body weight and the X was the BCS and vital statistics. The a value in the equation means that if the independent variables, BCS and vital statistics, have a fixed value, then the dependent variable in the form of body weight will decrease by a kg. The b value in the equation means that if the independent variable is increased by one, the dependent variable will increase by b kg. The simple linear regression analysis, correlation between body weight with BCS and vital statistic of Madura cattle in PI₀ age group can be seen in Table 2.

Table 2. Correlation between Body Weight with BCS and Vital Statistics on PI₀

Correlation	Number of cows	R	R ² (%)	Regression Equation	t Test
BCS – BW	26	0,42	17,8	Y = 93,82353 + 32,92157 X	2,27*
WH – BW	26	0,67	45,2	Y = -295,295 + 4,171268 X	4,44**
BL – BW	26	0,66	44,6	Y = -205,437 + 3,433182 X	4,39**
BH – BW	26	0,66	44,6	Y = -214,485 + 3,580792 X	3,94**
HH – BW	26	0,61	37,3	Y = -200,624 + 3,457757 X	3,78**
CG - BW	26	0,86	75	Y = -202,143 + 2,805944 X	8,49**

Note :

BW: Body Weight (kg)

WH: Withers Height (cm)

BL: Body Length (cm)

BH: Body Height (cm)

HH: Hip Height (cm)

CG: Chest Girth (cm)

*: Significant(P<0,05)

** : Highly Significant (P<0,01)

The results of the analysis showed that the correlation coefficient between body weight and vital statistics had a highly significant correlation (P <0.01) but the BCS and body weight had a significant correlation (P <0.05).

Chest girth had the best correlation coefficient which was 0.86 and the coefficient of determination of 75% while hip height, body height, body length, withers height and BCS had low coefficient determinations. The effect of vital statistics (HH, BH, BL, WH, CG) and BCS on body weight is described by the coefficient of determination (R²) that was 45.2%, 44.6%, 44.6%, 37.3%, 75% and the coefficient of determination of BCS to body weight was 17.8%, it showed that body weight affected the BCS by 17.8% and the remaining 82.2% was influenced by other factors such as feeds, environment, cowshed, and the animal health. The best coefficient of determination of vital statistics was the Chest girth which was 75% and the remaining 25% were influenced by other factors. It was concluded that the Chest girth is the best variable to estimate the body weight of Madura cattle. Body weight is one of the important points in judging / assessing the cattle. Chest girth is one parameter in knowing the

cattle growth pattern. When cattle grow, skeletal bones that make up the Chest girth evolve and grow in line with the body weight gain (Zaed, 1992).

Based on the results of simple linear regression analysis to estimate the body weight using a vital statistic variable in the form of Chest girth, regression equation $Y = -202.143 + 2.805944 X$ was produced. The 2.805944 value in the equation means that if the independent variable, Chest girth, has a fixed value, then the dependent variable, body weight, will increase by 2.805944. Whereas if we use BCS as a variable, regression equation $Y = 93.82353 + 32.92157 X$ is produced. The 32.92157 value in the equation means that if the independent variable, BCS, has a zero value, then the dependent variable, body weight, will increase by 32.92157. The results of linear regression analysis of vital statistics on the body weight had a highly significant correlation ($P < 0.01$) and of BCS on body weight also had a significant correlation ($P < 0.05$) so that it can be used as a reference to estimate the body weight of Madura cattle aged < 1 year. From the description it can be concluded that body weight and chest girth are parameters that can be used to estimate the BCS on Madura cattle objectively.

Body weight is one parameter to know the cattle growth pattern. Growth in general has a certain critical point provided that the ideal conditions are met, such as feeds, certain age and maintenance. Good feeding and maintenance on certain age will produce cattle with good performance (optimum growth of bones and muscle cells) (Yusuf, 2004).

The analysis results of the level of correlation between the body weight with BCS and vital statistics of PI₂ Madura cattle are shown in Table 3.

Table 3. Correlation between Body Weight with BCS and Vital Statistics on PI₂

Correlation	Number of Cattle	r	R ² (%)	Regression Equation	t Test
BCS – BW	32	0,24	5,9	$Y = 191,7 + 24,56667 X$	1,38
WH – BW	32	0,64	41,9	$Y = -240,741 + 3,984394 X$	4,66**
BL – BW	32	0,71	50,3	$Y = -190 + 3,524221 X$	5,58**
BH – BW	32	0,66	44,5	$Y = -364,734 + 5,215086 X$	4,91**
HH – BW	32	0,65	42,3	$Y = -340,561 + 4,997635 X$	4,69**
CG – BW	32	0,78	61,1	$Y = -251,821 + 3,226731 X$	6,86**

Note:

BW: Body Weight (kg) WH: Withers Height (cm)

BL: Body Length (cm) BH: Body Height (cm)

HH: Hip Height (cm) CG: Chest Girth (cm)

*: Significant($P < 0,05$) **: Highly Significant ($P < 0,01$)

Table 3 shows that the results of the analysis of BCS and vital statistics with body weight showed that the best correlation coefficient was the Chest girth which was 0.78 with the coefficient of determination of 61.1%, but the analysis of the BCS and body weight variables showed low correlation coefficient which was 0, 24 with a determination value of 5.9%. Growth at the age of PI₂ decreased because at that age the cattle experience puberty. Rashid and Nugroho (1991) state that the growth of body height, chest girth and body length

of Madura cattle starting from PI₀ shows very rapid growth but after reaching PI₂ and PI₄ the growth begins to slow.

The ideal growth of cattle is before puberty and they will experience an increase and acceleration until puberty, however the growth begins to slow when they reach adulthood. Growth is of a rapid growth phase (occurs until puberty) and a slow one (in adult). Bone is the fastest growing organ, followed by muscle growth and then fat whose growth is the slowest to stop. Growth is divided into two periods, namely the growth of pre-birth and growth after birth. The pre-birth growth begins with the fertilized egg, while the growth after birth is divided into two phases, namely pre-weaned growth and after-weaned growth. The rate of growth after being weaned is determined by several factors; the growth potential of each individual animal and the available feed, but it is also influenced by the factors of race and gender. The pattern of growth depends on the management system that is done, feeding, health and climate (Djagra, 1994).

Based on the results of simple linear regression analysis to estimate the body weight using a vital statistic variable which was Chest girth, regression equation $Y = -251.821 + 3.226731 X$ was produced. The 3.226731 value in the equation means that when the independent variable, Chest girth, has a fixed value, then the dependent variable, body weight, will increase by 3.226731. If using a BCS variable, regression equation $Y = 191.7 + 24.56667X$ was produced. The 24.56667 value in the equation means that if the independent variable, BCS, has a fixed value, then the dependent variable, body weight, will increase by 24.56667. The results of linear regression analysis showed that vital statistics and the body weight had a highly significant association ($P < 0.01$) and the BCS and body weight had no significant association ($P > 0.05$) so that a vital statistic variable, which is Chest girth, can be used as a reference to estimate the body weight of Madura cattle aged < 1 year. Thus, it can be concluded that the body weight and chest girth are parameters that can be used to estimate the BCS on Madura cattle objectively.

Mansyur (2010) states that the body measures have a significant and positive correlation on body weight, the Chest girth does so since it gets bigger as the cattle grow due to some organs in the chest such as the lungs and heart which also grow and get bigger as the cattle grow older.

Supranto (2008) states that the minimum value of this correlation coefficient is -1 and the maximum value of which is 1. The higher the coefficient of correlation between two variables is (approaching 1), the higher the degree of the correlation between the two variables is, otherwise the lower the value of the coefficient correlation between the two kinds of variables is (close to 0), the weaker the degree of the correlation between these two variables is. To determine whether coefficients is significant or not, the t test was done. PI₂ age group was of 32 samples, so that the degrees of freedom ($n-2$) for 32 samples in the t distribution table with a significance level of 1% (2,492) and 5% (1.71).

Conclusion and Suggestion

Conclusion

It could be concluded that the vital statistics and BCS (Body Condition Score) of female Madura cattle at the age of < 1 year (PI₀) had correlations with body weight, chest girth; chest girth had the strongest correlation with body weight. Then, the vital statistics of female Madura cattle at the age of > 1 year (PI₂) correlated to body weight, while BCS did not have correlation, in this age group the chest girth also had the strongest correlation with body weight.

Suggestion

Based on the result of this research, chest girth and BCS can be used to estimate the body weight of Madura cattle at the age of < 1 year (PI₀), while chest girth which becomes

the best variable can be used to estimate the body weight of Madura cattle at the age of > 1 year (PI2).

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Growth and Development of Senduro Goat in Senduro, Lumajang District

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Abstract

A survey of 77 Senduro goats male and female (PI0 - PI4) has been carried out for a month in the District Senduro, Lumajang, to determine and analyze the growth and development of Senduro goat. We hope this research can be used as consideration in developing businesses goat farming. The results showed that the Senduro goats have physical characteristics resemble to Etawah goat, but the Senduro's has a dominant color of smooth white, no horns and thicker body. The average weight gain was 10.6 ± 1.4 kg per year in females and 17.3 ± 3.1 kg in males. The mean increase in body length, height and chest girth per year in the female was 3.8 ± 2.75 cm, 2.3 ± 2.9 cm and 4.5 ± 1.06 cm respectively, whereas in males was 8.4 ± 4.7 cm, 8.8 ± 3.9 cm and 9.8 ± 3.6 cm. From the study it can be concluded that the growth and development of Senduro goat could be classified as fast, grower: Male Senduro goat has the ability to grow and develop faster than females. From the results of this study suggested that Senduro goats need to be developed and gained attention of many institutions.

Keywords: *Body weight, measure vital statistics*

Senduro Goats Doe Productivity Index in Senduro Subdistrict Lumajang Regency

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Abstract

The study was conducted from January 24th until February 24th, 2016 at this area SenduroSubdistrictLumajang Regency. The material used in this research was 155 of doe and 284 kid of Senduro goats. The method used in this research is a case study. Determination of the sample using purposive sampling that samples taken has been assigned based on specific criteria based on high, medium and low population. Primary data was taken in the terms of a direct observation questionnaire was used as a tool concerning reproduction and weighing in body weight of kids of Senduro goat while the secondary data obtained from Lumajang Regency Veterinary Office related to populations of goats, the number of farmers who raise the goats. The variables measured were litter size, kidding interval, mortality, and weaning weight. The results of the research in the Sendurosubdistrict Showed that the average litter size was 1.83 ± 0.69 , average kidding interval was 281.87 ± 37.66 days, the percentage of mortality is 4.93% of kid, the average weaning weight was 22.14 ± 4.19 and Senduro goat doe productivity index was 50.87 ± 23.43 kg/year. The conclusion of this research is the Senduro goat doe productivity index in the Sendurosubdistrict amounted to 50.87 ± 23.43 kg/year. Value Senduro goats doe productivity index can reach a maximum when the number of litter size in high, the kidding interval short, mortality percentage of kid pre-weaning is low and weaning weight is high.

Keywords: *litter size, kidding interval, weaning weight and mortality.*

Effects of Probiotics Supplementation on Milk Quality of Etawa Crossbred Dairy Goat Fed by Product of Palm Oil Industry

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Abstract

The objective of this research was to determine the level of replacement concentrate ration of PE dairy goat with concentrates formulated by various of by product of palm oil industry (palm kernel cake, palm oil sludge and palm fiber) that have supplemented with probiotics. Research was conducted using completely randomized design (CRD) with 5 treatments concentrate ration replacement and 4 replications. Treatment A). 100% concentrate standard (CS) and 0% concentrate of by products of palm oil industry (BPO), B). 75% CS + 25% BPO, C). 50% CS + 50% BPO, D). 25% CS + 75% BPO, and treatment E). 0% CS + 100% BPO. Parameters measured were quality of milk, ie protein, fat, lactose and mineral (Ca and P). From the overall parameters of the above it can be concluded that probiotic supplementation on concentrate rations based on by products of palm oil industry is able to maintain the milk quality of PE dairy goat measured by fat of milk, protein, lactose and mineral (Ca and P)

Keywords : *Probiotics, ration, etawa crossbred dairy goat, milk quality, by product palm industry*

Introduction

One of the source for very potential alternative nonconventional feed ingredients unconventional potential used as animal feed is a by-product of palm oil industry. In 2012, Indonesia is the largest palm oil producer in the world with a total production of crude palm oil (CPO) as much as 27 million tons / year, far above Malaysia, as the second largest producer, with 16.9 million tonnes (Wihardandi, 2012). With a total area of oil palm plantations in 2012 reaching 11.5 million hectares (Directorate General of Plantation, 2012), the amount of by-products of palm oil industries to be produced as the source of an animal feed ingredient is very large with as much as 60% of it is a byproduct. Thus, the amount of by-products of palm oil industries to be produced is very large and will be problems in the future if not handled properly.

By-products of palm oil industry consists of palm kernel cake (PKC), palm oil sludge (POS) and palm fibers (PF) that can potentially be used as animal feed because it has a fairly good nutrient content (O'Mara et al., 1999; Carvalho et al., 2005). PKC feed substances are as follows: Dry matter (DM) 91.83%, Crude Protein (CP) 12.36%, Crude Fiber (CF) 26.68%, Neutral Detergen Fiber (NDF) 66.70%, Acid Detergen Fiber (ADF) 46.10%, Cellulosa 43.25%, Hemicellulose 24.94%, Lignin 17.29% and Total Digestible Nutrient (TDN) 65.40%. The content of the palm oil sludge feed substances (POS) are as follows: DM 90.35%, CP 10.89%, CF 20.31%, NDF 45.91%, ADF 38.64%, Cellulose 20.19%, hemicellulose 7, 27%, Lignin 14.21% and TDN 58.60%. Meanwhile, palm fibers (PF) contains the following: CF 93.11%, CP 6.20%, CF 48.10%, NDF 77.65%, ADF 53.57%,

Cellulose 32.75%, Hemicellulose 24, 94%, lignin 21.25%, TDN 51.00% (Analysis of Ruminant Nutrition Laboratory, Faculty of Animal Science, Andalas University, 2008).

