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FACULTY OF ANIMAL SCIENCE
BOGOR AGRICULTURAL UNIVERSITY

4th isai
International Seminar on Animal Industry 2018

THE FOURTH INTERNATIONAL SEMINAR ON ANIMAL INDUSTRY

"Harmonizing Livestock Industry Development, Animal Welfare, Environmental and Human Health"

August, 28-30 2018
IPB International Convention Center, Bogor-Indonesia

PROCEEDING

Organized by:

Supported by:

FLPI
FORUM LOGISTIK PETERNAKAN INDONESIA
MSM MAASTRICHT SCHOOL OF MANAGEMENT
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Harmonizing Livestock Industry Development, Animal Welfare, Environmental and Human Health. Proceeding Full Papers of the 4th ISAI (International Seminar on Animal Industry) held at IPB International Convention Centre, Bogor, 28 – 30 August 2018

Created by
Faculty of Animal Science, Bogor Agricultural University (FAS-IPB)
Jl. Agatis Kampus IPB Darmaga
16680 Bogor, Indonesia

ABOUT ISAI

International Seminar on Animal Industry

International Seminar on animal Industry (ISAI) is a special forum for the exchange of information, discussion on animal production issues and opportunities to present scientific and technical achievements in animal sciences. Its strategies and formulations are going to transform into practices. This seminar will provide a window for strengthening international co-operation between scientists, livestock specialists from industry and related institutions. The seminar is triennial meeting hosted by Faculty of Animal Science, Bogor Agricultural University in collaboration with Animal Scientists Society Indonesia (HILPI).

The first ISAI was held in Bogor on 23-24 November 2009. The theme of this seminar was *Sustainable Animal Production for Food Security and Safety*. Participant to the seminar came from Germany, United State of America, Japan, Malaysia, and Indonesia. Eighty eight research papers had been presented in this seminar.

The second ISAI was held in Jakarta Convention Center (JCC) on 5 – 6 July 2012. The theme of the second ISAI was *Empowering Local Resources for Sustainable Animal Production Due to Climate Change*. The second ISAI was conducted in conjunction with Indo Livestock exhibition, the biggest and the most comprehensive livestock technology exhibition and forum in Indonesia. In total 131 papers had been presented in the seminar consisted of 12 papers from invited speakers, and 119 papers from participants (72 papers were presented orally and 47 papers were presented as posters). Participants to the seminar came from several different countries including Australia, England, Japan, South Korea, South Africa, Sweden, Switzerland, United States of America, Malaysia, Thailand, Turkey, Iran, Iraq, Pakistan and Indonesia.

The third ISAI was held in Bogor on 17-18 September 2015. The theme of this seminar was *Sustainable Animal Production for Better Human Welfare and*

Environment. Ninety seven papers had been presented during the two days seminar; 9 by invited speakers, 69 for oral and 28 for posters presentations. The speakers came from different coutries including Australia, Egypt, France, Korea, German, Netherland, Indonesia, Malaysia, Nigeria, Pakistan, Thailand, The United State and Indonesia.

The fourth ISAI will be held in Bogor on 28 – 30 August 2018. The theme of this seminar will be *Harmonizing Livestock Industry Development, Animal Welfare, Environmental and Human Health*.

PREFACE

It is a great honor for us to complete the Proceeding of the Fourth International Seminar on Animal Industry. The proceeding consists information about editors, reviewers, about ISAI, about HILPI, papers presented in the seminars, committee, and supporting organizations.

We have received 110 abstracts to be reviewed, however, only 93 papers were accepted to be presented in oral or poster presentation. The full paper from accepted presenter were reviewed by scientific committee in the related field and international reviewers. Papers from the invited speakers were not further reviewed and some of them were not in full papers. Some papers have sent back to the authors for substantial correction. Some technical correction only were done by reviewers and editors directly.

In this opportunity, the Editors would like to thanks all reviewers, contributors and organizing committee for their collaboration and support from the preparation until the finalization of the proceeding. Hopefully, this proceeding will be useful reference to improve animal production and animal industry information and technology for academicians and livestock industry experts, as well as other related users.

Bogor, August 2018

On behalf of Editors,

Dr. Ir. Asep Sudarman, M.Agr.Sc

FOREWORD

Distinguished,

- Rector of Bogor Agricultural University, Dr. Arif Satria, SP, MSi.
- Director General of Livestock Services and Animal Health, Ministry of
- Agriculture, Republic of Indonesia, Dr. drh. I Ketut Diarmita, MP.
- Dean of Animal Science Faculty, Bogor Agricultural University, Dr. Ir.
- Mohamad Yamin, MAgr. Sc.
- Invited Speakers and all participants of the International Seminar on Animal
- Industry 2018

Assalamu'alaikum warahmatullaahi wabarakatuh,

Good morning ladies and gentlemen,

It is my great pleasure to welcome you all, distinguished guests, speakers and participants, to the Fourth Internasional Seminar on Animal Industry (ISAI 4th, 2018) held at the IPB International Convention Center, Bogor Indonesia. This seminar with the theme "Harmonizing Livestock Industry Development, Animal Welfare, Environmental and Human Health" is organized by Faculty of Animal Science, Bogor Agricultural University in collaboration with Animal Scientists Society Indonesia (HILPI).

Following the commendations from ISAI 1, ISAI 2, and ISAI 3 which were held in Indonesia in 2009, 2012, and 2015, the strategic issues of ISAI 4th is emphasized on animal logistics, trade-off between animal industry development, animal welfare, and environmental concern toward a sustainable animal production. There are 102 papers will be presented during the three days seminar; 9 by invited speakers, 66 for oral and 27 for posters presentations. The speakers come from different coutries including the Netherland, Poland, USA, Australia, Egypt, Japan, China, Malaysia and Indonesia.

In concurrent with this seminar, several events will be conducted including congress of FLPI (Indonesian Animal Logistics Forum), Youth Forum, and Mid Conference Tour. FLPI congress will be conducted in the second day which involves

Indonesian and the Netherland Government, Logistics Associations, Logistics Experts, Animal Logistics Companies, and all participants of this seminar. Youth Forum consists of poster, paper and art competition. Selection for paper and poster competition have been done by international experts prior to this seminar. The winner will be invited to join this seminar. The participants of art competition will show their performance during this seminar and will be judged by all seminar participants.

This is a great opportunity for scientists, researchers, private sectors and policy makers to discuss recent issues on sciences and technologies development in a broad sense of animal production, including animal enviroment; animal feed nutrition and nutrigenomics; animal logistics; animal management; animal product's technology; animal welfare, health and disease prevention; breeding and genetics; animal agribusiness, social economics and policy in animal production. I believe, there is an open window for initiating and strengthening collaboration amongst scientists, institutions, and private sectors during and after the seminar.

On behalf of the Organizing Committee, I would like to express my sincere appreciation and thanks to IPB, and some units within, including Directorate of International Program, Faculty of Animal Science, Department of Animal Production and Technology, Department of Nutrition and Feed Technology for all advice and funding supports.

I would like to express my sincere appreciation and thanks to the Netherlands Government, and some units within, including NUFFIC (The Dutch Organization for Internationalization in Education), MSM (Maastricht School of Management), WUR (Wageningen University Research) and AERES Groep. The success of this seminar could only be achieved with all valuable supports and sponsorships from Animal Logistics Indonesia-Netherlands (ALIN) and Directorate of International Program of IPB.

My recognition and gratitude are also forwarded to the Steering Committee for advice and support, to international and national reviewers and the Scientific Committee for hard working and such great contribution. Last but not least, toall my dear coleagues of the Organizing Committee members, who have been working smartly and full of dedication and passion, to make this seminar a great succesfull event.