As seen from the content of nutrients, the three industrial byproducts of palm oil industry is quite high but the amount of benefit as animal feed are very low. This is because of the high content of crude fiber and lignin, especially in palm fiber which causes low palatability (Iluyemi et al., 2006). In Africa, PKC has been used in sheep rations and can make efficient use of concentrates around 20-30% (Chanjula et al., 2011). Palm oil sludge can replace 60% of bran in the diet of sheep (Harfiah, 2007). Palm fiber can be used in cattle rations as replacement of forage as much as of 25% dry matter. If the reimbursement exceeds 25% will reduce feed intake.

Efforts that have been made to improve the nutritional value byproducts of the palm oil industry by applying a processing technology has yet to deliver optimal results in favor of livestock productivity (Nurhaita, 2008). Therefore, an increase in the digestibility of fibrous feed needs to be combined with efforts to optimize biological process in the rumen by rumen microbial population increase by feeding affixes (supplementation) of probiotics.

Probiotics are live microbial feed additive which is profitable for cattle. Probiotics are able to create a balance of microbes in the digestive tract thus creating optimum conditions for digestion of fibrous feed and improving feed conversion efficiency, which in turn can increase the production of livestock (Winugroho, 2008). Then added that, if on right target, probiotics are very economical because a side from increasing the production, probiotics can also increase better feed conversion and improve the health of livestock. Probiotic bacteria are also able to suppress the growth of pathogenic microorganisms residing in the gastrointestinal tract through the production of anti-microbial substances thus improving the health of livestock (Supardjo, 2008). Probiotics contain one or a mixture of various kinds of microorganisms that function as digestive fiber in the diet and can interact positively with rumen microbes (Ngadiyono et al., 2001).

PE dairy goat rearing is one alternative livestock for dairy cattle diversification aside from dairy cows. Various studies indicate that goat milk is quite popular like cow's milk (Sunarlin et al., 1990). Goat milk has the advantage that is easier to digest than cow's milk because of the smaller size of the fat and in a more homogeneous state (Jennes, 1990). The use of non-conventional feed with probiotic supplementation is expected to meet the needs of livestock in terms of protein and energy to support the productivity of dairy goats.

Based on the description above, research was conducted on milk quality Etawa goat feeding by rations the palm oil industry by products supplemented probiotics with the aim of studying the effect of the replacement of conventional feed rations formulated from various byproducts of oil processing industry which has been supplemented with probiotics on milk quality of Etawa Crossbred Dairy Goat (ECDG)

Methodology

Research on "Probiotic supplementation on Etawa Crossbred Dairy Goat ration based on by products of palm oil industry and its influence on milk quality" consists of 3 stages of research, follows:

Research Phase I: In-vitro studies (Phase I) of the concentrate ration of by product of palm oil industry (CPalm)

Research using completely randomized design (CRD) with 4 kinds of concentrate ration formulation treatment consisting of a mixture of various byproducts of palm oil industry (PKC, POS and PF) with 5 replications. Ration treatments are as follows: A ration (10% POS + 30% POS + 10% PF), B ration (20% PKC + 20% POS + 10% PF), C ration (30% PKC + 10% POS + 10% PF) and D ration (40% PKC + 5% POS + 5% PF). Other materials used in the ration is polar, soypulp, molasses and corn. The content of constituents

of feed rations can be seen in Table 1, while the ration formulations treatment and feed content of ration treatment can be seen in Table 2.

Implementation of In-vitro study refers to methods of Theodore and Brook (1969) with the preparation of the solution medium mimicking the conditions in the rumen of ruminant true. The materials used in the manufacture of medium solution is a solution macromineral, micromineral and reazurin. The solution was made to determine the level of reduction of the oxygen contained in the solution medium. CO₂ gas is required to condition the medium becomes anaerobic solution and keep the oxygen does not enter into the bottle invitro which has been in a state of aneorob when inserting material or when taking samples of rumen fluid. Rumen fluid that has been taken directly inserted into the flask so that the temperature can be maintained 39 °C under anaerobic conditions. Rumen fluid is filtered using a 4-layer chessloth for digestibility

Table 1. Nutrient Content of Ration Constituents (%)

Nutrients	Feedstuf						
	PKC ¹	POS ¹	PF ¹	Polar ²	Soypulp ²	Molases ²	Corn ²
Dry Matter	91.83	90.35	93.11	88.80	90.21	82.11	86.50
Crude Protein	12.36	10.89	6.20	15.00	24.00	1.70	8.74
Crude Fiber	26.68	20.31	48.10	20.31	23.15	9.70	3.36
NDF	66.70	45.91	77.65	41.47	83.00	52.17	49.96
ADF	46.10	38.64	53.57	28.29	56.78	26.40	36.76
Celulose	43.25	20.19	32.75	12.67	41.00	20.10	29.52
Hemicelulose	24.94	7.27	24.94	13.08	36.0	25.77	34.25
Lignin	17.29	14.21	21.25	10.51	15.32	6.50	8.50
TDN (%)	65.40	58.60	51.00	67.90	65.00	80.00	83.00

Table 2. Formulation and Nutrient Content of Feed Rations In-vitro Experiments Phase I

Feedstuffs	Formulation of Treatment Ration (%)			
	A	B	C	D
Palm Kernel Cake	10	20	30	40
Palm Oil sludge	30	20	10	5
Palm fiber	10	10	10	5
Polar	5	5	5	5
Soypulp	25	25	25	25
Molasses	6	6	6	6
Corn	13	13	13	13
Mineral	1	1	1	1
Number (%)	100.00	100.00	100.00	100.00
Nutrient Content				
Dry Matter (DM)	88.76	88.91	89.05	89.07
Crude Protein (CP)	13.11	13.26	13.40	13.79
Crude Fiber (CF)	21.39	22.03	22.66	21.91
NDF	60.66	62.74	64.81	65.31

ADF	43.53	44.28	45.02	45.02
Cellulose	29.58	31.89	34.19	35.87
Hemicellulose	22.82	24.59	26.35	27.24
Lignin	14.70	15.74	16.77	17.46
TDN	64.46	65.14	64.91	66.88

Research Phase II : Supplementation of bioplus on rations Concentrate of by Product Palm Oil Industry (CPalmt) The Best In Phase I

The aims of study was to determine the influence of supplementation of bioplus on the quality and digestibility of the ration concentrate based on byproducts of palm oil industry (CPalm) which is the best result of phase 1 (D rations measured by pH, VFA and NH₃-N rumen fluid) . The research used a completely randomized design (CRD) with 4 treatments and 5 replications. The treatment is a dose of probiotic supplementation in the ration of concentrate which were A) 75 g, B) 100 g, C) and D 125 g) 150 g. Probiotics was given once one time at the beginning of the experiment based on Winugroho and Widiawati, (2003) and (2004), Prihandono (2001) and Ngadiyono et al. (2001).

3.1. Phase III studies: Biological Test of Ration of Concentrate Formulation of by Product Palm Oil (CPalm) Best Results of a Phase II Research As Substitute Concentrate Ettawa Goats

The objective of the research was to determine the effect of concentrate rations containing PKC, POS and PF (CPalm, D ration) as a substitute of standard dairy goat (goat PE) that has been supplemented with probiotics bioplus (150 g) on the quality of milk.

Animals used are lactation PE dairy goats (lactation 1). Research used completely randomized design (CRD) with 5 treatments and 4 replications. The treatment is replacement of the standard concentrate ration of dairy goats with the best research best research results of Phase II concentrate ration as follow :

1. Treatment A = 100% standard concentrate ration (CStandard) + 0% Ration Concentrate Byproduct Palm Oil Industry (CPalm).
2. Treatment B = 75% (CStandard) + 25% (CPalm)
3. Treatment C = 50% (CStandard) + 50% (CPalm)
4. Treatment D = 25% (CStandard) + 75% (CPalm)
5. Treatment E = 0% (CStandar) + 100% (CPalm)

The composition of the standard concentrate ration (CStandar) and Concentrae Concentrated By Products of Palm Oil Industry (CPalm) best result phase II) used in the Phase III study (biological test) can be seen in Table 3.

Table 3. Composition of Standard Concentrate (CStandard) and ration Concentrate of By Product Palm Oil Industry (Cpalm) Ingredients in ration (%)

Feedstuff	Percentage in Ration (%)	
	CStandard	Cpalm

Palm Kernel Cake (PKC)	-	40
Palm Oil Sludge (POS)	-	5
Palm Fiber (PF)	-	5
Polar	50	5
Soypulp	25	25
Molases	5	6
Corn	19	13
Mineral	1	1
Jumlah	100	100
Nutrien Content (%)		
Crude Protein	15.25	13.79
TDN	69.97	66.88

Differences between treatments were tested using analysis of variance (anova) according to Steel and Torrie (1998), while the difference between treatments was tested by Duncan Multiple Range Test (DMRT)

Parameters

The parameters measured in this study was the quality of the milk which t is Total Solid (TS), Fat Milk (LS), Solid Non Fat (SNF), Milk Protein (PS), Lactose, Mineral, and Density of milk. Milk quality was measured 3 times then average of taken.

Results and Discussion

The research result of PE goat milk availability in Table 4.

Table 4: Milk Quality of PE goat from Various Rations Formulated By Product Palm Oil Industry Probiotics Supplementation Probiotics (%)

Treatments	Milk Quality (%)						
	Protein	Fat	Dry Matter	Density	Ca	P	Lakto-se
A	4.62	5.16	17.39	1.033	2.96	0.58	5.02
B	4.72	5.30	17.58	1.032	2.78	0.62	5.24
C	4.84	5.55	16.75	1.032	2.82	0.56	4.67
D	4.85	5.10	16.37	1.033	2.87	0.61	4.77
E	4.91	5.10	17.65	1.032	2.78	0.57	4.50
Average	4.78	5.24	17.19	1.032	2.84	0.56	4.84

The nutrient content of milk is a key factor that affects the quality of the milk. Milk quality is quite good if the nutrients contained in milk meets the quality standards of milk.

Statistical analysis showed that the treatment did not affect the quality of goat milk ($P > 0.05$), the results of research and quality of goat milk goats above is within the quality standards of milk goats. This suggests that the response of goats to concentrate rations based palm oil industry byproducts is good, no differences in the quality of milk although the base material ration has been replaced by palm oil industry byproducts.

Some of the factors that led to no differences in the quality of the milk is the same feed quality as well as the nation and the same maintenance of system. Bruhn (2006) reinforce the above results stating that the kind of feed affects the quality of milk and feed quality will affect the body's metabolism in animals that affect the availability of energy and nutrients for the synthesis of the components of milk. Added by Haenlein (2002) that 50%

nutritional components of milk is determined by feeding and management factors, if the feed and livestock management is good nutritional composition of milk would be good too.

In addition, the intake of dry matter ration was also relatively similar, causing no difference to the quality of the milk produced. The relatively similar composition and nutrient content of ration will not affect the end product of fermentation in the rumen because milk and milk fat synthesis is the main raw material of milk in lactating dairy cattle. This is supported by the opinion of Sukarini (2010) which stated that the feed is the determining factor of the final product of feed fermentation in the rumen, the increased production of VFA will provide enough energy for microbes to thrive and availability of raw materials for the synthesis of milk (Orskov and Ryle, 2000).

Judging from the content of protein and fat, according to Damayanti (2002), Afandi (2007) the protein and milk fat content ranged between 4.1% and 4.5%. Subagiana (1998) and Chaniago and Hartono (2001) got the goat milk protein content ranging between 3.3 - 4.9%, while Adriani (2003) got the range of goat milk research results are 3:00 - 6.90%.

The results of the above study showed that the protein content of milk obtained from this research is still in the normal range of protein and fat goat's milk. The similar content Protein and fat of milk is caused by the same proportion of forage and concentrate, where such of the forage and concentrates is a source of acetic and propionic acid affecting levels of fat and milk protein. According to Tilman et al. (1986) acetic acid formed in the rumen is the main raw material forming fat milk, reduced the amount of acetic acid resulted in reduced milk fat synthesis so that the fat content of milk decreases. In addition, the influence of feed to milk proteins are relatively small, feed was affecting more of the fat milk. Le Jaouen (1994) explains that the variation in the protein content of milk is less compared to the fat content of milk because milk protein is more influenced by genetic factors than environmental factors.

The research density of dairy goat also did not differ much from those obtained by Adriani (2003) who got an average weight of 1,029. Meanwhile, Budi (2002) got the density of milk ranges between 1.027-1.035. No difference in the quality of milk above was because of the similar composition of ration, stage of lactation, age and breeds of cattle in accordance with the opinion of Fox and McSweeney (1998) that the quality of the milk produced by an animal depends on the individual animal, nation, health, nutritional status, stage lactation, age and milking interval. Added by Bremel (2008) that a variation in the composition of milk can occur among individuals of one species of animal, age, body weight, feed, environmental and animal health.

Ca content of milk is high enough with 3:10%. Goat milk is a great source of Ca and nutrients. In addition, goat milk is consumed by people who are intolerant to cow's milk because some protein in cow's milk could cause allergies, which was not found in goat's milk and goat's milk also contained some anti-inflammatory agents like oligosacharida (Mateljan, 2008).

The treatment effect on milk production and quality can be seen in Figure 1.