To all participants, hopefully, the three days seminar may bring fresh ideas, and enhance collaborations for future success toward harmonizing livestock industry development, animal welfare, environmental and human health. Big appologies for any incoveniences during the seminar, wish you all having good times, and fruitful discussions.

During your short stay, please enjoy the surrounding of Bogor city, the Museum of Presidential Palace and Historical Botanical Garden of Bogor.

Bogor, August 28, 2018
The ISAI 4th 2018,
Chairperson of Organizing Committee

Despal

REMARKS

- Dr. drh. I Ketut Diarmita, MP (Director General of Livestock and Animal
- Health-Ministry of Agriculture Republic of Indonesia)
- Dr. Arif Satria, SP, MSi. (Rector of IPB)
- Dr. Despal, SPt, MSc. Agr (Chairperson, The 4th International Seminar on Animal Industry)
- Our Colleagues from Indonesian universities and research institutes,
- Distinguished foreign participants and speakers,
- Representative of livestock services officers of local government from all over Indonesia,
- Distinguished guests, ladies and gentlemen.

Assalamu'alaikum warahmatullaahi wabarakatuh,

I am pleased to welcome you all to Bogor city for attending "The Fourth International Seminar on Animal Industry 2018" held by Faculty of Animal Science, Bogor Agricultural University (IPB) and Animal Scientists Society Indonesia (HILPI). As the Dean of the Faculty, I am also really honored to host this conference.

First, let me introduce briefly about Bogor city. Bogor is one of the major scientific and educational centers in Indonesia. A significant part of academic and research base was designed and laid in the period of Dutch colonization. In particular, since the beginning of the 19th century laboratories and professional schools were established and focused primarily on improving the efficiency of the colonial agriculture. Similar to the prevailing profile of research and academic activity was retained in Bogor after independency. As in the second half of 20th century, and in the 2000s strongest areas were Agricultural Sciences, Biology, Animal and Veterinary Sciences. The main educational and scientific center with the utmost national importance is Bogor Agricultural University - IPB. It is therefore the city regularly hosted various international events, such as international seminars and conferences.

I would like to express my gratitude to IPB and the Netherlands government for supporting us to hold this conference, and also to the organizing committee of the present conference for their hard work and persistence. I convey my sincere gratitude to all the parties which is supporting this event, such as Directorate General of Livestock and Animal Health-Ministry of Agriculture Republic of Indonesia, Animal Logistics Indonesia Netherlands (ALIN), Directorate of International Program of IPB, NUFFIC (The Dutch Organization for Internationalization in Education), MSM (Maastricht School of Management), WUR (Wageningen University Research) and AERES Groep. Thank you so much with huge appreciation, for being part of this important event and such enormous contributions.

I am very pleased to see here the delegates from various foreign countries as well as representatives from many domestic institutions. I hope you find this conference and the city, both interesting and stimulating and that you enjoy meeting up with your professional colleagues as well as having pleasure time during your stay in Bogor.

Thank you very much and Wassalamu’alaikum warahmatulaahi wabarakaatuh.

Bogor, August 28, 2018
Dean Faculty of Animal Science,
Bogor Agricultural University

Dr. Ir. Mohamad Yamin, MAgr. Sc

SEMINAR PROGRAM
FIRST DAY

Tuesday, August 28, 2018
Venue: Ballroom, IPB International Convention Centre

Time	**Event**
08.00 - 08.30	Registration
08.30 - 09.00	Morning coffee
09.00 - 10.00	Opening ceremony
	Report from OC
	Welcome Address from Dean Faculty of Animal Science
	Opening speech from Director General of Livestock and Animal Health
	Appreciation for Director General of Livestock and Animal Health
	Appreciation for Sponsors
	Photo session
10.00 – 12.00	Plennary Session 1
10.00 - 10.20	Invited Speaker 1 **Prof Wayne Pitchford (Australia)** *Optimizing sheep production in tropical area*
10.20 - 10.40	Invited Speaker 2 **Dr Marcel Ludema (The Netherlands)** *Livestock supply chain, problem and future prospect*
10.40 - 11.00	Invited Speaker 3 **Prof Luki Abdullah (Indonesia)** *Green concentrate development in Indonesia*
11.00 - 11.20	Invited Speaker 4 **Livestock Industry** *AGP-Free Poultry Production System*
11.20 - 12.00	Discussion
12.00 - 12.10	Invited Speakers and moderator appreciation
12.10 - 13.10	**Lunch**
13.10 - 13.35	Poster session I

FIRST DAY
POSTER SESSION I

Tuesday, August 28, 2018
Time: 13.10-13.35

No ID	Author(s)	Titles
18014	Retno Widyani; Muh Hisyam Hermawan	In Vitro Studies : Potensial of Dyospiros Kaky as an Agent of Anti Cholesterol to Decrease Stroke Case
18016	Helmy Metawi	Small Ruminants Production Performance under Different Water Availability in Egypt
18031	Erina Erina; M. Aman Yaman; Vinky Claudya Fransiska; Kamiliyatul Fadhilah	Ratio of Bursa Fabricius Weight and Final Body Weight, Thymus Regression Time on Alpu Chicken
18039	Fuad Hasan; Hamdan	Inbreeding of Murrah Buffalo in Tanjung Garbus Village, Deli Serdang Distric, North Sumatera Province
18042	Zakiah Wulandari; Laila Wahyuni; Neny Polii	Nutritional Content and Characteristics of Protein Tortilla Corn Chips with The Addition of Egg White Powder as Protein Source
18050	Ingriet Lumenta; Lidya Kalangi; Artise Salendu; Femi Elly	Development of Duck Farming Environmentally Friendly in Regency Of Minahasa, North Sulawesi Province, Indonesia
18052	Artise H.S. Salendu; Ingriet D.R. Lumenta; Femi H. Elly; Derek Polakitan	Prospect of Environmental Beef Cattle Development in Regency of North Bolaang Mongondow, North Sulawesi Province, Indonesia
18053	Lidya Siulce Kalangi; Stanly Oktavianus Bryneer Lombogia; Sony Arthur Ely Moningkey	Empowerment for Duck Farmer Group in Tuutu Villages West Tondano District Minahasa Regency North Sulawesi Province, Indonesia
18055	Tilly F.D Lumy; Meiske L. Rundengan; Anneke K Rintjap; Richard E.M.F Osak	Role of Feed Technology in Increasing Cattle Productivity in South Minahasa Regency Of North Sulawesi, Indonesia

18056	Ingriet D.R Lumenta; Agustinus Lomboan; Sony A.E. Moningkey; Femi Elly	Pig Farming Development Environmental Friendly in the Villages of Pinapalangkow District of Suluun Tareran Regency of Minahasa, North Sulawesi Province, Indonesia
18057	Paulina Szulc; Magdalena Bryszak; Min Gao; Haihao Huang; Małgorzata Szumacher-Strabel; Victor Rodriguez; Yulianri Rizki Yanza; Anna Stochmal; Barbara Moniuszko-Szajwaj; Adam Cieślak	Effect of Flavonoids of Paulownia Clon In Vitro 112® on In Vitro Ruminal Fermentation and Methane Emission Using the Hohenheim Gas Test
18058	Sintya Umboh; Erwin Wantasen; Hendrik Gijoh	Technology Adoption Rate of Crop-Cattle Integrated Farming System in Minahasa District
18060	Femi Hadidjah Elly; Artise H.S. Salendu; Charles L. Kaunang Indriana; Syarifuddin; Ramlan Pomolango	Empowerment of Farmers in Efforts To Develop Sustainable Cattle Farming In Sangkub District Regency of North Bolaang Mongondow, North Sulawesi Province, Indonesia

FIRST DAY
PARALLEL SESSIONS

Tuesday, August 28, 2018

Time/ Sessions	**Room A** **Animal Product Technology**	**Room B** **Feed, Nutrition, and Nutrigenomic**	**Ballroom** **Breeding and Genetics**
Session 1			
Moderator :	**Dr Tuti Suryati, S.Pt., M.Si.**	**Prof. Dr. Ir. Komang G.W.**	**Prof. Dr. Ir. Ronny R Noor**
13.45 - 13.55	18024 **Yurliasni; Yusdar Zakaria; Sitti Wajizah; Zuraida Hanum** Quality of *Lactobacillus plantarum* in Goat and UHT Milk	18018 **Endang Sulistyowati; Irma Badarina; Sigit Mujiharjo** Milk Production of Dairy Cow Fed Concentrate Containing Durio Zibethinus Peel Meal Fermented with Pleurotus Ostreatus	18030 **M. Aman Yaman; Zulfan; Muhammad Daud; Allaily** The Effects of Chicken Type on Egg Production and Egg Quality on Crossbreed Local Chicken with Backyard Maintenance System
13.55 - 14.05	18028 **Hajrawati; Henny Nuraini; Irma Isnafia Arief; Dondin Sajuthi** Oxidation and microbial growth characteristic of cooked Beef Patty as affected with Cemba (*Albizia lebbeckoides* [DC.] Benth.) leaf extract	18043 **Irma Badarina; Dwierra Evvyernie; Toto Toharmat** The Improvement of Concentrate Diet Quality on The Lactating PE Goat Health	18011 **Surya Nur Rahmatullah; Zulham Efendi; Hamdi Mayulu; Fikri Ardhani; Abrani Sulaiman** Comparative Morphometrics Based on Discriminant Analysis in Rooster and Hens Local Chicken from East Kalimantan
14.05 - 14.15	18040 **Muhamad Arifin; Irma Isnafia Arief; Cahyo Budiman**	18073 **Lilis Khotijah; Citra Fadzria; Didid Diapari; Prasetyo Nugroho; Dewi Apri Astuti**	18101 **Alif Iman Fitrianto; Anny Rosmayanti; Arief Boediono**

	Kinetic and Thermodynamic Study of Plantaricin IIA-1A5 Produced by *Lactobacillus plantarum* IIA-1A5	Effect of flushing diet with different fat sources on preovulatory follicle of Etawah crossbred doe	In vitro Embryo Production Using Simmental Cattle (Bos taurus) and Brahman Cattle (Bos indicus) Frozen Semen
14.15 - 14.25	18029 **Suharyanto; Henny Nuraini; Tuti Suryati; Irma Isnafia Arief; Dondin Sajuthi** Enhancement of Physicochemical Properties of Beef Sausage Batter by Adding Senduduk (Melastoma malabathricum L.) Leaf Extract	18091 **Nyai Mukholisah; Tria Dansi Anggraini; Suprihandini Aprilia Pribadi; Komang G Wiryawan; Sri Suharti** Isolation and Identification of 2,3-Dihidroxypyridine (2,3-DHP) Degrading Bacteria of Bali Cattle Rumen Fed *Leucaena leucocephala* Leaves Based Ration	
14.25 - 14.45	**Discussion**		
Session 2			
Moderator	**Dr. Irma Isnafia Arief, S.Pt., M.Si**	**Prof. Dr. Ir. Nahrowi, M.Sc.**	**Dr Asep Gunawan, S.Pt., M.Sc**
14.45 - 14.55	18069 **Muhammad Yusuf; Rifa Rafi'atu Sya'bani Wihansah; Asti Yosela Oktaviana; Bunga Putri Febrina; Rifkhan; Julian Karta Negara; Yuni Nur Raifah; Aristo Kurniawan Sio; Muhamad Arifin; Tuti Suryati** The Effect of Curing on Phsycal, Chemical and Physicochimical Properties of Dendeng	18020 **Allaily Tarman; Muhammad Aman Yaman; Herawati Latif; Zulfan Zulfan; Nahrowi Ramli; Muhammad Ridla** Chemical, Physical and Microbiological Characteristics of Fermentation Feed	18026 **Eka Meutia Sari; Riska Maulani; Mohd. Agus Nashri Abdullah** Reproduction Characteristics of Female Buffalo in Condition of Livestock Farming in North Singkil District, Aceh Singkil Regency

14.55 - 15.05	18049 **Wendry Setiyadi Putranto; Maggy Thenawidjaja Suhartono; Harsi Dewantari Kusumaningrum; Puspo Edi Giriwono; Apon Zaenal Mustopa; Hartati Chairunnisa** Lactobacillus Casei 2.12 Isolated From Ettawa Goat Milk Showed Milk Clotting Activity	18033 **Yuli Retnani; Taryati Taryati; Dipa Argadyasto** Quality Test of Feed Supplement of Mash, Pellet, Wafer Containing Nigella Sativa Waste For Dairy Goat	18032 **Bram Brahmantiyo; Henny Nuraini; Astari Wibiayu Putri** Phenotype Characteristics of Hycole, Hyla and New Zealand White
15.05 - 15.15	18108 **Herly Evanuarini; Imam Thohari; Anggraini Ayu Putri Pratama** Chemical Quality and Sensory Evaluation of Salted Eggs with Addition of Black Grass Jelly (Mesona palustris BL.)	18035 **Samadi Samadi; Siti Wajizah; Agus Arif Munawar** Near Infrared Spectroscopy Applied to Animal Feed: Fast Analysis of Main Quality Attributes	18041 **Rudi Afnan; Sri Darwati; Nur Widayanti** Egg Production and Reproduction of Arab and Merawang Chickens Crossbred
15.15 - 15.25	18087 **Nurmeiliasari; Dewi Apri Astuti; Rudy Priyanto; Salundik Salundik; Junichi Takahashi; T Okamoto; M Okamoto** Carcass, Meat Quality and Fatty Acid Composition of The Longissimus Muscle of Rumen Mechanical Stimulating Brush Administrated Brahman Cross Steers	18036 **Mohammad Miftakhus Sholikin; Anuraga Jayanegara; Nahrowi Nahrowi** Characterisation of antibacterial peptides and minimal inhibitory concentration of *Hermetia illucens* with different chemically processing	18079 **Fariz Am Kurniawan; Jakaria Jakaria; Rudy Priyanto** Non-Genetic Factors Affecting Reproduction Traits of Indonesian Brahman Cross (BX)

15.25 - 15.45	**Discussion**		
15.45 - 16.00	**Coffee break**		
	Room A	**Room B**	**Ballroom**
	Animal Environment ; Feed, Nutrition, & Nutrigenomics Animal Management &Production	**Animal Agribusiness, Social Economics and Policy in Animal Production**	**Feed, Nutrition, and Nutrigenomics**
Session 3			
Moderator :	**Prof Dr. Ir. Dewi Apri A., M.S**	**Ir. Huub Mudde, MSc**	**Dr. Ir. Idat G. P., M.ScAgr.**
16.05 - 16.15	18067 **Teguh Dwi Putra; Novadhila Rahmi; Bramada Winiar Putra; Sigit Bintara; Endang Baliarti** The Physiological Response of Angus x Bali Crossed Calf on Tropical Environment as an Indicator of Adaptability	18007 **James Hellyward; Argus Saadah, Fuad Madarisa; B.R.T Putri** Prospect of Dairy Cattle Business Development in Padang Panjang, Indonesia	18086 **Nur Kumalasari; Lusi Wahyuni; Luki Abdullah** Germination of Asystasia gangetica seeds exposed to different source, size, storage duration and pre-germinative treatments
16.15 - 16.25	18084 **Nur Fathia; Idat Galih Permana; Komang Gede Wiryawan** The Influence of Palm Kelner Cake on Nutrient Intake and Performance of Growing Brahman Cross Cattle	18099 **La Ode Arsad Sani; Usman Rianse; Bahari; Harapin Hafid; Widhi Kurniawan** Household Economy of Bali Cattle Farmer with Different Farming Combination in Konawe Selatan Regency of Southeast Sulawesi Province	18094 **Panca Dewi Manu Hara Karti; Rahmat Triyono; Indah Wijayanti** Selection of irradiated 300 Gy Alfalfa (Medicago sativa) on Acid Stress through Tissue Culture