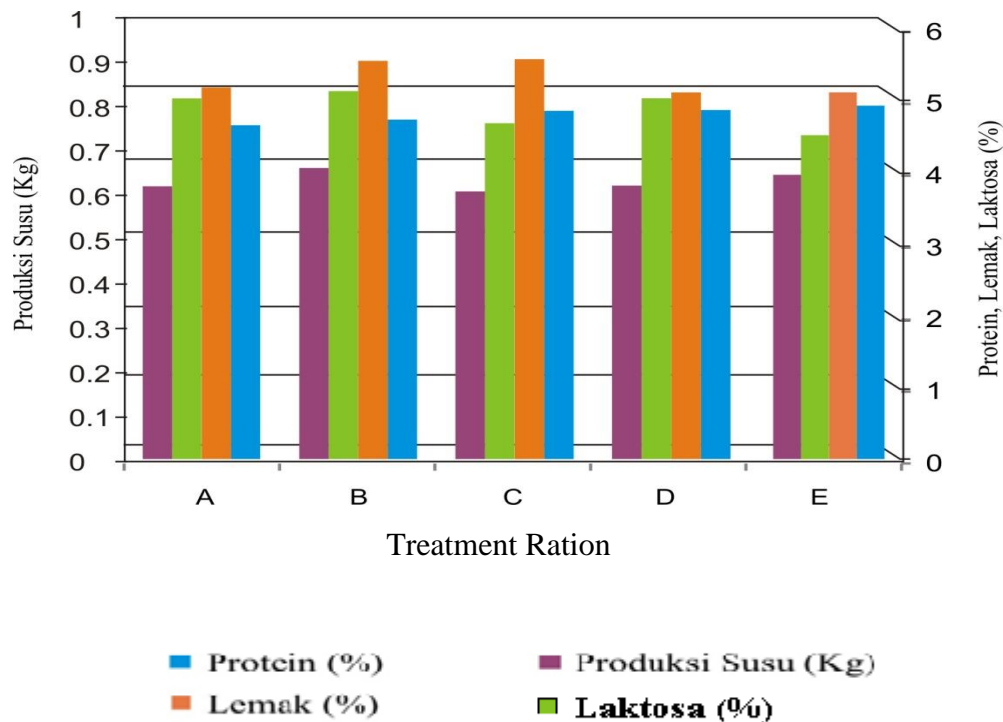


Figure 1: Effects of Treatment on Production and Quality of Milk

Conclusion

From the description above can be concluded that:

1. The byproduct of palm oil industry, name as palm kernel cake, palm oil sludge and palm fiber can be used as a feed ingredient PE dairy goats
2. The use of a byproduct of palm oil industry for goat lactation ration does not affect the quality of milk in terms of protein, fat, lactose, dry matter minerals and density of milk.

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Milk Production of Holstein Friesian cows related to heat stress in Responding to Climate Change

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Abstract

Influence of global climate change is a growing worry for exposing heat stress on livestock in the tropics. This study aimed to evaluate milk production of HF dairy cows in related to heat and humidity stresses under an intensive management located at a medium altitude in Bogor, West Java. Temperature and humidity were measured, then the value of Thermal Humidity Index (THI) were calculated. HF cows observed were 73 heads for daily and partial cumulative milk production for lactation 1 and 2 in 2013-2015. Higher ambient temperature caused lower humidity. Mild stress on animals occurred during morning (THI 71.8) due to high humidity and low temperature of environment. Moderate stress happened during the day (79.7 THI). Daily milk yields at 30, 150 and 300 d at the 1st lactation were 11.8, 8.2, and 6.0 lt. respectively; while those at the 2nd one were 10.6, 7.7, and 5.7 lt. respectively. Heat stress related to climate change is expected to further suppress milk production of dairy cattle.

Keywords: dairy cattle, heat stress, milk production

Introduction

Global climate change has been reality and will continually progress. Climate change phenomenon is not only a concern of livestock farming in subtropical regions, but also in tropic area. Climate change gives direct effects on biological and physiological aspects of various types of livestock, but how its mechanism of influences is still difficult to measure directly. In many studies, effects of climate change have been studied in the relationship between the increasing of ambient temperature and productivity of livestock (Bagajai, 2011). Changes in heat stress can be predicted to give more depress on physiology of livestock. Dairy cattle is the most vulnerable animals to be exposed by the increasing environmental temperature due to their high metabolic rate and worse mechanism of water retention (Collier *et. al.*, 2005).

National milk production is mostly produced by Holstein Friesian (HF) cows as an excellent dairy breed from subtropics. Temperature and humidity are two components of the climate for giving direct influences on productivity of livestock. By lowering region will increase environmental temperatures that increasingly provide higher heat stress on animals. Relationship between temperature and humidity, stated as temperature humidity index (THI), determine the level of stress of dairy cows. Milk production of dairy cows will be reduced when ambient temperature and relative humidity index increase over a critical threshold (Little and Campbell, 2008). Milk quality such as protein content and solid nonfat (SNF) will also decline in dairy cows exposed by heat stress.

Heat stress will increase by the increasing atmospheric temperature, which will further reduce milk production of lactating cows. This study aimed to study effects of temperature and humidity on milk production of HF cows managed intensively at a dairy breeding station at a middle latitude in Ciawi, Bogor, West Java. Information of milk production from this study may become possible good consideration in anticipating more serious heat stress of dairy cattle from climate change to make sustainable dairy farmings in the tropics.

Methodology

This research was conducted at a dairy cattle station possessed by Research Ins. for Animal Production (RIAP), located in Ciawi Subdistrict, Bogor, West Java. The station is at a medium latitude around 574 m asl. A number of HF cows observed were 73 hds in lacion periods of the 1st lactation (73 hds.) and the 2nd one (44 hds.) in 2013 - 2015. Forages were fed around 10% of body weight, while commercial concentrate were fed by 4-5 kg/hd /d by containing protein content of 15-17%. Additional tofu by product were also fed for 6-8 kg/hd/d.

Temperature and humidity were measured thermometers (wet and dry bulb), digital anemometer; while physiology aspects were measured by stethoscope and piranometer. Temperature Humidity Index (THI) was calculated according to Hahn formula (1999), namely: $THI = DBT + WBT + 0.36 + 41.2$. DBT was temperature of dry bulb (°C), while WBT was temperature of wet bulb (°C). Milk yields were observed for daily milk production and partial cumulative production at 30-d intervals. These milk yields were observed only for the initial 300 days of milking days.

Results and Discussion

Microclimate Components

Description of temperature, humidity and THI values surrounding animal house during morning, midday and afternoon observed in September-November 2015 is presented in Table 1. A clear relationship was patterned between temperature and humidity. By increasing temperature, resulted in decreasing humidity. HF cows optimally produced milk for temperature by 18.3 °C and RH by 55 % (McDowell, 1972).

Table 1. Microclimate components surrounding dairy cattle station

climate components	Morning (08.00 a.m.)		Midday (12.00 a.m.)		Afternoon (16.00 a.m.)	
	Average	Min - max	Average	Min - max	Average	Min - max
Temperature(°C)	23.2	22 - 25	30.2	29-31	30.9	29-34
Humidity(%)	79.1	70 - 84	55.8	45.6 - 1.7	58.3	44.6 - 61.7
THI	71.8	70.4 - 74.1	79.7	78.1 - 80.8	80.5	78.5 - 83.8

THI was Temperature Humidity Index

THI values from morning to afternoon increased from 71.8 to 81.2. This caused the observed HF cows experiencing heat stress from mild to moderate. Another study conducted at a higher altitude of 675-750 m dpl, within temperature ranges of 22-31 °C and RH of 68-100% (THI 73-82) was stated that the HF cows felt into a mild heat stress.

Milk Production

Averages of 300-d cumulative milk production of HF cows in this study based lactation periods at the 1st, the 2nd and both were successively 2,333±570 lts, 2,805 ± 982 lts and 2,501 ± 774 lts. Location of the RIAP dairy cattle station in this study was lower compared to those of others dairy cattle stations either in Purwokerto District, Central Java (675 m) and in Lembang District, West Java (1,200 m asl). the 300-d milk production from the first station was 4,335 lts., while for the latter was 4,083 lts. Differences of milk

production could be caused by a number of factors, such as genetic potency of the cows, management, health services and climates.

Table 2. Daily and partial cumulative milk production (liter) of HF cow at 30-d interval

Days of Lact.	1 st Lactation			2 nd Lactation			Both		
	N	X ₁ ±Sd	X ₂ ±Sd	N	X ₁ ±Sd	X ₂ ±Sd	N	X ₁ ±Sd	X ₂ ±Sd
30-d	70	10.6±2.7	283±65	44	13.5±3.4	375±113	120	11.8±3.4	322±99
60-d	69	9.9±2.5	593±139	43	12.2±3.3	757±206	118	10.9±3.2	664±191
90-d	67	9.5±2.1	880±201	43	10.0±3.3	1091±304	114	9.7±2.6	971±274
120-d	66	8.6±2.1	1151±257	38	9.4±3.4	1377±409	104	8.9±2.7	1247±352
150-d	64	7.7±1.9	1397±313	34	9.1±3.3	1652±507	98	8.2±2.6	1504±427
180-d	65	6.8±2.0	1615±371	29	7.9±3.2	1898±595	94	7.1±2.5	1731±498
210-d	61	6.0±1.5	1802±424	26	7.7±3.1	2130±688	87	6.5±2.5	1932±568
240-d	61	5.8±1.8	1983±471	23	8.0±3.1	2358±781	84	6.4±2.4	2126±635
270-d	58	5.9±1.7	2157±521	16	8.0±3.3	2572±887	76	6.3±2.4	2312±707
300-d	58	5.7±1.8	2333±570	15	7.1±2.7	2805±982	73	6.0±2.1	2501±774

Description: N was number of records; X₁ was daily milk production; and X₂ was partial cumulative milk production; Sd was standard deviation

As an illustration, the latter station was located at the highest altitude than the two others. The highest location gave temperature by 19.3 °C (13.8 to 24.6 °C) and RH by 80.5%. This was advantageous in providing a more comfortable environment for dairy cows to produce milk.

By developing dairy farming in lower area will certainly increase heat stress on cows to produce milk. Thus more stress from heat temperaute and humidity could be a major challenge in developing dairy cattle farming in tropical zones, especially in the lowlands. This is necessary considered more seriously in connection with the continuing temperature changes.

Conclusion

HF cows in this study experienced mild stress during morning (THI = 71.8) up to moderate stress during midday to afternoon (THI = 79.7-80.5). Milk production of the observed HF cows were lower under microclimate pressures. More expected pressure from climate change should be anticipated to make more sustainable tropical dairy cattle farming.

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The Effect of Water Clover Leaf Juice (*Marsilea crenata*) Against Blood Calcium Levels And Histology Os humerus On Rat (*Rattus norvegicus*)

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Abstract

The aim of this research were to find an natural herbal active compounds which contain phytoestrogen that could be potential to develop as alternative compound against animal with low level of blood calcium. One of the compound which isolated from *Marsilea crenata* that consist of natural phytoestrogen isoflavones. This research is true experimentally post test control design based on completely randomized design. Animal experiment used old females white rat (*Rattus norvegicus*), age 3 months, with an average weight about 200 grams, divided into 5 groups challenges with *Marsilea crenata* juice in different concentration such as P2 (20%), P3 (40%), P4 (60%) and P5 (80%) about 2 ml each and given by gastric sonde along 23 days, and P1 as a negative control. The parameters measured are level of blood calcium using Atomic Absorption spectrophotometric (SSA) method. To find that could be shown effect of Calcium toward osteogenesis used to determine osteoblast and osteocyt that impact on bone density. The results showed that *Marsilea crenata* juice give a increase of blood Ca level among treatments. Histology os humerus showed that have impact on higher of the bone density. The conclusion of this research were *Marsilea crenata* juice plays a role in increasing toward blood calcium levels and surely increase bone density in animal laboratory (*Rattus norvegicus*) especially on 80% concentration. The suggestion was *Marsilea crenata* juice or fresh could be give to animal feed supplementation especially to prevent against low level of estrogen and blood Calcium.

Keyword : phytoestrogen, Blood Calcium, less compact of bone

Introduction

Used for natural compound just like substance like hormon or phytohormone already widely researched both on human and animal. Phytoestrogen is one of many potential phytohormone that have estrogen like hormone substance (Glover dkk, 2006). Chemical structure of phytoestrogen almost the same as natural animal estrogen, they are bound in Estrogen Receptors (ER) alpha and/or beta, and then act just like estrogenic factors. (Setchell, 1998). Chemical compound of Phytoestrogen consist of isoflavon, koumestan, and lignan, but that much more were daidzeindan genistein (Kim dan Park, 2012).

Marsilea crenata or water clover has a round shape of leaves and consists of four strands small leaves. This plant is a plant group of salviniales, live wild in aquatic environments such as ponds, paddy fields, lakes, and marshes (Afriastini, 2003). Freshwater clover plant content phytochemical such as sugar, steroid, carbohydrate, and flavonoids. Flavonoids also have a function as an antibacterial, anti-inflammatory, antitumor, allergenic, and prevent osteoporosis. (Yacoeb et al. 2010).

Freshwater clover plant *Marsilia crenata* content phytochemical such as sugar, steroid, carbohydrate, and flavonoids. Flavonoids also have a function as an antibacterial, anti-inflammatory, antitumor, allergenic, and prevent osteoporosis. (Yacoeb et al. 2010). The main content of the water clover isoflavones is a genistein and daidzein. Water clover contains more genistein than daidzein. Isoflavones are phytoestrogens that are part of this has important functions in the defense mechanisms of plants. Isoflavones are an active substance that contains estrogen hormone from plant material (Kumar et al., 2009).

The main content of the water clover isoflavones is a genistein and daidzein. Water clover contains more genistein than daidzein. Isoflavones are phytoestrogens that are part of this has important functions in the defense mechanisms of plants. Isoflavones are an active substance that contains estrogen hormone from plant material (Kumar et al., 2009).

Steroid hormones should be pass through the cell membrane, binds to specific receptors, then enters the nucleus to bind with the cells DNA which then activates certain genes (Direct gene activation).mRNA is synthesized in the nucleus and enters the cytoplasm and promotes protein synthesis for: enzymes as catalysts,tissue growth and repair, regulate enzyme function,

Although estrogen is known to induce new bone formation in the long bones of female mice, this response is only thought to occur following administration of high doses, suggesting that it may not be mediated by a conventional estrogen receptor. To address this question further, we first examined the stereospecificity of this response by comparing the potency of 17beta-estradiol in stimulating cancellous bone formation at the proximal tibial metaphysis of intact female mice with that of the relatively inactive stereoisomer, 17alpha-estradiol (alphaE(2)).

Methodology

The study was conducted in the Laboratory of Epidemiology, Faculty of Animal Husbandry, University of Brawijaya, Malang. Using in vivo challenges against laboratory animal (50 head mice strain Wistar) and Completely Randomized Block Design of five treatment and four replications. The treatment were P1 as negative control group and the other group challenged of four level of *Marselia crenata* juice about P2 (20%), P3 (40%), P4 (60%), P5 (80%),) as much as 2 ml along 23 days. To measured the parameters were titer of blood Calcium in serum that collected pre and post treatment, used Atomic Absorption spectrophotometric (SSA). The data were analysed used analysis of variance followed by Duncan Multiple Range Test.To supported result of treatment used description analysed to definite about influence of treatment to osteogenesis shown by Histological figures. Results of histological preparations os humerus were observed using a microscope with a comparison between control and treatment groups.