16.25 - 16.35	18047 **Hamdani Maulana; Panjono ; Bayu Andri Atmoko; Endang Baliarti** Pre-Weaning Growth of Bali Calf from Cows that Kept Semi Intensif in Oil Palm Plantations	18054 **Jolanda K.J Kalangi; Jeane C Loing; Femi H. Elly; Sintya J.K Umboh** Empowerment for The Group of Cattle Farmer in the Village of Pinabetengan Tompaso District Minahasa Regency North Sulawesi Province Indonesia	18095 **Widhi Kurniawan; Hamdan Has; Muh. Amrullah Pagala; Natsir Sandiah; Teguh Wahyono; Shinta Nugrahini Wahyu Hardani; Supriyanto** bmr Sorghum Productivity Grown on Swamp-soil Applied Biochar and Harvested in Different Age
16.35 - 16.45	18063 **Marsetyo; Mustaring; Muhammad Basri** The effect of Legumious Supplementation on Feed Intake, Digestibility and Liveweight Gain of Etawa crossbreed goat given Paspalum atratum as basal feed	18015 **Ulrikus Romsen Lole** Local Chicken Marketing System in Kupang City East Nusa Tenggara Province Indonesia	18075 **Asep Tata Permana; Panca Dewi Manu Hara Karti; Luki Abdullah; Suwarno** The effect of Eisenia foetida on Latosol on the Growth of Plants: Sorghum bicolor and Centrosema pubescens
16.45 - 17.00	**Discussion**		

FIRST DAY
WELCOME DINNER

Venue: Ballroom
Time: 18.30 – 21.30

Time	Agenda
18.30 - 19.30	Registration and Dinner
19.30 - 19.35	Opening
19.35 - 19.45	Speech from Chairman of Committee
19.45 - 19.55	Speech from Dean of Animal Science Faculty
19.55 - 20.30	Art Performances (Contestants)
20.30 - 20.45	Art Performances (Angklung; participants)
20.45 - 21.20	Art Performances (country representatives)
21.20 - 21.30	Closing

SECOND DAY
FLPI MID CONFERENCE

Wednesday, August 29, 2018
Venue : Ballroom

Time	Activity	PIC/Speaker/Moderator
07.30 - 08.30	**Registration & Coffee Morning**	
08.30 - 08.35	**Opening**	Master Ceremony (bilingual)
08.35 - 08.45	**Welcoming Speech**	Prof. Dr. Ir. Iskandar Zulkarnaen Siregar, M.For.Sc.* (Director of International Program)
08.45 - 08.55	**Welcoming Speech**	Nanya Burki (Head of Development and Partnership, NUFFIC – NESO Indonesia)
08.55 - 09.15	**Keynote Speech**	Zaldy Ilham Masita (Indonesian Logistic Association)
09.15 - 09.30	**Symbolic opening** ceremony by playing *angklung* together followed by photo session	all participants
09.30 - 09.45	**Coffee Break**	
09.45 - 10.15	**Session 1 :** "Animal Logistic in International Perspective"	
	1. Multis takeholder cooperations	Ir. Huub Mudde, M.Sc. (MSM, Netherlands)
	2. FLPI's Development and Contribution	Prof. Dr. Ir. Luki Abdullah, M.Sc. (Chairman FLPI)
10.15 - 10.20	**FLPI profile video playback** (5 minutes duration)	
10.20 - 12.00	**Session 2:** "National Research and Development Planning"	**Moderator : Prof. Dr. Ir. Senator Nur Bahagia**
	1. Animal Logistics at National Program 2019	Ir. R.Anang Noegroho Setyo Moeljono, M.E.M (Director of Food and Agriculture BAPPENAS)
	2. Animal Logistics Research Scheme	Prof. Dr. Muhammad Dimyati, M.Sc. (Director General of Research and Development – Ministry of RISTEKDIKTI)

	3. Animal Logistic Business in Indonesia	Ir. Juan Permata Adoe* (KADIN)
12.00 - 13.00	**Break (pray & lunch)**	
13.00 - 14.50	**Panel Session** "Prospective of Animal Logistics Business in Indonesia"	**Moderator : Noverdi Bross, PhD**
		1. George Hughes (Red Meat and Cattle-Indonesia-Australia Partnership)
		2. Efi Lutfillah (Frisian Flag Indonesia)
		3. Frits Blessing (Initiator Living Lab Logistics Netherlands – Indonesia)
		4. Lennart Ephraim (Chartering Manager Livestock Express Pte Ltd. |SINGAPORE/PT. Vroon)
		5. Cris Lumabi, HSE (Superintendent and sailed as Captain on livestock ships, Livestock Express Pte Ltd. SINGAPORE/PT. Vroon)
14.50 -15.00	**Conclusions of the conference**	Dr. Despal, S.Pt., M.Sc.Agr.

MID CONFERENCE TOUR

(Will be conducted according to participant's registration. Details of the tour will be announced at welcome dinner)

THIRD DAY

Thursday, August 30, 2018

Venue : Ballroom, IPB International Convention Centre

Time	**Event**
08.00 - 08.30	Registration
08.30 - 09.00	Morning coffee
09.00 - 10.00	**Keynote Speech** Rector of Bogor Agricultural University *Animal Industry in Industrial Era 4.0*
	Appreciation for Rector of Bogor Agricultural University
	MOA signing between Faculty of Animal Science IPB and 1. Adeleide University 2. Animal Research and Development (ICARD), Ministry of Agriculture 3. PT Lembu Jantan Perkasa
	Photo session
	Plennary Session 1
10.00 - 10.20	Invited Speaker 1 **Prof Junichi Takahashi (Japan)** *Livestock and Greenhouse Gas Emission: Bilateral Impact and Prophylactic Modulation*
10.20 - 10.40	Invited Speaker 2 **Dr. Sanders (Netherland)** *Poultry Welfare*
10.40 - 11.00	Invited Speaker 3 **Prof Cece Sumantri (Indonesia)** *Genetic marker of Indonesian local livestock*
11.00 - 11.20	Invited Speaker 4 **Dr Mohamad Yamin (Indonesia)** *Sheep and Goat Industry in Indonesia: The Prospect, Potency and Challenges*
11.20 - 12.00	**Discussion**
12.00 - 12.10	**Invited Speakers and moderator appreciation**
12.10 - 13.10	**Lunch**
13.10 - 13.35	**Poster session II**

THIRD DAY
POSTER SESSION II

Thursday, August 30, 2018
Time: 13.10 – 13.35

No ID	Author(s)	Titles
18061	Artise H S Salendu; Femi H Elly; Fietje S.G. Oley	Introduction of Technology for the Development of Duck Farming in the Village of Tompaso District Minahasa North Sulawesi Province, Indonesia
18062	Yulianri Rizki Yanza; Adam Cieslak; Anuraga Jayanegara; Andre Meiditama Kasenta; Małgorzata Szumacher-Strabel	The Effect of Medium Chain Fatty Acids on Rumen Methanogenesis In Vitro: Meta-Analysis
18066	Min Gao; Magdalena Bryszak; Haihao Huang; Victor Rodriguez; Paulina Szulc; Yulianri Rizki Yanza; Maciej Gogulski; Adam Cieślak; Małgorzata Szumacher-Strabel	Fatty Acids Profile of Breast and Leg Muscles Enteric Methane Emission of Broiler Chicken Fed Diet with Fermented Rapeseed Cake
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18071	Magdalena Bryszak; Min Gao; Haihao Huang; Małgorzata Szumacher-Strabel; Victor Rodriguez; Yulianri Rizki Yanza; Paulina Szulc; Adam Cieslak	The Effect of Lupinus Angustifolius on the Milk Gene Expression FASN, LPL, SCD, FADS1 and ELOVL5 of High-Yielding Dairy Cows
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18088	Yulianri Rizki Yanza; Katrin Roosita; David Kuåºnicki; Min Gao; Victor Rodriguez; Paulina Szulc	Evaluation Effects of Different Galactogogue Sources: M. Oleifera, C. Amboinicus L., and Galohgor Â® Herbmix on Rumen Fermentation
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18100	Sawosz E; Łozicki A; Łukasiewicz M; Niemiec T; Niemiec J; Matuszewski A; Jankowski J; Józefiak D; Chwalibog A	Nanoparticles of Zink Oxide as a Source of Zn in the Diets for Broiler Chicken
18102	Anisya Nur Khasanah ; Irma Isnafia Arief; Lucia Cyrilla ENSD	Perception of Frozen Beef From Bussiness Consumers at Bogor

THIRD DAY

Thursday, August 30, 2018

Time/ Sessions	Room A	Room B	Ballroom
	Agribusiness, Social Economics & Policy; Production & Management	**Feed, Nutrition, and Nutrigenomics**	**Animal Environment; Feed, Nutrition, and Nutrigenomics**
Session 4			
Moderator :	**Prof. Dr. Ir. Asnath M Fuah**	**Prof. Dr. Ir. Samadi, M.Sc.**	**Prof. Dr. Ir. James Hellyward**
13.50 - 14.00	18064 **Stanly O.B. Lombogia; Lidya S Kalangi; Sony A.E Moningkey; Jeane Pandey** Introduction of Technology in Support to Duck Farming in The Tuutu Village of West Tondano District Regency of Minahasa Province of North Sulawesi Indonesia	18009 **Muhammad Daud, M. Aman Yaman, Zulfan, Asril** The Effects of Leubiem Fish Waste (Chanthidermis Maculatus) as Protein Source in Rations on the Performance of Male Alabio Ducks	18051 **Femi Hadidjah Elly; Agustinus Lomboan; Charles L Kaunang; Ramlan Pomolango** Integrated Farming System (Cattle-Crop) Environmentally Friendly and Sustainable in North Bolaang Mongondow Regency North Sulawesi Province, Indonesia
14.00 - 14.10	18093 **Bramada Putra; Novadhila Rahmi; Endang Baliarti; Cuk Noviandi; Rusman** Comparisons in Morphometric Performances of Bali and Bali Cross Angus Weaning Female Cattle Using Digital Image Measurement Technique	18034 **Heri Ahmad Sukria; Suharyati Suharyati; Dewi Apri Astuti** Dietary Supplementation of Fulvic Acid and Ground Moringa oleifera on Performance and Hematological Profile of the Javaness Quail (Coturnix coturnix japonica)	18003 **NSBM Atapattu; WWDA Gunawardana; LM Abeywickrama; M Munasinghe** A Comparison of Nitrogen partitioning and utilization efficiency of broiler production under open and closed-house systems

14.10 - 14.20	18059 **Lidya Siulce Kalangi; Stanly Oktavianus Bryneer Lombogia; Femi Hadidjah Elly; Tilly Flora Desaly Lumy** Development of Cattle in District of Pinogaluman Regency of North Bolaang Mongondow Province of North Sulawesi, Indonesia	18098 **Dwi Margi Suci; Yuhelensi; Widya Hermana** Growth Performance of Quail (Coturnix coturnix japonica)Fed on Diet Using Salvinia molesta Meal	18106 **Arif Darmawan; Sumiati; Dwi Margi Suci; Lely Kurniawati** Effect of Feed Aditive Selacid, Presan, and Selko pH on Cobb Broiler Performance
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Session 5	**Room A**	**Room B**	**Ballroom**
	Animal Management and Production	**Feed, Nutrition, and Nutrigenomics**	**Feed, Nutrition, and Nutrigenomics**
Moderator :	**Ir. Bertus Bronkhorst, MSc.**	**Dr. Ir. Endang Sulistyowati, M.Sc**	**Dr. Ir. Asep Sudarman, M.Rur.Sc**
14.35-14.45	18008 **Imam Suswoyo; Rahayu Widiyanti** The Use of Antioxidants in Increasing Duck Welfare in Commercial Farms And Its Impact on Farmers' Income	18037 **Dadik Pantaya; Ujang Suryadi; Suci Wulandari; Reza Apriliansyah Efenndi** The effect of wheat pollard dietary fibre on cholesterol content of egg yolk laying ducks	18045 **Panca Dewi Manu Hara Karti; Iwan Prihantoro; Dian Anggreni Manurung; Dewi Sukma** Selection of irradiated 50 Gy Lamtoro (Leucaena leucocephala) Callus on Acid Stress through Tissue Culture
14.45-14.55	18010 **Retno Widyani; Mus Nilamcaya; Aan Suryani** Management Of Dairy Cow Maintenance In Kondang Group And Multipurpose Cooperative Museum (KSU) Karya Nugraha Cigugur District, Kuningan Regency, West Java, Indonesia	18105 **Sumiati; Widya Hermana; Arif Darmawan** Duck Egg Functional Production High Antioxidant and Omega 3 Fatty Acid Fed Diets Containing Indigofera Leaf Meal, Cassava Leaf meal and Lemuru Oil	18070 **Prasetyo Nugroho; Komang Gede Wiryawan; Wasmen Manalu; Dewi Apri Astuti** Effect of flushing with different fatty acid profiles in ration on follicle development of Peranakan Etawah doe

14.55-15.05	18012 **N.G.A. Mulyantini, S.S.; Ulrikus Romsen Lole; Franky Telupere** Crossbred Local Chickens from East Nusa Tenggara Province Indonesia Under Semi Intensive Management System	18006 **Khalil; Suyitman; Montesqrit** Crude Nutrient and Mineral Composition of *Asystasia gangetica* (L) Derived from Different Growing Areas	18046 **Wulansih Dwi Astuti; Roni Ridwan; Achmad Dinoto; Mitsuo Sakamoto; Maki Kitahara; Tomohiro Irisawa; Yantyati Widyastuti** Isolation and Identification of Lactic Acid Bacteria from Silages
15.05-15.15	18038 **Gusti Ayu Kristina Dewi; I Made Nuriyasa; Made Wirapartha; Ni Pande Made Suartiningsih** Quality of Broiler Carcasses, and Abdominal Fat Given Rations Containing Dragon Fruit Meal (Hylocereus Polyrhizus) Fermented		18083 **Idat Galih Permana; Despal; Nurul Damayanti; Linda Sri Yolanda** The Influence of Different Concentrate Levels on Milk Production and Quality at Local Dairy Farming
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15.35-15.45	**Coffee break**		
Session 6	**Room A**	**Room B**	**Ballroom**
	Animal Logistics	**Feed, Nutrition, and Nutrigenomics**	**Breeding and Genetics**
Moderator :	**Dr. Rudi Afnan, S.Pt., M.Sc.Agr**	**Prof. Dr. Ir. Khalil, M.Sc**	**Dr. Ir. Rudy Priyanto**
15.30-15.40	18092 **Rika Zahera; Istychoiroh Mahdiyah; Muhammad Arifan; Toto Toharmat; Idat Galih Permana; Despal**	18089 **Sri Wahjuningsih; Muhammad Nur Ihsan; Nurul Isnaini; Gatot Ciptadi; Sri Rahayu; Angga Setiawan**	18103 **Krido Brahmo Putro; Arief Boediono; Amrozi; Adi Winarto; Wasmen Manalu** Reproduction Performance of Peranakan Ongole Heifer during