Results and Discussion

Blood Calcium level

Calcium is one of the most important minerals in the body. The majority of it is found in teeth and bones, but it is also involved in muscle function, blood clotting and nerve function. Phytoestrogen compound improves calcium balance especially in female rat (Pratiwi, et all 2015).Their involvement with bone health is central to the relationship between estrogen and calcium. Maintaining an appropriate level of calcium is important not only for bone growth over time but also for protecting bone strength. Estrogen supports this activity by aiding in intestinal absorption of calcium., are at risk for bone loss.

Levels of the blood calcium in this research P1 is a group of negative control, mean levels of blood calcium is the lowest among the five groups between treatments. This may cause a high amount of blood Ca levels in the study above normal titer.Data of SSA Ca blood

test parameters of control and *Marselea crenata* juice phytoestrogen challenges were presented in Table 1. It is shown that all *Marselea crenata* juice supplementation with different levels showed towards raiselevel of blood Ca among level of treatments (P<0.05).

Table.1Result of treatment Marselea crenata juice in Blood Calcium level (P <0,05)

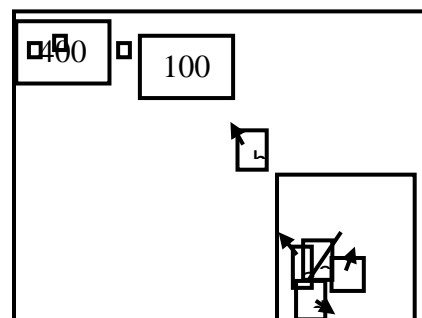
Treatment Groups	Blood Ca levels (mg/dl) x±sd
P1Negative Control	11.490 ± 0,8883 ^a
P2 C . 20%	11.755 ± 1.8695 ^a
P3 C. 40%	14.040 ± 2.5186 ^c
P4 C 60%	13.250 ± 1.7799 ^b
P5 C 80%	14.267 ± 2.5032 ^c

Osteogenesis

Result of this research were raise the possibility that estrogen-induced osteogenesis in the mouse represents an estrogen-receptor-mediated response that is not confined solely to supraphysiological estrogen levels, as stated by Samulel, *et al*, (2000).Estrogens are multi-functional hormones, and one of their functions involves the bones.The osteogenic response was subse-quently assessed by histomorphometry performed on longi-tudinal and cross sections of the humerus. E2was found to causean equivalent increase in cancellous bone formation inERMice.

The phytohormones influence bone-metabolism through different mediators like growth factors. One such a growth factor is Insulin-Like Growth Factor-1 (IGF-1). That an increased uptake of calcium increases osteoblast apoptosis is also shown by IGF-1 influence; IGF-1 is a potent growth factor for osteoblasts It also increases bone resorption and induces osteoblast apoptosis. Other such growth factors are Fibroblast Growth Factors (FGF). FGF play a critical role in bone growth, and overexpression of FGF2 increases osteoblast apoptosis.

The result the optimum level is in 80% concentration of *Marselea crenata* juice,among there differencies stage of osteogenesis, histological approach of os humerus, illustrated as much of osteoblast and osteocyte that impact against in increase of bone density.



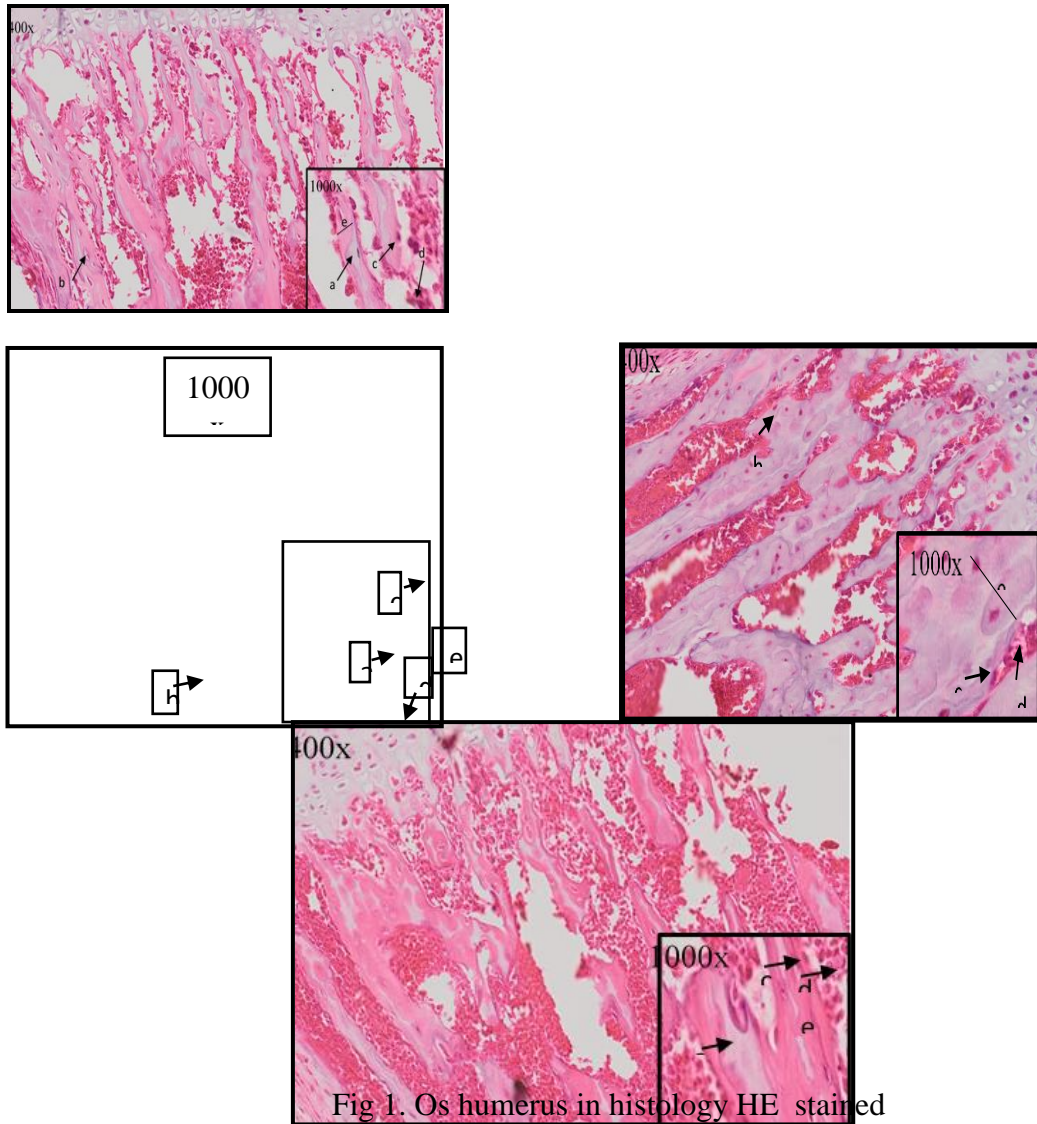


Fig 1. Os humerus in histology HE stained
(Left-Right P 1,2,3,4,5)a. Cartilago, b Osteocyte, c osteoblast

Conclusion

Supplementation of *Marselea crenata* juice as source of phytoestrogen increase the titer of blood Ca and raise the rate of osteogenesis, that is mean that suggestion to be used in case of low estrogen hormone in female, and to increase the density of bone both male and female animal in low blood calcium state.

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Oral Presentation 5 Focus Session:
Socio-Economics and Others
Friday, 21 October 12:30-14:10
Room : Welirang

Financial Analysis of The Pig Farming That Utilizing Waste Disposal System as Environmentally Friendly Farming Practices (a Case on a Pig Breeding Farm in Tomohon, North Sulawesi)

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Abstract

This study analyzes the financial potential on the utilization of the sewage system on pig breeding farm in Taratara, sub district of West Tomohon, Province of North Sulawesi. The study conducted on the utilization of sewage systems were built through the program of science and technology for the community (*Iptek bagi Masyarakat/IbM*). Utilization of sewage system, as well as the utilization of manure waste as an additional farm income is an investment for environmental costs, need to be analyzed financially. The study results showed that the utilization of the sewage system on pig breeding farm is feasible, continued or developed. So the farmers need to invest the environmental infrastructure, especially the sewage system (waste management system), in order to implement the farm is environmentally friendly and sustainable.

Keywords: *pig farming, waste disposal system, environmentally*

Introduction

Livestock farming system is generally not implement good practices in waste (manure) handling. The impact of not well-organized sewage is manure surplus, so that farmers will pay extra for transporting the waste elsewhere (IAEA, 2008). Integration of livestock with crop is one of the good agricultural practice. In general, smaller farms generate less excess nutrients per hectare than larger farms. This is because most small-scale pig farms are mixed systems where some croplands are available for nutrient assimilation (Catelo et al., 2008).

Though manure waste can be composted or growing media for floriculture crops. Waste of animal manure can be stored in the hole for the decomposition of anaerobic before applied on crops as fertilizer, thus animal waste at the household level can be recycled an ongoing basis. The system of animal waste treatment depends on the scale of the farms. Solid wastes can be composted (sometimes in combination with other agricultural residues), and liquid wastes can be stored in deep pits for anaerobic decomposition before being applied to the farmland as fertilizer. Thus, animal waste at household level can be recycled in a sustainable way (Cheng and Dilger 2009).

In Tomohon, there are pig farmers and growers of floriculture (especially ornamental plants). Through science and technology program for the community (IbM program), performed the integration between pig farming and floriculture (ornamental plants) farming. Based on observations indicated that the location and construction of the cage quite good, but the construction of the sewage system of manure is still not good. Currently pig manure also

liquid waste directly poured into the river polluting the river water and the resulting odors very disturbing smell surrounding communities.

Methodology

This study analyzes the ecology financial on the utilization of the sewage system of pig breeding farm. In addition to carrying out community service were also carried out a case study using the financial analysis on pig breeding farm in Taratara, sub district of West Tomohon. The experiment was conducted using research methods prescribed by Hidayatullah, et al. (2011) and Sugiyono (2004).

Analysis of cost-benefit analysis used is based on the criteria of investment, which was preceded by the calculation of cash flow (cash flow) efforts over the years of production, followed by calculation of Benefit Cost Ratio (BCR), Net Present Value (NPV) and Internal Rate of return (IRR) for a certain period of time (Gittinger, 1982; Kadarsan, 1995; and Kadariah et al, 1999). For this study taking into account external costs and environmental benefits through the environmental externalities cost-benefit analysis (E-CBA) by Abelson (1980). Cost-benefit analysis is an assessment method that quantifies in monetary terms (Kiratikarnkul, 2008)

Results and Discussion

The results of program activities in accordance IbM stages that have been implemented, namely: experimental application of technology sewage systems that is environmentally friendly; and processing and utilization growing media that manure bioslurry-based for floriculture crops.

The analysis showed that the cost of the environmental investment through the utilization of the waste management system in the beginning (T_0) led gains relatively little effort compared to conventional farming practice. But in the middle period until the end of the period, profit gained greater than conventional practice. This is because the environmental costs only on the initial investment, whereas a greater environmental revenue in the initial, middle and end of the period.

Results of analysis showed that production cost of externalities that investment and operational costs in the conventional and environmental costs. Pig farmer only cost environment as an externality cost of 0.39%. The results of the analysis of externalities with the revenue and cost combination of conventionally or the environment, pointing out that farmers make a profit for the year amounted to Rp.77.408.176. This means that even if farmers sacrificing funds for environmental costs, yet still provide financial benefits for their farming agribusiness. It is necessary for a financial analysis for the next 10 years, to see the prospect of feasibility by increasing investment for the costs of externalities.

This study uses three investment criteria, namely NPV, IRR and BC Ratio, conducted a financial analysis for 10 years, by analyzing the externalities in the investment criteria of cash flow shows the NPV value conventionally or in externalities was greater than zero, or positive. Likewise NPV conventionally or in externalities is greater than zero, or positive. IRR analysis of pig breeding farm development at a discount rate (discount factor) in accordance with the prevailing market interest rate range, demonstrating the value of IRR is 33.10%. Likewise, in eco-financial IRR was greater than one, amounting to 33.12%, these results indicate that the pig breeding farm with externalities investment in farm development over the next ten years can provide a level of financial gain. The results of the study in the conventional BC ratio or in externalities is greater than one.

This study showed that a case study on a pig breeding farm, conventionally provides a comparison between income or benefits with the investment costs greater than one meaning is financially viable, as well as investment plans externalities provides a comparison between income or benefits with the investment costs greater than one.

Conclusion

The study results showed that the development of investment criteria externalities investment in livestock business case study effort pig breeding farm is feasible for continued or developed. The farmers that invest externalities, especially environmental infrastructure construction, in order to implement the farm is environmentally friendly and sustainable.

It is suggested that the government should enforce the rules with that livestock farm investing primarily externalities, to implement sustainable farms.

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Farmers Group's Role in Farming Management and Rabbit Farmers' Communication in Lang – Lang Village, Singosari District, Malang Regency, Indonesia

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Abstract

Farmer groups have been proven to have a lot of contribution to the progress of farming in Indonesia. It helps farmers to perform in the farm management and provides good communication in farmers' community. The research was conducted on "Bina Mandiri" Farmer Group in Lang – lang Village, Singosari, Malang which has 15 members of rabbit farmers. This study used descriptive qualitative method. All members of the group are used as respondent. This study describes the role of farmer group in the business management and farmers' communication pattern. The roles of farmers group analyzed were: 1) production inputs; 2) farming management supervision; 3) processing; 4) marketing 5) service for member. The research also discussed about the communication in the farmers group.

Keywords: production input, supervision, processing, marketing, communication

Introduction

Farmers group in Indonesia is considered as one of the most important farmers' activator in farming system. Based on Indonesian Agriculture Minister Regulation number 273 / Kpts / OT.160 / 4/2007, there are two types of institutions important role in agribusiness system, first, as an information provider and second, as a provider of physical / services on each subsystem. Both roles are equally needed by farmers. Thus, institutional effectiveness of farmers group are identified by how far its influence in changing farmers behavior in farming management and its success in giving of physical / services to the members (Cahyono and Tjokropandojo, 2013).