	Comparison of Feed Logistic Efficiency between Urban and Rural Dairy Farming	The Effect of Supplementation of Moringa Oleifera Leaves Extract in Skim Milk-Egg Yolk Diluent on Buck Semen Quality	Estrus Phase Stimulated using Low Dose Pregnant mare serum gonadotrophin (PMSG)
15.40-15.50	18111 **Bertus Bronkhorst** Challenges during transport of Day-Old chicks and Broilers, and its impact on the final quality of Broiler carcasses.	18076 **Ida Maria Lestari Hutabarat; Nahrowi Ramli; Yoshiki Matsumoto** Effect of dietary bamboo charcoal enriched with acetic acid (BCAA) on egg quality and intestinal morphology of laying hens	18109 **Asep Gunawan; L.Sahertian; K.Listyarini; M.A.Abuzahra; M.Yamin; C.Sumantri; I Inounu; Jakaria** Identification of TGBR2 gene polymorphism associated with fatty acid traits in Indonesia sheep
15.50-16.00	18074 **Nur'aini; Luki Abdullah; Gede Made Ditha Dwitama; Alvi Rahmalia; Dwi Pramono; Despal** Conditioning and Feed Adaptability Periods on Cattle Behavior After Transportation	18110 **Asep Sudarman; Denbeti Noviani Rita Mutia** Performance and Egg Yolk Profile of Duck Fed A Diet Supplemented with Garlic Powder and Shrimp Waste	18096 **Muh.Amrullah Pagala; La Ode Nafiu; Widhi Kurniawan; Herlina** The Body Weight, Growth and Heterosis of Kampung Chicken and Crossbreeding with Laying and Broiler Chicken
16.00-16.10	18078 **Kania Asri Liany; Despal ; Yuli Retnani** Evaluate the Physical Quality of Various Types of Feed to Improve Warehousing Efficiency	18027 **Aeni Nurlatifah; Mathari Ilman; Iis Arifiantini; Didid Diapari; Kokom Komalasari; Dewi Apri Astuti** The Effect of Animal-based and Plant-based Protein on the Blood Profiles and Quality of Buck's Semen	18112 **Mohamad Yamin; Sri Rahayu; Muhammad Baihaqi; Asep Gunawan** Rapid Selection at Fattening Farm for Sheep Genetic Improvement

16.10-16.20	18080 **Intani Dewi; Galih Sudrajat** Factors Influencing Beef Imports in Indonesia	18104 **Fensa Eka Widjaya; Yuli Retnani; Despal; Luki Abdullah & Rudi Priyanto** Regression Analysis on Physical Quality of Straw, Elephant Grass, Leucaena, and Indigofera Leaves for Shipping Cattle Feed	
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THIRD DAY
CLOSING CEREMONY

Thursday, 30 August 2018
Venue: Ballroom

Time	Agenda
17.00 - 17.05	Opening
17.05 - 17.15	Award Announcement
17.15 – 17.20	Winners Appreciation
17.20-17.25	Speech from representative invited speaker
17.25-17.30	Speech from representative participant
17.30-17.35	Closing speech from Dean of Faculty of Animal Science IPB

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FULL PAPERS

INVITED SPEAKERS

Decoupling in Livestock and Fresh Meat Supply Chains

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Introduction

In most countries the fresh food processing industry is one of the most vital industries, generating substantial revenue and employment to a large part of the population. Handling of perishable fresh food products throughout supply chains is an important activity including reliable temperature conditioning (Chung-Kee & Chuwonganant, 2014). Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities, including coordination and collaboration of all channel partners (Council of Supply Chain Management Professionals, 2018). Supply chains link businesses from raw material sources to the delivery of products, services and information. Fresh food safety forces governments to assess food processing methods together with controlled supply chain management from processing sites to the marketplace (Carter & Easton, 2011). The following objective is formulated: "to identify the role of decoupling in livestock and fresh meat supply chains and understand related management decisions that can be made to choose appropriate business models."

Supply Chain Management (SCM)

Supply chain management is: "The integral planning, coordination, and control of all logistic business processes and activities in the supply chain to deliver superior customer value at less cost to the supply chain as a whole, while satisfying requirements of other stakeholders (e.g. the government or NGO's) in the wider context of the supply network, cf." (Lambert & Cooper, 2000). Supply chain management results in stating scenario's, i.e., an internally consistent view on how a supply chain should be configured in terms of choice of partners from the total supply chain network, and the way their mutual activities on supply, production, and distribution of goods are coordinated.

Supply chain management strategies facilitate the redesign process and attain joint supply chain objectives (Van der Vorst & Beulens, 2002) consists out of: (1) Redesign the roles and processes performed in the supply chain (e.g. reduce the number of parties involved, reallocate roles such as inventory control, and eliminate non-value-adding activities such as keeping (too much) inventory). (2) Reduce lead times (e.g., implement ICT-systems for information exchange and decision support, increase manufacturing flexibility or reallocate facilities). (3) Create information transparency (e.g., establish an information exchange infrastructure in the supply chain and exchange information on demand/supply/inventory or work-in-process, standardise product coding). (4) Synchronise logistical processes with consumer demand (e.g., increase frequencies, of production and delivery processes, decrease lot sizes). (5) Coordinate and simplify logistical decisions in the supply chain (e.g., coordinate lot sizes, consolidate flows, eliminate human interventions, introduce product standardisation and modularisation).

Mapping and analysing operational, logistics and/or supply chain systems is focussed on getting insight in the following characteristics (Chopra & Meindl, 2013): (1) The position of the company in its competitive business environment; (2) The marketing channels available and the possibilities for the delivery of products (either via direct sales, a wholesaler of a retail channel); (3) The demand patterns of several groups of customers; (4) The characteristics of products, the possibilities of portioning and conditioning (and its related supply network); (5) The organization of the customer order decoupling point (push/pull boundary) [to be discussed later], and the chosen production and processing strategies; (6) The characteristics of supply chain, logistics, and operational processes (including available information systems, automation, capabilities, reliabilities, responsiveness and process infrastructure); (7) The key performance indicators (delivery, lead-time, delivery frequency and accuracy and understanding of the available bottlenecks).

Livestock and fresh meat supply chains

Animal logistics is all about the supply chain from breeding to the final consumption of the processed food by the consumer. In fresh food supply chains more and more attention is given to food quality change modeling and the development of time temperature indicators to individually monitor the temperature, humidity and the presence of contaminations. Environmental conditions may be influenced by, i.e., the type of packaging and the availability of temperature conditioned transportation means and warehouses.