Institutional farmers have some role to support the sustainability of agriculture, including:

1. Facility planning, management, procurement and distribution of means of production that enable the implementation of a farming technology and the optimal utilization of natural resources
2. Farming Supervision and development of farming in order to increase agricultural production, good farming for smallholders and large farms
3. Processing subsystem results in a simple farm level and post-harvest handling of agricultural commodities produced
4. Marketing of raw or processed products including: distribution and marketing activities in the domestic and export
5. Service or Support (Department of Agriculture, 2011 and Zakaria, 2003), banking services, transport services, insurance, storage and other (Nurmala et al, 2012).

Communication in farmers group is also important since it enables a great information flow between stakeholders. If members of farmers group can have good information sharing, then it is possible to find out many solutions of their problems and reach other institutions to get support. They should also use appropriate communication channels to encourage the circulation and dissemination of information flowing from the source to the community, or the community on various levels of the decision making process, or between the group and the community itself (Bessete, 1996).

Thus, farmer group roles in farming management and communication can give big differences in farming performance.

Methodology

This type of research is descriptive qualitative research. The research was conducted in the village of Lang - lang, Singosari, Malang Regency, Indonesia. Respondents are all rabbit farmers who joined the group Livestock BinaMandiri totaling 15 people. Data collection technique used was structured interview using questionnaire and participatory observation. The data analysis technique was to make a systematic description, factual and accurate about the facts and the properties of the population or a particular object.

Result And Discussion

Institutional role in farming system

The roles of Bina Mandiri farmer group are divided into five categories: 1) production inputs; 2) farming management supervision; 3) processing; 4) marketing for members 5) service for member. Data collected are shown in the table below.

Table 1. Support from Bina Mandiri Farmer Group to its members

Support from BinaMandiri Farmer Group	Frequency of support given				
	Never	Rarely	Sometimes	Often	Always
Production Inputs					
Litter	14	-	-	1	-
Feed	14	1	-	-	-
Medicine	15	-	-	-	-
Cage	15	-	-	-	-
Rabbit Breeding Management Supervision					
Litter selection	11	4	-	-	-
Feed selection	13	2	-	-	-
Medicine selection	12	1	2	-	-
Cage construction	12	2	1	-	-
Processing					
Product processing	12	2	1	-	-
Processing equipment	15	-	-	-	-
Marketing					
Marketing information (price)	-	-	-	4	11
Marketing channels	-	-	-	2	13
Service for member					
Health service	14	-	-	-	1
Financial support	15	-	-	-	-

Production Inputs

The role of the farmers' group in supporting means of production for group farming activities in the village of Lang - lang is not well organized. Tabel 1 shows that for all production inputs (litter, feed, medicine and cage), most of the respondents said that they never get any support from the group. Bina Mandiri farmers' group is difficult to cooperate with the stakeholders to get support in farming equipments because it does not have formal structured organization. Yet according Sukadi (2007) there are three crucial roles of farmers' groups, among others: 1) as a media that able to reach the target, fair and dynamic, 2) as a tool to achieve change in accordance with the purpose of agricultural extension, 3) as an institution where farmers can give their aspirations. It can be concluded that the role of the farmers' group in providing a wide range of equipments needed is still in a low level.

Rabbit Breeding Management Supervision

According to the research, Bina Mandiri farmer group never provide supervision to most of its members, some members get supervision rarely and only few of them got more frequent assistance (Table 1). Actually, supervision in selecting the right litter, applying the correct use of feed, setting up the cage and using drugs are very important for group members. However, since the leader is also not an expert, he is also still need to get assistance in the rabbit breeding management. This was also the effect of the poor communication between farmer group with other stakeholders (academician, government, etc) and between members themselves. It leads to unfavorable impact on the members of the farmer group because their knowledge about would not go better. According to Sukadi (2007), in the deployment and application of new innovations to the formation of farmer groups, through group activity will be faster and more easily widespread than if delivered through an individual or mass approach. It will be more effectively and efficiently distributed. Competition application of technology and productivity of farming among farmers will be healthier, because it has the same view, namely to achieve a common goal.

Product Processing

Main products from rabbit farming are actually potential to increase revenues significantly, however farmers never tried to do this effort. Table 1 shows that there was poor support from the group and it demotivated the members to do after harvest processing. The effect was farmers had lack knowledge about product adding value process and felt apathetic to increase knowledge about the processing of rabbit meat production and its sideline. Thus, the post harvest processing program seems need to done for BinaMandiri group, as Firman (2007) said that the main objective of farming development is to raise farmers' income and wealth. It can be reached by optimalizing the function of stakeholders because it will broaden working opportunities.

Marketing

The role of Bina Mandiri farmer group in helping group members to market their rabbit is very important. Actually there are parties involved in rabbit marketing but farmers rarely communicate with them. The marketing process of products directly coordinated by Mr. Dwi as the the chairman of the group. The group members entrust Mr. Dwi to market their rabbits for sale. Although this marketing process viewed as very helpful by the members, but they said it lack of transparency. Group members mentioned about their curiosity in parties involved in the marketing process and profit share between Bina Mandiri farmer group and its members. According Cahyono and Tjokropandojo (2013) institution like farmer group has function to market its members' products. But the role farmer

organizations have different levels of ability or performance. In this case, it is better to have good transparency to maintain members' trust, to acknowledge the members about rabbit marketing chain and to educate them in the marketing process.

Service for Member

Bina Mandiri Farmer Group never gives health and financial support to its members. These two important roles are failed to carry out since all managements do not have capacities to assist the members in health management. The farmer groups also do not have a formal or informal financial partner to support them. According Cahyono and Tjokropandojo (2013) the role of institutions in agribusiness system is as an information provider and as a provider of physical/services on each subsystem. Both roles are equally needed by farmers. Financial is included in physical support. The absence of financial support can be the reason why rabbit performance and members' farming scale in this village are constantly low.

Communication process

Communication process in BinaMandiri Farmer Group was divided into two criteria: communication channels and communication pattern.

Table 2. Communication Process in the Bina Mandiri Farmer Group

Communication Process	Frequency of communication activities				
	Never	Rarely	Sometimes	Often	Always
Communication Channel					
Members directly communicate with other members	10	3	-	-	2
Members communicate with other members by using media (mobile, mail)	11	4	-	-	-
Members communicate with stakeholders	12	1	-	-	2
Members communicate with stakeholders by using media (mobile, mail)	13	-	-	-	2
Members communicate with stakeholders mediated by farmer group	12	-	3	-	-
Communication Pattern					
Communication between members	11	2	-	-	2
Communication between members to non member farmers	13	2	-	-	-
Communication between members with stakeholders	9	2	2	-	2
Communication between groups	12	-	1	-	2

Communication channels

In the process of communication, Table 2 shows that most respondents stated that they had poor communication with other members and stakeholders either directly or using communication tools such as (phone, mail, and so on). While there are also small numbers of respondents who sometimes make communication with farmer group and stakeholders either directly or using communication tools such as (phone and mail). Respondents who communicate with other parties usually have their rabbit farming as their main income. Hence, they put a lot of effort in enhancing their farming scale. These active farmers regularly have communication between groups of rabbit farmers and with stakeholders like extension officers, paramedics, parties involved in marketing, third-party sellers of farming equipment. It was very unfortunate because communication with stakeholders actually is the

most important activity in growing farmers' awareness, especially to improve their farming management and to raise their income. As Nasikhin (2015) states that the resources are used for different purposes mass media to convey and disseminate information to farmers quickly. The mass media as a channel for distributing information are intended to reinforce the message, whereas interpersonal channels for example relating to extension officers, government officials, intended to affect behavior change.

Communication patterns

Communication pattern is the way people communicate to each other in their community which has been patterned as a usage and it repeatedly happened. It also said as a form of the way two persons or more in delivering and accepting message so both parties have the same understanding. In Bina Mandiri farmer group, communication pattern between farmers includes communication between members, between members to non member farmers, between members with stakeholders and between groups of farmers. With these patterns, they exchange information (messages). While group communication usually conducted informally between Bina Mandiri farmers with other group members in an informal place, such as in a coffee shop. In Table 2, communication patterns were not happened frequently, thus information and knowledge were not easily spread to farmers. Only few farmers who owned rabbit farming as their main income (who also have bigger farming scale) dominated communication patterns. Mulyana (2000) said that interpersonal communication is communication between people face to face, which allows participants to catch the reactions of others directly, either verbally or non-verbally. This allows people to exchange information easier.

Conclusions

The conclusions are: 1) the farmers group still delivers a poor role for its member, 2) communication between members or other parties was weak, but there was a big potential to help its members by strengthening coordination between stakeholders.

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The Development Program “*Village Poultry Farming*” to local hens *Farmers of Tenga Village*

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Abstract

The purposes of research is to developing village poultry farming program to local hens farmers of Tenga village. Development of cultivation poultry in the villages (village poultry farming) is one of effort run by government in developing animal husbandry local hens, especially in the villages. The development activity (IPTEKS) for society in Tenga village is how to increasing nutrient for society, help to build back poultry local industry belongs to populave with supplying chicken village fot Anugerah farmers and Gracia farmers of Tenga villages. Material being used is chicken village breeder in Tenga village, “Gracia” group and “Anugerah group at South Minahasa, North Sulawesi. Method being used is literature from various writing also journal source result frop other side also source result to implementation IPTEKS activity to chicken village farmers of Tenga village. The main obstacle faced farmers of Tenga village is a matter of the availability of seeds and the observance of which system is less than optimal. Program of “Village Poultry Farming” conducted seeds female chicken to the farmers and counseling improvements to systems maintenance and chicken village management.

Keywords : *Village Poultry Farming, local hens .*

Introduction

During this time, efforts of the farmers and breeder executed separately because of kind commodity effort which is different. Whereas, both of the effort have the connected in supporting continued farmers and breeder effort. (Nuhriawangsa dkk. 2015). In the event to accomplish mission of government territory and center, then necessary raising of chicken village population as local product to fulfillment nutrient for society. Chicken village has important role in equipping poultry meat got the taste and special tescture. With the population reaches 230 tails, contribution local chicken to National meat production about 11,07 % or 259.9 thousands tons, meanwhile to National poultry meat production, the contribution reaches 16,9 % (Ditjen PKH.2010)

Until now, the equipping of chicken local seed with good genetic quality very hard to get, because there is no chicken local seed breeding result with clear the result. Most of the equipping chicken local seeds available, new limited to hatching efforts for utility the own breeder or for sold based on ordered previously. Seed quality in things can not based on certain criteria quality. The chosen seed has own quality, even most of them based on the crossing result with taste chicken or with Bangkok chicken or Arab chicken(Sartika.2012) . Animal protein include general animal results which used as source protein is meat (cow,pork and chicken), eggs (chicken and duck), milk (especially cow milk), and fishery results (fish, shrimp, cockle shells and others). Because of it, necessary equipping animal protein sources

which provides to village society and increased chicken village sources with base on “village poultry farming” program, as a step to substract proverty, malnutrient and keep the food endurance to village in North Sulawesi.

Methodology

Material being used was Poultry of local hens in the village Tenga group “Gracia “ and group “Grace “ South Minahasa. Method being used was study literature of various articles and the source of journal the results of the study from other parties and the result of research on activities IPTEKS for the local hens farmers of Village Tenga. Method analysis data was using descriptive analysis. According to Sugiyono (2008), descriptive analysis is research method with way to collecting data, stacked, tricked, and analyzed to giving illustration about the problems.

The Application Of Ipteks For Society Consumption of animal protein

Improved nutrition society from the consumption of the egg is life expectancy for society considering that nutritional content chicken village egg high. Nutritional content chicken village 12%, protein content poultry meat 16%, beef protein 18%, milk protein 4% (Yuwanta.2010). This shows that chicken village egg which is easily reached by and the low price of consumption have a chance for the society. Meat and eggs very popular the society because of nutritious high, savory, and having full-flavored which had much cache consumers. The oragoleptic test resulst showed that the highest of egg color were from the hens fed the diets containing 10 % HE, 10% filleting waste,and 10 % arachon.For the egg aroma, the highest score was acquired at level 10 % HE,10% filleting waste, and 5 % arachon in the hens diet. The highest ratings of both egg texture and flavor were from the hens fed the diets cointaining 10% HE, 5% filleting waste, and 10 % arachon. It was concluded that the use of 10 % level of HE, filleting was, and arachon of skipjack fish industrial waste in the local hen diets achieved the best products results on characteristic of color,aroma, texture and flavor of eggs(Leke ,*et al.*2015)

Application of Science and Technology for local hens farmers of Tenga village, given assistance 25 local hens to the farmers Gracia and Anugerah. Population chicken husbandry take care by household of poultry effort at South Minahasa : chicken village 106.121 tails, layer chicken 910 tails, broiler chicken 56.500 tails, duck 13.225 tails, manila duck 1.507 tails.

If assumed 25 local hens mated with 3 tail male, with total average 1 adult chicken female the production of eggs every year 40 grains/ year, total production 1125 grains/year. 1 egg donates 12% animal protein (Yuwanta.2010). Contributions animal protein from the egg chicken village is production 1125 egg x 12% protein eggs = 135. The price of 1 kg egg Rp.30.000 (16 grains). Animal protein from 1 egg 12%. So, Rp.30.000/ 16 grains = Rp.1.875, with the result that Rp.1.875 x 12% protein. The price of one gram is about Rp.225, if 1 kg protein eggs then Rp.3.600. This shows that the contributions animal protein from chicken local hens egg fot Tenga society, can completed and achieved. Thus, the program village poultry farming, made turning the success of overcome malnutrition and poverty alleviation. If chicken village propely nourished, then the chicken will play an important role as a source of animal protein (meat and eggs) and as a source od income for poor households, so that cases malnutrition insurmountable systematically. Hence, program family poultry worthy weighed as a pratical solutions in overcoming malnutrition case, effective in brittled poverty and ensure food security at the household level 15.5 millions poor household in Indonesia (Rusdifa,2005a, Rusdika 2005b).

Breeding Stock

Breeding stock is a group of animals used with the done purpose of recovery in a planned to get a new race or seeds of which have pedigree to produce seeds spread. Selection conducted in local chicken able to increase its productivity with does not change characteristic of products and fenotic. Research on improvement the quality of seeds chicken local to increased the production of eggs through a selection process is still very limited. The development breeding stock in the farmers of Anugerah group and Gracia group is the development program of village poultry farming where assistance a hen 25 chickens, if 1 female local hens, the production of eggs on average 30-60 grains/year, ready hatched 60 eggs, the assumption 2% mortality, so that DOC 58 chickens, maintained reached the age of 8 weeks (mortality 5%) the amount of 55 chickens. If 10 chickens of female means breeding stock 550 chickens, if 15 chickens of female means breeding stock 825 chickens (prediction breeding stock year-2). When farmers want to get some cash out of total breeding stock almost 50% from 825 chickens then there woulg have to be the tail of a hen. If the market price in South Minahasa adult female chicken Rp.150.000 then farmers get cash of Rp.61.875.000 (Prediction year-2). Heryandi *et al.*, (2010) has suggested that 10 parent tails would have produce 48 tails of hen a candidate every year of new parent, so that the total number of female parent is 58 tails, increase 5,8 times the basic population. Besides, farmers also raise cash as much as Rp.670.000 consume 150 eggs and 24 chickens in the first year.

Conclusion

Program “Village Poultry Farming” with intergrity the activities of a group of cattle and farmers through the application of development consumption of animal protein and breeding stock is able to improve nutrition the society and local hens population to farmers of Gracia group and Anugerah group in Tenga village at South Minahasa, North Sulawesi.

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Utilization of Pig Waste to Biogas, in Kotamobagu City

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Abstract

Farming of pigs are the source of income of people in Kotamobagu. Market prospects, high for the surrounding communities, and the people of North Sulawesi in general. The problem, of pig farming is done in a residential community. Based on this problem, it has carried out research on the extent of utilization of waste from pigs (feces and urine) in the area. This research has been conducted with the aim to evaluate the maintenance of pigs, and empowerment for farmers in the use of pig waste to biogas. The research method that has been used is survey method, to determine the respondents by purposive sampling, ie members of the farming of pigs, in a residential community, then proceed with the empowerment of group members, for the manufacture of biogas. Analysis of the data that has been used is descriptive analysis. The results showed that the pigs developed at the site of the home of one member of the group. Waste of pigs allowed to flow into the fish pond. This phenomenon of members of the group as long as they develop the farming of pigs. Based on these results, the next has introduced biogas reactor, so the pig waste is no longer dumped in the fish pond. In conclusion, the farmers in developing the farm pigs do not consider the environmental pollution. Making biogas, responded well by the group members. Suggestion, need socialization both by governments and universities to minimize environmental pollution by utilizing pig waste as biogas.

Keywords: pigs, waste, biogas, empowerment

Introduction

One type of livestock that can reliably supply of animal protein, in form of meat, is pig, is also one farm commodity reliable by some people as source of their income. Pigs may provide profit to farmers. This is because pigs can be sold at age of 8-9 months, with weight reaches 90-110 kg.

Pig farming is source of income of people in Kotamobagu City. Market prospects, high enough for surrounding communities and people of North Sulawesi in general. Pigs are one of livestock commodities that have great potential to be developed (Kementerian Pertanian, 2011), because it has properties, and ability of such favorable (Sinaga et al. 2011; Gobai et al 2013). In addition, pigs and or processed products of considerable potential as national export commodities (Kementerian Pertanian, 2011, 2012). Pigs are one of potential business to be developed (Aku et al, 2013).

Problem of farm pigs, has been developed in a residential community. Pig cage built near homes of farmers and even people in study site. Distance cage with residential homes, about 5-15 meters. Solid waste and urine can cause pollution on air, soil and water. Cages of

pigs in settlement cause an unpleasant smell for farmers themselves, neighbors and even people in general who visited village. Pig farming causes disturbed public convenience, because impact of pollution generated (Zukri, 2012).

Pig manure dumped at a lower place (ponds and small rivers). This poses a problem for around community and in regions which are lower located. Problems posed in form environment pollution (soil, water and air). Meanwhile, farmers' knowledge is very less in processing pig waste, so that waste is disposed of and pollute surrounding environment.

Based on this problem, has done research on extent of utilization of pig waste (feces and urine) in area. This study aimed to evaluate maintenance of pigs and empowerment for farmers in use of pig waste to biogas.

Methods of Research

This study was conducted using a survey method. Research location determined by purposive sampling that Tumobui village, consideration in this village are farmers who develop a pig farming. Number of respondents 8, has been determined by purposive sampling that members of group who keep pigs in a residential community, followed by empowerment group to manufacture biogas reactor. Biogas is important as one of alternative fuel are cheap, available, and easy to raw materials, and environmentally friendly (Biyatmoko and Wijokongko, 2011). Analysis of data that has been used is descriptive analysis.

Results and Discussion

Characteristics of farmers may determine success of farming. Results of research have shown farmers age ranged from 38-57 years, which means that farmers are categorized in productive age. Pig farming profitable for farmers be seen from the RC ratio of 1.53. Results of Suryadi et al (2014) showed that pig farming a profitable business entrepreneurs. Farmers, onsite research, develop pigs in a semi-intensive. Wea and Koten (2013) suggests productivity of pigs that developed extensively lower.

Research that has been produced showing pigs kept behind house of one member of group in Tumobui village. Total pig ranges between 20-50 tail. Pigs waste allowed to flow into fish pond. This phenomenon, has made group members for their pig farming, so it is necessary to restructure pig farming with an environmentally friendly development of area. Interest structuring environmentally friendly pig farming according to Kementerian Pertanian (2011) was for pig farmers can overcome faced and efforts to control environmental pollution because of smell.

Based on these results later introduced biogas reactor so pig waste is no longer dumped in fish pond. Biogas reactor made permanent for a capacity of 4 cubic. Biogas is produced after reactor was filled with pig and cow waste. This has been done to speed up process of producing gas. Methane gas produced from reactor exit through hose from container of gas to gas burner. Gas generated after 3-4 weeks of filling livestock waste. Gas stove can already ignited and generate heat, and has been used for cooking.

According Schievano et al (2009), biogas production can partially replace fossil fuel energy. This can reduce environmental impact is with availability of cleaner fuels and into renewable raw materials.

Biogas technology has been introduced and developed for a long time in Indonesia (Widodo et al. 2009), even in North Sulawesi. Eze (2009) suggested biogas technology can be applied to scale household, commercial, or village. Biogas reactor being introduced in area of research because it allows to do with raw material is pig manure. Seseray et al (2012) reported that pigs, in addition to producing meat, organic fertilizer, as well as biogas. Farmers

engaged and responded well, to manufacture biogas reactor. Household-scale biogas technology is used as fuel for cooking replace firewood and to improve human health and environment (Barnhart, 2012).

Biogas is a mixture of gases of process of anaerobic fermentation of pig manure produced. Results of research Adl et al (2012), shows reactor was successfully created starting with pig manure. Process produces biogas for 3-4 weeks after biogas reactor filled with waste. Biogas is produced by bacteria of organic material in conditions without oxygen (anaerobic process). This process takes place during fermentation. Resulting gas is composed largely of CH₄ and CO₂. If CH₄ gas content of more than 50%, then mixture is flammable gas, CH₄ gas content in biogas derived from pig manure.

Resulting gas mixture, among others: CH₄ (methane), CO₂ (carbon dioxide), N₂ (nitrogen) and others. Naturally, methane gas is always case, but need for equipment and specific conditions to accelerate formation of gas. This methane can produce energy, and energy that is used for cooking. Biogas contains, CH₄ 50-70%, and 30-50% CO₂ (Bond and Templeton, 2011).

Making biogas reactor requires investment funds, and so we need government assistance. According Yiridoe et al (2009), production of biogas are generally financially feasible to farm with 200 of sows. However, biogas for household cooking needs can be met from biogas is being introduced. Local government should give special attention to development of environmentally friendly farms. Introductions biogas reactor for pig farmers is very beneficial for availability of fuel energy. Farmers use biogas for household purposes, and household expenditures for kerosene reduced.

Benefits of most urgent of introduction of biogas reactor is emphasis of environmental pollution. Waste of pigs causes unpleasant odors to surrounding community and can damage health. Waste of pigs managed with introduction of biogas reactor can reduce breeding of flies and mosquitoes region (Simpson, 1979) a bad smell and flies can be suppressed. Community dependence on fuel wood can also be subtracted (Aklaku et al, 2006).

Biogas introduced to address environmental problems. Farmers retain pig farming despite disturbing environment, because business is source of their income. Farmers do pig farming production process, semi-intensive, with aim to maximize their profits. Biogas produced from pig waste is one of alternative fuel are cheap, readily available and easy to raw materials, as well as environmentally friendly. Biogas is a type of energy and sustainable development are essential to energy and environmental planning (Srisertpol et al. 2010). Pigs waste management into alternative energy greatly benefit all parties (Mariawan, 2012).

Conclusion and Suggestion

In conclusion, the farmers in developing the farm pigs do not consider the environmental pollution. Making biogas, responded well by the group members. Suggestion, need socialization both by governments and universities to minimize environmental pollution by utilizing pig waste as biogas.

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Spatial Distribution Model of Dairy Cattle Productivity in West Java

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Abstract

The number of dairy cattle in Indonesia remains steady and the average of milk production is only 11,9 litter/day however this amount is lower compared to other countries even ASEAN countries. On the other hand, the demand of milk consumption moves significantly every year. Finding suitable locations for growing the dairy cattle is no doubt required. There are many production centers in West Java, as well as known as the second largest milk contributor in Indonesia. However those areas required to be analyzed regarding feed, management and environment conditions. The aim of this research is to develop spatial distribution of dairy cattle productivity in West Java. A total of 89 dairy farmers interviewed about dairy cattle management and its environment. There were 220 dairy cattle were observed around West Java measured its productivity. Data of good farming practices application in these areas were analyzed by Geographical Information System (GIS) to develop spatial distribution of dairy farming in West Java as the output. In addition, feed and milk quality were also analyzed. The data showed the average of milk production was 12.25 litter/day. The feed quality such as fat content, protein content and fiber contents were 1.4%, 12.1% and 25.4% respectively. It can be concluded that the dairy farming management system was still need to be improved particularly in health and milking process.

Keywords: dairy cattle, management, productivity, spatial distribution

Methane emission from beef cattle production at low- and high-altitude of East Nusa Tenggara, Indonesia

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Abstract

Beef cattle production in NTT province is one source of CH₄ emission in Indonesia. This study aimed at quantifying CH₄ from beef cattle production low and high altitude in this area. The study was conducted in April - December 2015. Cluster sampling technique was used to divide the province into two clusters based on altitude viz high (> 500 m asl) and low altitude (<500 m asl). Cattle population data was obtained from Annual Reports of Bureau of Statistics for the period of 2010-2015. Feeds and faecal samples from each rearing systems, seasons and altitudes were collected using convenient sampling technique. Calculation of CH₄ emission for each cluster was based on cattle population, rearing systems, and season (rainy- and dry-season). All equations were taken from IPCC (2006) for tier 2 category. Estimated CH₄ production was the only variable reported in this paper. Descriptive statistics was employed in data analysis. Results showed that yearly CH₄ emission from beef cattle production in NTT was 32.6 Gg/year. Cattle at low altitude produce around 61.5% of this value due to a higher cattle population (73%) and lower feed quality compared to those at high altitude. Comparison between source of emissions showed that 93% CH₄ was derived from enteric fermentation. It might be concluded that beef cattle production in NTT contribute around 521.6 Gg in the period of 2000-2015. Cattle reared at low altitude produced more CH₄ than those at high altitude due a larger number of cattle in this cluster.

Key words: green house gas, altitude, enteric fermentation, season, rearing system

Introduction

Until recently, Indonesia is one among the countries that have not able to produce an accurate GHGs emission data from livestock sector in a regular base. Permana *et al* (2012) calculated that CH₄ emission from livestock population in Indonesia in the period of 2000 – 2006, and found that average CH₄ production was 687.6 Gg/year. About 56.6% (388.84 Gg) of this was contributed from beef cattle production. The figure for NTT was 22,84 Gg/year. However, data used by Permana *et al* (2012) as the basis of their calculation was cattle population only. These researchers did not take into account other factors known to have strong effects on CH₄ emission in livestock production system such as physiological status of the animals, climate/temperature, type of feed, feeding management, feed intake, and rearing systems (Moss *et al*, 2000; Park *et al*, 2006; Cottle *et al*, 2011; Ramin dan Huhtanen, 2013). This study was design to calculate CH₄ emission from beef cattle production system in NTT based on more detail dan actual data such cattle rearing systems, feed quality, season effect, and altitude which has a strong correlation with temperature.

Methodology

This study lasted for 9 months (April - December 2015). Locus of the study was East Nusa Tenggara (NTT) Province. Cluster sampling technique was used to divide the area based on two clusters viz high altitude (> 500 m asl) and low altitude (<500 m asl). Cattle population in the two clusters were used to calculate CH₄ emission. All equations used in the calculations were based on recommendations of IPCC (2006) for tier 2 category. Cattle population data for each cluster was obtained from data reported in the Annual Reports of Bureau of statistics for each village in NTT for the period of 2010-2015. For primary data, samples of feed and feces from each rearing systems, seasons and altitudes were collected for feed and nutrient composition analysis. The feed and faecal samples were taken using convenient sampling technique. To attain an accurate estimation, calculation of CH₄ emission for each cluster was based on (1) cattle population structure (calves age less than 12 months old, weaners and young cattle age 12-24 months old, male cattle age >24 months old, late pregnant and lactating cows, and empty cows), (2) rearing systems (free grazing, and tethering), and (3) season (rainy- and dry-season). Methane gas production was the only variable reported in this paper, but it is categorized according cattle population structure, source of emission, and altitude. Data for each category was not analysed using comparison or variance analysis, rather presented using descriptive statistics where only deviation standards were used.