Most fresh meat supply chains consists out of the following directly involved stakeholders (actors): farmers/producers/breeders, slaughterhouse, processors, distributors and retailers, and final customers (hospitality sector and individual). Besides these actors, other stakeholders, the direct environment of the supply chain are: authority bodies, governmental bodies, organisations that check health and hygiene issue, shareholders and inhabitants that live close to facilities.

Van der Vorst et.al. (2005) discusses the role of ICT in supply chains, based on vegetable and animal-based products. They distinguish two main types of Food

Supply Chain Networks (FSCN) as an developed interconnected system with a large variety of complex vertical (along the supply chain by means of forwards and backwards integration) and horizontal relationships (with competitors). In such an cluster-like network innovation is an continuous issue of attention. The two distinguished FSCN's are: (1) FSCN for fresh agricultural products and (2) FSCN's for processed food products.

If the animal and meat industry is seen from this perspective the following two FSCN's can be distinguished: (1) FSCN for living animals (breeders, auctions, wholesalers, importers and exporters, retailers and speciality shops and their inputs and service providers), including the main processes conditioning, protection and transport, and (2) FSCN for processed animals, that is fresh meat products (slaughterhouse, processing company, importers and exporters, retailers, speciality shops, hotels/restaurants/bars and their inputs and service providers). In both types the requirements for specialized conditioned transportation and (temporary) storage are high. For living animals to keep them at the right weight, health and for processed fresh animal products either cooled or frozen.

The inter- and intra-organizational complexity of fresh food supply chains is quite high. Improving the decision making within the companies logistics chain and its operational processes together with aligning the increased information exchange process are relevant issues of supply chain management (Hanf and Dautzenberg, 2006).

Remaining self-life and safe consumption

For understanding of the effectiveness and efficiency of a cold chain realistic temperature conditions in the fresh food supply chain must be available. The effective and efficient management of quality and temperature data is important in perishable food supply chains due to shelf-life conditions (Van der Vorst et al., 2007). To secure a good shelf life conditions and keep the value of the perishable products at the highest level not only a well-functioning cool chain should be in place but also a good infrastructure or temperature registration and transparent information exchange of the location and (temperature) condition of the perishable fresh food product between all relevant supply chain actors, together with a good data-logger system to be able to backtrack relevant data for later use, like analysis and redesign projects.

Temperature measurement and exchange between supply chain partners is not very common. Less than 50% of companies in fresh meat supply chains (e.g. in pork and poultry) exchange quality and temperature data with upstream or downstream partners. Furthermore at several locations in the supply chain the temperature show a large differentiation of temperature due to cooling technologies and the alignment between different cooling systems along the supply chain. There are several temperature monitoring systems, but to implement them successfully other factors must also be considered like organisational structure (distribution length, packaging material and size, etc.), (Raab, et al., 2011).

Shelf life is based on the different temperature of fresh meat in respect to the microbiological growth. Time and temperature are the most important elements of the velocity of decay. Because the last part of the supply chain is the last-mile where the perishable fresh meat product often is transported under for bacteria ideal circumstances and the refrigeration of the product at home or in a restaurant is. At a certain moment the subject to the cooling infrastructure at home certain shelf conditions have to be agreed upon the secure a minimal food safety situation. In all circumstances the customer must be able to buy a fresh product that is consumable at the moment of purchase, after last mile transport and after 1 to 2 days in realistic situations where the fresh food in stored in a refrigerator for consumption. Nevertheless the customer is always responsible to control the condition by his senses prior to consumption. Increasing the self-life of the products means to organize the most effective and efficient supply chains. The longer the self-life the more opportunities for sales are available leading to lower cost of lost sales.

The problem of not knowing what the demand of fresh meat products is or to manipulate the demand is very difficult. This leads to more standardize supply chain where the supply triggers the supply chain and storing products (often frozen products) to minimize the risk of ‘lost sales’. In a supply chain where the customer demands more specific products supply chains are becoming more complex. Below the notion of decoupling in supply chains will be discussed.

The Art of Decoupling

Romme & Hoekstra (1992) reflect on the notion of 'decoupling points' as part of the concept ‘integral control’, the planning and management of the goods flow, from the supply of raw materials and components up to delivery of the final goods to the final customers. For every company there is an interrelation between product-market-combinations, the business or organisational structure and the control system in place. To integrate integral control within a company the following issues should be agreed upon:

1. Objectives (chosen markets, market segments and their requirements, and product range);
2. Characteristics of the market (delivery times, reliability, price and quality), product structure (catalogue, dedicated, volume) or, process (lead times, flexibility);
3. Basic structure of the company (relevant departments and its functions and interrelations);

4. Planning and control (decoupling points, control structures (feedbacks and forecasting), stock points);
5. Logistics organization (responsibility for decisions and coordination of planning and control);
6. Information requirements (related to the above and the relevant infrastructure of information);
7. Procedure and systems (methods, procedures, information systems and automated systems).

The decoupling point facilitates the control of the flow of goods. The decoupling point (DP) separates activities related to 'the part of the organization oriented towards customer orders from activities that are the part of the organization based on forecasting and/or planning' (Romme & Hoekstra, 1992). The customer order penetrates as far as the decoupling point, and from there the goods ordered are supplied to the customer. Generally a decoupling point coincide with a main inventory point. Downstream from (to the right) the decoupling points there are no stocks, while upstream (to the left) there are stocks only this is financially justified. Decoupling points decisions are made as a balancing process between market requirements and the customers' expected service(s) and logistic lead times in production, assembly and distribution. Five decoupling point positions can be identified (understand that some reference models, like the SCOR model distinguished 3 decoupling point positions, that is: Make to Stock, Make to Order, and Engineer to Order), see figure 1.

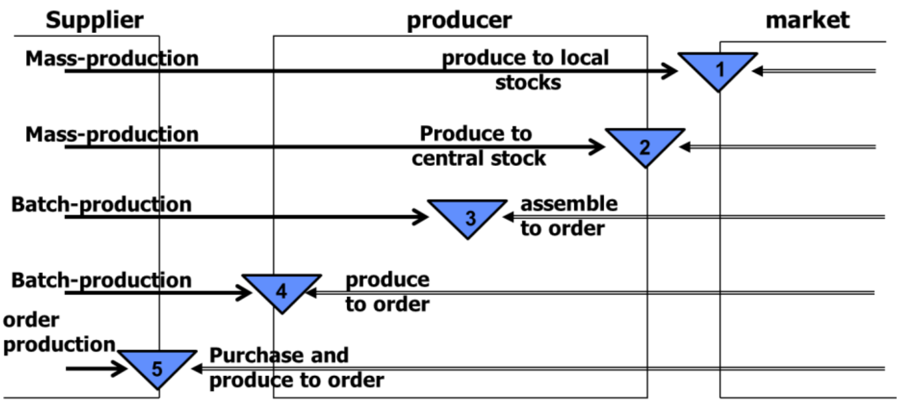

Figure 1: Decoupling point locations, based on (Romme & Hoekstra, 1993).

- Decoupling point 1 (DP 1): 'Make and ship to stock' Products are manufactured and distributed to stock points which are spread out and located close to the customer.

- Decoupling point 2 (DP 2): 'Make to (central) stock' End products are held in stock at the end of the production process and from there are sent directly to many customers who are scattered geographically.
- Decoupling point 3 (DP 3): 'Assembly to order (for one specific customer)' Only system elements or subsystems are held in stock in the manufacturing centre, and the final assembly takes place on the basis of a specific customer order.
- Decoupling point 4 (DP 4): 'Make to order' Only raw materials and components are kept in stock: each order of a customer is a specific project.
- Decoupling point 5 (DP 5): 'Purchase and make to order (for a specific customer)' No stocks are kept at all: purchasing takes place on the basis of the specific customer order; furthermore, the whole project is carried out for the one specific customer.