Results and discussion

In the period of 2000-2015, beef cattle production in NTT was estimated to emit 32.6 Gg/year (Tabel 1) which mean that a total of 521.6 Gg has been contributed to the atmospheric CH₄ pool. Calculation based on cattle population structure showed that 40% of yearly CH₄ emission was contributed by mature and old males (>24 m.o), and lesser value (7.1%) was shown by waeners and growing cattle (12-24 m.o). Around 93% CH₄ emission released from enteric fermentation.

Table 1. Yearly methane emission from beef cattle production at low- and high-altitude of East Nusa Tenggara (NTT) in the period of 2000 - 2015

Variable	altitude		Total NTT
	Low	High	
Total methane emission:			
Gg/year	20.5±4.29	12.1±1.18	32.6±3.07
Proportion (%)	61.5±4.29	38.5±1.18	100
<i>Emission by population structure (%):</i>			
Calves (<12 months old)	6.3±0.32	27.1±0.85	16.7±0.58
Weaners & Growing (12-24 months old)	2.5±0.13	11.8±0.37	7.1±0.25
Male >24 months old)	46.9±2.26	33.1±0.88	40.0±1.57
Pregnant & lactating cows	3.3±0.17	18.2±0.57	10.7±0.37
Empty cows	41.1±1.94	9.9±0.15	25.5±1.05
<i>Emission by source:</i>			
Enteric fermentation (Gg/year)	19.0 (58%)	11.2 (34%)	30.2 (93%)

Faecal management (Gg/year)	1.5 (4.6%)	0.9 (2.7%)	2.4 (7%)
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Average CH₄ emission reported in the present study was slightly higher (2.1%) than the value reported by Permana *et al* (2012) for the same period (2000-2006). However, both studies indicate a positive linear trend and strongly correlation with number of cattle. Higher value obtained in present study could be explained by the data used where calculations were done based detail aspects such as cattle population structure, rearing systems, season and altitude. These are important factors known to affect CH₄ emission (FAO, 2009; Kim *et al*, 2013; Hegarty *et al*, 2010). In contrast, Permana *et al* (2012) only use cattle population as the basis of their calculation. Estimated CH₄ emission from low and high altitude areas of NTT showed that 61.5% of CH₄ (20.5 Gg/year) was produced by cattle from low altitude. Higher value for low altitude could be attributed to two factors viz higher proportion of cattle population (73%) and lower quality of ingested feed (5% less digestible than feed from higher altitude).

Conclusion

Methane emission from beef cattle production in NTT tends to increase every year following the growing number of cattle. Every year around 32.4 Gg methane were emitted into the atmosphere. Large proportion of this value (61.5%) was derived from beef cattle reared at elevation of <500 m asl since a large proportion of cattle lives in this cluster.

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The effect of Parity, Month of Lactation and Incidence of Subclinical Mastitis on Milk Yield

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Abstract

Various factors affects production performance of dairy cattle. Health is one of determinat factors in dairy milk yield. Subclinical mastitis is known to have adverse effects to milk production. Aims of this research was to investigate the effects of parity, month of lactation and incidence of subclinical mastitis on milk production. The samples of 192 dairy cattle collected based on parity ranged from one to five and to be tested for mastitis test started from the second month to the seventh month of lactation from small holder dairy farms. IPB-1 mastitis test was used to diagnose the subclinical mastitis prevalence of each udder of dairy cattle. The collected data were analyzed by using ANOVA to evaluate the effect of parity, month of lactation and incidence of subclinical mastitis on milk yield. Results showed that parity highly significantly affected milk yield ($P < 0.01$). The highest milk yield was measured at the third parity (17.5 l/d); in contrast, the lowest was at the first parity (15.2 l/d). In addition, month of lactation also have effects on milk yield ($P < 0.05$). Milk yield at the first month of lactation significantly higher than that of sixth month of lactation (18.2 l/d vs 13.5 l/d). This research found that the incidence of subclinical mastitis did not affect milk yield ($P > 0.05$). In conclusion, milk yield is affected by parity and month of lactation whereas the incidence of subclinical mastitis was not proven to affect milk yield.

Keywords: parity, month of lactation, subclinical mastitis, milk yield

Production and Carcass Performance of Male Local Mojosari Ducks Given the Traditional Medicine Herbs on Drinking Water

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Abstract

As tropical country, Indonesia is rich in herbs which are not only use as food spices but also for healthy and medicinal drinking water (*jamu*), included also for animals. The aim of the research was to know the effect of giving fermented mixed medicinal herbs through drinking water to the production and carcass performance of male local Mojosari ducks. About 30 male ducks of 2-7 weeks of age was used during the study. The result showed that the treatment gave no significant effect to the feed consumption, weight gain and feed conversion. The significant effect on visceral fat and carcass percentage was not caused by the treatment but the initial weight of the animals.

Key words: *medicinal herbs, male ducks, production and carcass performance*

Effect of Closed House Temperature on feed intake, weight gain and Triiodothyronine (T3) and Thyroxine Hormone (T4) levels of Broiler Chickens

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Abstract

This research was conducted to determine the effects of temperature on feed intake, weight gain, T3 and T4 levels of broiler chickens. The research background was about the fluctuation of weather especially on temperature as a micro climate. Especially to get an accuracy data to consideration about used broilers closed house. Seventy five male of broiler DOC as sample of this research conducted treatment three levels of temperature T1 first week was 30⁰ C, T2 first week was 33⁰ C, T3 first week was 36⁰ C then decrease 2⁰C every weeks until fifth week, on all of treatments. Methodes of these research was Experimentally design 3X5 Completely Randomized Design. The indicators variables were about feed intake, water intake, weight gain, and level of T3 and T4 blood hormones that supporting against Growth Hormon activity measured every weeks a long 35 days.

The results of these research there were signifanlty different ($P < 0,01$) among treatments about feed intake, water intake, weight gain and titers of T3 and T4 blood hormones. Highest level of feed intake was showed by T1, that was significantly different ($P < 0,01$), while S1 to S2 was significantly different ($P < 0,05$). Highest level of weight gain was showed by S1, significantly diferent ($P < 0,01$) to S3. The highest of measured of titer T3 and T4 showed signifanly ($P < 0,01$) T1 vs T3. The conclusion of these reseach were the lower temperature would be increase of feed intake, weight gain and supported with the titer of T3 and T4 blood hormones. In practice should be as a consideration for ajusted the temperature along broilers live as long as close housed.

Keywords: *Temperature, Triiodothyronine (T3) and Thyroxine Hormone (T4)*

Production and Nutrition Composition of Pollen from Foraging Honey Bees (*Apis mellifera L.*) in The Red Kaliandra (*Calliandra calothyrsus*) Plantation Area

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Abstract

The purpose of this research was to determine production and nutrition composition based on protein, fat, moisture, ash, and carbohydrate of pollen from foraging honey bees in the red kaliandra plantation area. The material included 25 colonies of bees. The method of this research was experiment with Completely Randomized Design by using three treatments five replication. The three treatments were harvesting pollen at 08.00-09.30 am (P1); 09.30-10.00 am (P2); P 10.00-11.30 am (P3). Parameters observed were the amount of pollen production and content of protein, fat, water content, ash, and carbohydrate. Data were analyzed with Analysis of Variance (ANOVA), if there were significantly influence would be continued by Least Significantly Different (LSD). Result of this research showed that the top amount pollen production at 09.30-10.00 am (292.40 ± 70.518 g), pollen nutrition composition were 11.27% protein content, 1.1% fat content, 18.48% moisture content, 1.68% ash content, and 67.46% carbohydrate. This research can be concluded that pollen production was decreased during afternoon, pollen nutrition was decreased during afternoon in clined and pollen nutrition composition were not meet requirement of honey bees.

Keywords: *bee pollen, honey bee, productivity, proximate composition, red kaliandra*

Introduction

Honey bees product (*Apis mellifera*) plays an important role in nutrition and pharmaceutical industries. Honey bee breeding business has a very well developed because of its high productivity and ongoing maintenance period. System maintenance honeybees tend to graze and move due to limited food resources are pollen and nectar. Pollen and nectar greatly affect the outcome of honey bee products. Pollen is the main protein source and one for honey bee colonies in the can from nature. Pollen is required for the development of young bee (Chamberlain, 2000). Seedling growth is very important in the life of a colony for pollen in the hive if it does not meet requirements of the bees, then tillering will be disrupted (Minarti, 2010). Pollen is needed for the production of honey bees due to the consumption of high protein in pollen stimulate the development of a functioning hypopharyngeal gland secrete invertase enzyme for the formation of honey.

Kaliandra plant (*Calliandra calothyrsus*) is a multipurpose plant, one of them to feed honey bees. Kaliandra plant area is one of the targets farmers as grazing land honeybees (Herdiawan et al., 2006). Kaliandra plant growth is supported by a program of Perum Perhutani for reforestation activities. The quality of honey is produced from plants kaliandra very well and has a sharp fruit aromas (Chamberlain, 2000). Honey is produced from plants kaliandra which is about 1 ton of honey per hectare each year. The downside of grazing on

the plant area kaliandra ie plants kaliandra not produce pollen that honey bees take pollen in other plants in the grazing area.

Pastoral honey bees in crop acreage kaliandra only provide a source of nectar and pollen fluctuating number raises a problem for farmers. Breeders attempted to substitute for nectar feeding. Breeders do not know in detail the percentage composition of nutrients should be added. Breeders need to know the adequacy of nutrients from pollen taken on crop acreage kaliandra so they can more efficiently use additional feed. Based on the need to do further research to assess the quantity and quality of pollen pollen in terms of production and composition of nutrients contained in pollen.

Materials and Methods

This study was conducted in Klepu, Parang, Banyakan, Kediri, CV. Kembang Joyo and Quality Testing Laboratory da Food Safety, Department of Agricultural Technology, Faculty of Agricultural Technology, Universitas Brawijaya.

Materials

The research material using 25 or 25 colonies of honey bee *Apis mellifera* stup each containing 8 active strokes. Equipment used for the collection of field data, namely: box colonies (stup), pollen trap, trays, tool smoker, plastic bottles of 150 g, thermometer digital hygrometer, and scales with the number of grams.

Methods

The method used is experiment using a completely randomized design with three treatments and five replications. Based on preliminary research that has been done, the availability of sufficient sample began at 08.00 am with the old harvesting every treatment for 1.5 hours.

Treatment among others:

P1 : Harvesting pollen at 8:00 to 9:30 am

P2 : Harvesting pollen at 9:30 to 10:00 am

P3 : Harvesting pollen at 10:00 to 11:30 am

Harvesting pollen, replicated colonies with the following details :

U1 : Harvesting pollen colonies 1-5

U2 : Harvesting pollen colonies 6-10

U3 : Harvesting pollen colonies 11-15

U4 : Harvesting pollen colonies 16-20

U5 : Harvesting pollen colonies 21-25 , Harvesting is carried out 10 times every 3 days.

Research procedure

- Pollen trap installed at 08:00 to 12:30, trays placed under pollen trap. Then pollen harvested for 1.5 hours each treatment.
- Weighing pollen harvested on each treatment then the pollen is placed into a sample that has been labeled
- Sample preparation prior to laboratory observation and observation in the laboratory, including the levels of protein, fat, water, ash and carbohydrates

Result and Discussion

Based on the results, the averages production and nutrition pollen on each treatment is shown in the Table 1.

Table 1. Average production and nutritional composition of pollen

Variable	Treatments		
	P1	P2	P3
Production (g) ±SD	274,80±109,111 ^b	292,40±70,518 ^b	133,60±35,956 ^a
Protein (%)±SD	11,58±0,858	11,28±0,158	11,20±0,131
Fat (%)±SD	1,33±0,363	1,06±0,663	0,92±0,999
Water (%)±SD	17,58±2,707	17,44±4,076	20,43±4,873
Ash (%)±SD	1,72±0,215	1,69±0,026	1,64±0,065
Carbohydrate (%)±SD	67,97±3,179	68,57±3,742	65,84±3,938

Effect of Treatment of Pollen Production

Table 1 shows significant differences ($P < 0.05$) in the variable production. In Table 1 shows that P1 and P2 are not different, but the P1 and P2 different from P3. P1 and P2 show the average value that is not much that is 13.6 g. P3 shows the average vastly different from P1 and P2. Collecting peak occurs in P2 (08:00 to 9:30 pm) with an average of 292.40 ± 70.518 g, it is in line with the opinion of Reyes-Carrillo et al. (2007) that the highest amount of pollen collected in the morning and a little pollen in the afternoon. Collecting pollen with a small amount going on P3 (11:00 to 12:30 pm) with an average of 133.60 ± 35.956 g. Pollen collection by honey bees always have the same pattern every day. Collecting pollen production graph results are presented in Figure 1.

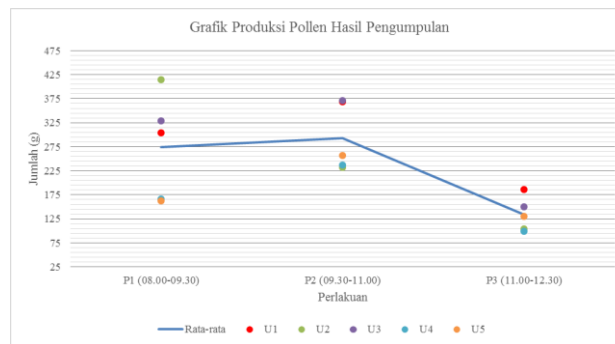


Figure 1. Graph result of collecting pollen production

Collecting pollen decreased in P3 (133.60 ± 35.956 g) and pollen collection stops at 1300 because it was raining at the research site. Minarti (2010) explains that the differences in the activity alleged differences in air temperature, distance feed resources, and other environmental conditions. According Someville (2005), the collection of pollen by bees average - average 4g / hour. Honeybees on kaliandra collecting fewer plants. Graph of average temperature and humidity are presented in Figure 2.

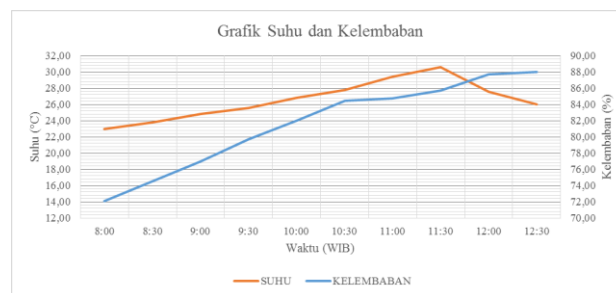


Figure 2. Graph of temperature and humidity

Effect of Treatment of Nutritional Composition Pollen

Based on the results of analysis of variance treatment time difference harvesting pollen by harvesting at 8:00 to 9:30 pm, 9:30 to 11:00 pm and 11:00 to 12:30 pm no significant effect ($P > 0.01$) against pollen levels of nutrients (protein, fat, water, ash and carbohydrates). An important condition in search of pollen is the smell, but the worker bees can not detect plants with good nutrition (Pernal and Currie, 2002). Comparison levels of nutrients to the production of pollen show in Figure 3-6.

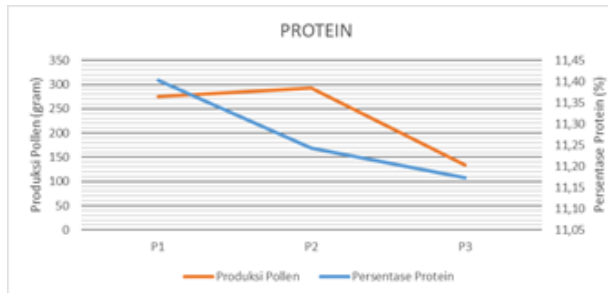


Figure 3. Chart comparison with the production of pollen protein content

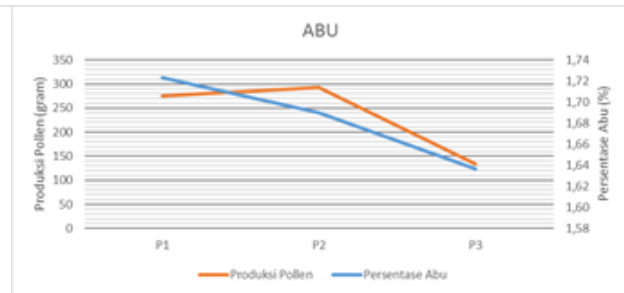


Figure 6. Comparison charts ash content with the production of pollen

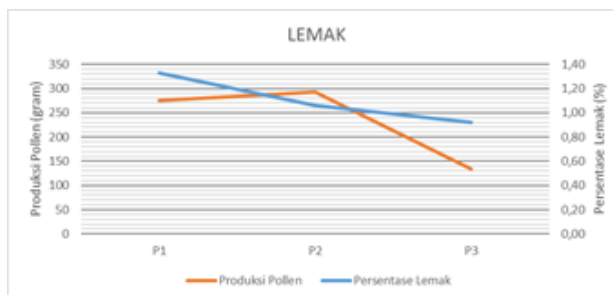


Figure 4. Comparison charts fat content to the production of pollen

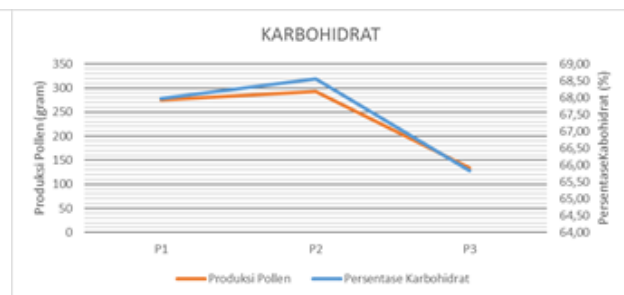


Figure 7. Comparison charts carbohydrate levels with pollen production

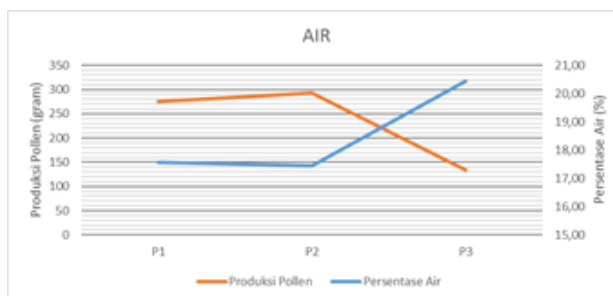


Figure 5. Comparison charts water content with the production of pollen

Figure 3, 4, 6 and 7 shows that the lunch, levels of protein, fat, ash and carbohydrates tend to decline. These results indicate a honey bee looking for pollen on pollen sources available then progressively during the pollen source will be reduced. Honeybees grazing on plants kaliandra as the main vegetation plant to get the honey. Honeybees take food from almost all flowering plants. In the area of plant kaliandra many plants other than plant kaliandra. Without human intervention honeybees rely solely on natural plants around it to make ends meet. Bees visit plants around it like bushes that have pollen. Levels of nutrients contained in pollen from various plants is different or varied.

Nutritional composition Pollen Harvesting Kaliandra results compared with the required Nutritional Requirements Honey Bee

Average protein content is 11, 27%, while the protein requirements should not be more than 15% (Campos et al., 2008). The fat content of 1.10%, while the supposed needs of 1.5%, indicating that the fat on kaliandra pollen. Air dala pollen in the plant area kaliandra reached 18.48%, while the water content in the pollen is not more than 8% (Campos et al., 2008). Harvesting pollen ash content in the plant area kaliandra that is equal to 1.68%. Campos et al. (2008) mentions that the ash content in pollen should not be more than 6%. Carbohydrates contained in pollen harvesting results in the plant area kaliandra of 67.46%. The corresponding results of the opinion Campos et al. (2008) which states that the total carbohydrate content of not less than 40%. Qian et al. (2008) added carbohydrates can make up 25-61% of the weight of protein. Most of the carbohydrates in terderivasi pollen and nectar mixed with pollen. The carbohydrate content in nature can not be ascertained, because the carbohydrates in the pollen will relate to the sugar found in nectar.

Table 2. Composition of pollen in the area of nutrition calliandra

Composition	Percentage (%)	Requirements (Campos <i>et al.</i> 2008),
Protein	11,27	Not less than 15%
Fat	1,10	Not less than 1,5%
Water	18,48	No more than 8%
Ash	1,68	No more than 6%
Carbohydrate	67,46	Not less than 40%

Conclusion

1. Pollen production in crop acreage decreased kaliandra at noon
2. The nutritional composition of honey bee pollen tends to decrease during the day
3. The nutritional composition of pollen in the plant area kaliandra not meet the nutritional needs of honeybees

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Application of Porang Flour for Fat Replacer in Reduced Fat Mayonnaise

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Abstract

Mayonnaise is a kind oil-in-water emulsions, containing 70-80 % of oil, egg yolk as an emulsifier and many optional ingredient in commercial mayonnaise. One of the major trends is to reduce the fat content of mayonnaise. It is necessary to use hydrocolloid with different functional roles to replace the quality attributes lost when fat is removed on reduced fat product. Porang flour as a fat replacer can create mayonnaise that has lower in fat. The objective of this research was to observe the quality of reduced fat mayonnaise using porang flour for fat replacer. Mayonnaise samples were prepared using soy bean oil as dispersed phase, egg yolk, porang flour 0.1, 0.2, 0.3 % (w/w) respectively, and controls were made for without porang. The research methods was using experimental design. The result showed that reduced fat mayonnaise with the 0.3% porang flour addition could be applied as an fat replacer to stabilize reduced fat mayonnaise.

Keywords: *Reduced fat mayonnaise, porang flour, fat replacer*

Introduction

Mayonnaise is an animal product which has high fat content because the main ingredients are oil and egg yolk. Consumer prefer to healthier mayonnaise, reduced fat mayonnaise because of health reason. Producing reduced fat mayonnaise can be done by decreasing oil phase and increasing continue phase, however the quality of mayonnaise is not optimal, therefore using soy bean oil, and porang flour is expected to optimize the quality of mayonnaise. The most widely used fat replacer in food applications are hydrocolloid. Fat replacer influences the performance and texture of manufactured mayonnaise. It may function to stabilize the emulsion. The use of stabilizer or thickener, will prevent the decrease of emulsion stability. Porang flour as one of hydrocolloid which is has low calories polysaccharides which has a good function as dietary fiber source. Porang flour can used as fat replacer to oil phase in mayonnaise production. Therefore, the objective of this study was to observed application of porang flour for fat replacer in reduced fat mayonnaise production.

Materials and Methods

Sample preparation

Mayonnaise samples were prepared following the method used by Mun et al., (2009), Four different mayonnaises were prepared using 50 % (w/v) concentration soy bean oil and 70% oil for the control, three different addition of porang flour (0.1, 0.2, 0.3 %) (w/v) and other ingredients same. A full fat mayonnaise without porang flour formulation was used as a control. Pasteurized egg yolk was mixed with salt 1.5 g, sugar 2 g, mustard 1,5 g, and

vinegar for about 1 min. 20% of oil was added slowly during the first five minutes of the mixing and 50 % of the oil was added during the next five minutes of the mixing and then 30% of the oil was added gradually the last of mixing. Porang flour was added to the emulsion. Vinegar was slowly added to the system until the emulsion formed.

Chemical Analysis

Mayonnaise were analyzed for pH, viscosity, fat content, and emulsion stability. The parameter observed were emulsion stability were measured by stability rating. pH measured using pH metre. Viscosity measured using viscometer Brook Field, while fat content of mayonnaise was measured using Babcock method according to the method by AOAC (2000).

Statistical Analysis

The research methods was using experimental design. The data characteristics and emulsion stability of mayonnaise obtained are the average of three triplicate of analysis. One-Way Analysis of Variance (ANOVA) followed by Duncan Multiple Range Test (DMRT) at a level of $p < 0.05$ if there was significant differences between samples.

Results and Discussions

The characteristic and emulsion stability sample of mayonnaise with different concentration of kefir were presented in Table 1.

Table 1. pH, Viscosity(cps), fat content(%), emulsion stability(%) samples mayonnaise

Treatment	Viscosity	Fat content	pH	Emulsion Stability
M0FF	3400 ^c ± 10.00	72.20 ^d ± 0.22	4.23 ^d ± 0.01	85 ^c ± 0.00
M1RF	3090 ^a ± 10.00	53.26 ^c ± 0.05	4.10 ^c ± 0.01	82 ^a ± 1.15
M2RF	3300 ^b ± 8.00	52.40 ^b ± 0.26	4.24 ^b ± 0.02	84 ^b ± 2.00
M3RF	3460 ^d ± 8.10	51.00 ^a ± 0.15	4.30 ^a ± 0.02	87 ^d ± 1.00

Note: Result are means ± standar deviation; means with different superscript in the same column differ significantly ($P < 0.05$).

Characteristic and emulsion stability of mayonnaise

The characteristic of mayonnaise samples are shown in Table 1. There were significant differences ($p < 0.05$) on pH, viscosity, fat content, and emulsion stability.

Based on Table 1, there is significant different ($p < 0.05$) for pH among all of treatments. Increasing porang flour addition in reduced fat mayonnaise production and decreasing of oil phase will cause increasing of pH mayonnaise. More porang flour addition in treatment, pH which is resulted become higher. Snyder (2008) reported pH in low fat mayonnaise between the range 3.4 and 4.0.

Result of viscosity in mayonnaise showed significant different among all of treatments ($p < 0.05$). The viscosity of reduced fat mayonnaise with 0.3 % porang addition was 3460^d ± 8.10 cps, while the lowest viscosity of mayonnaise (3090^a ± 10.00 cps) was observed in mayonnaise added with 0.1 percent porang flour solution during preparation. Decreasing oil and increasing porang will be affected viscosity of mayonnaise. Porang flour 0.3 percent which was added in reduced fat mayonnaise caused it more stable because porang flour has capability as emulsifier to replace oil phase. Porang flour has function to stabilize emulsion of reduced fat mayonnaise by viscous the emulsion. The viscosity of reduced fat mayonnaise with 0.3 percent porang flour, have a higher viscosity. Increasing viscosity in aqueous phase

by adding porang flour will make emulsion stability. Manoj *et al* (2002) reported a light mayonnaise containing potato flour as a fat replacer have consistency of a highly viscous mayonnaise like full fat mayonnaise and good stability.

Based on Table 1, there is significant different ($p < 0.05$) for fat content all of treatments. Decreasing oil in low fat mayonnaise production and increasing aqueous phase will cause decreasing of fat content. More porang flour addition in treatment, fat content which is resulted become lower. In P3 treatment, fat content that was resulted lowest than all of other treatment. Increasing addition level of porang flour amount reduced fat content and increased dietary fiber of reduced fat mayonnaise. Dudina *et al.* (1992) reported fat content in light or low fat mayonnaise between the range 30 and 50 %.

The stability of emulsions was monitored by measuring the amount of oil separated. The result all of the treatment showed all sample mayonnaise no separated oil. The emulsions control and reduced fat mayonnaise were stable. Porang flour addition could be used up to maximum 0.4 percent (w/v) on mayonnaise production as a fat replacer. The porang flour in mayonnaise can act as a thickener agent and stabilize emulsions. Worrasinchai (2006) stated the used of gum can increase the viscosity of continue phase. Stability of emulsion is the most important factor in mayonnaise production. It is mainly controlled by the three phases in the emulsion system: the dispersed phase, the continuous phase, and emulsifiers (Dalglish, 2004).

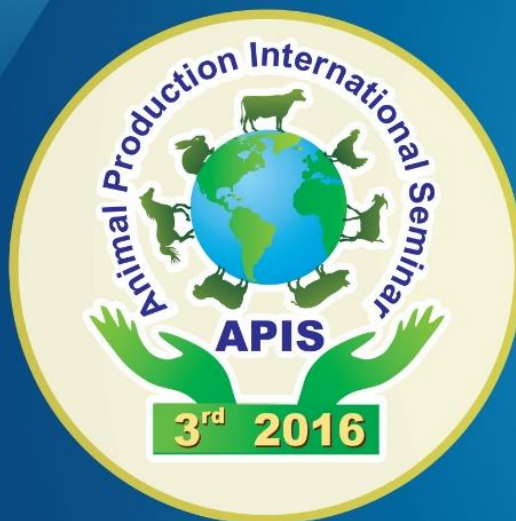
Conclusion

The result showed that 0.3% porang flour addition could be applied as a fat replacer to stabilize reduced fat mayonnaise and affect the characteristic and emulsion stability.

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