Push-Pull Supply Chains

Push and pull strategies help companies to organize their supply chain. The basic forms are pull-based supply chains and push-based supply chains. The pull logistics system is based on real customer orders or actual customer demand, while a push logistics system is based on forecasts. The supply chain is a sequence of transformation processes that have an inbound flow and an outbound flow. Each inbound flow is connected to the outbound flow of the transformation process further upstream and each outbound flow is connected to an inbound flow further stream downwards.

Where supply meets demand a push-pull boundary can be located. If the supplier supplies something demanded, the customer pulls the product from the chain. In other cases the customer is unknown and the suppliers has to anticipate on potential demand. The push-pull boundary is the location within an operational, logistics and/or supply chain process where the customer demand meets supply. In the case of an unknown demand the push-pull boundary is often closer to the market (at the retail location) in the case of a known demand, depending on an already finished product or where the design and or components have to be purchased especially the push-pull boundary is often closer at the location of the manufacturer.

In some case hybrid push/pull logistics systems are put in place. The logistics system is operated in a push type manner that uses specific demand models and effective forecasts for the initial period and then in a pull type manner that uses the replenishment level for the remaining period. This makes sense because in the beginning the demand is unclear and if the market has matured to a certain behaviour and demand is predictable or known several stock point can be seen as the customers pull approach filling up an replenishment stock.

Good balanced companies have their decoupling point more upstream than less balanced companies. These companies are able to avoid stocks to far downstream in the supply chain. These companies are by nature more cost driven and geographically specific. The location of the decoupling point is related to the opportunities and risks of a company, within a supply chain.

Push and Pull Strategies in Practise

Often businesses employ a hybrid system combining a push-strategy together with a pull-strategy. Supply chain operational processes are based on the following steps: (1) Determine the availability of raw materials, to investigate where, how and against what prices and conditions they can be acquired. (2) Processing the raw materials in a factory to yield the final products. (3) Distribute the finished product to a storage or distribution facility. (4) Distribute the packaged product to a retail store or ship it directly to the customer.

Analysing the push/pull decisions in this context generally allows the companies to understand how their extended supply chain functions in respect to their business strategy. These type of decisions depends on factors such as the attributes of the product & demand itself. However, understanding the overall supply-chain and analysing the product and demand characteristics within that context does help companies understand their options and even opens new segments in an industry that may not have existed till then.

Deciding where the inventory-order point must be placed is a matter of analysing more than only the supply chain operations. The products, market conditions, demand patterns, competitive and other external market pressures must be understood and analysed to be able to make a decision changing towards another decoupling point. The decision affects the operational costs, response times to fulfil demand, agility (ability to react to changes in demand), as well as flexibility (ability to react to changes in product design or demand locations).

Business Opportunities and Risk in consideration of the decoupling point

Each decoupling point position represents a trade-off between the required delivery and throughput times. When short delivery times are required the company normally shifts the decoupling point downstream. Opportunity and risks are different for each of the five decoupling points. The companies most important risk performance indicator is 'Cost of Lost Sales'. With DP5 the risk is zero. In case of a DP1 the obsolescence risk is high. In this case companies should reduce the investment risks by:

1. Improving the forecast methods;
2. Generally improve forecasts by more effective market research;
3. Improve the product design, by applying modular design in where the forecasting of the modules and/or components becomes more reliable.

The risks in delivery can be reduced by:

1. Reduce lead time for manufacturing and distribution;
2. Improve process control in manufacturing to increase the reliability of lead times;
3. Improve the contracting arrangement with (external) suppliers by co-makership to shorten lead times and time to market;
4. Ensure secondary sourcing opportunities;
5. Improve estimating for costs and lead times.

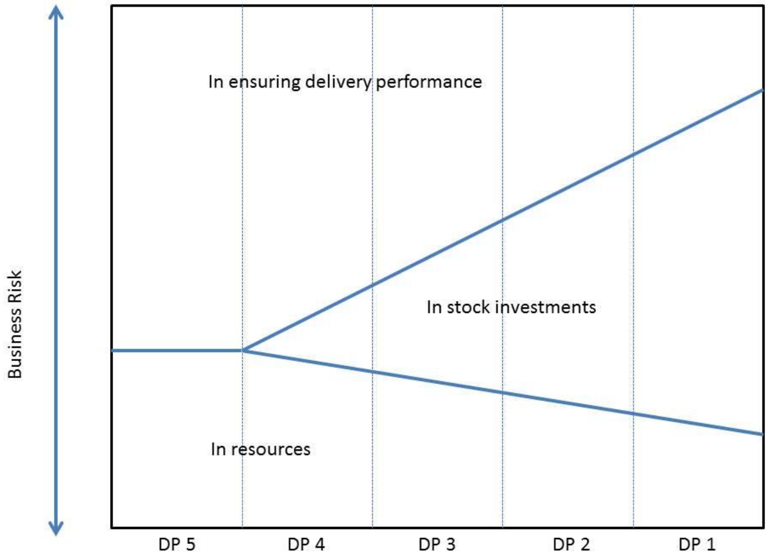

Figure 2: Business risk and decoupling points, based on (Romme & Hoekstra, 1993).

For the majority of products the decoupling point can be moved upstream without large investments and no negative effects on customer service together with considerable reduction in (inventory) costs.

Live-Death Decoupling Livestock & Fresh Meat Supply Chains

Next to the important aspects of supply chain management two types of supply chains and relevant networks have been identified. The FSCN for living animals and the FSCN for processed animals, that is fresh meat products. The decoupling point and the difference between 5 different types of decoupling points and the essence of push-pull boundaries business risks have been described. Theoretical all indicated push-pull boundaries may lead to successful business models for the supply chain of livestock and for the supply chain of fresh meat. Both supply chains can be merge and often are in the real world. Often the slaughterhouse is the decoupling point where the demand for fresh meat by the customer predetermines the demand for livestock send to the slaughterhouse. So each decoupling point position may coincide with the slaughtering of the animal to be processed into fresh meat products. This position will be called the live-death decoupling point. Taking the positions of the 5 decoupling point this leads to the following 5 live-death decoupling points relative to supply partner positions. FSCN for living animals: (1) farmer/breeders, auction/traders, wholesalers, retailers, and customer. FSCN for fresh meat products: (1) slaughterhouse, (2) (3) processing company, (4) wholesaler/trader, (5) retailers, and (6) customer.

The following reference supply chain including actors and decoupling points can identified (note that the original concepts where derived from manufacturing perspective).

- **Supplier (2th tier) -- DP5 -- Supplier (1th tier) -- DP4 -- Manufacturer -- DP3 -- Assembly -- DP2 -- Retail -- DP 1 – Customer**

The following reference supply chain including actors and decoupling points can identified for FSCN for living animals.

- **Fertilizing -- DP5 -- Hatching -- DP4 -- Breeder -- DP3 -- Wholesale -- DP2 -- Retail -- DP 1 – Customer**

The following reference supply chain including actors and decoupling points can identified

For FSCN for fresh meat products.

- **Breeder -- DP5 -- Livestock -- DP4 -- Slaughterhouse -- DP3 -- Processor -- DP2 -- Retail -- DP 1 – Customer**

More in general the following live-death decoupling points (LDDP's) can be identified (note all kinds of hybrid forms could be found theoretical and in real life):

- The LDDP is at the farm/breeder; in this case the farmer/breeder slaughters the animal at the farm and sells the fresh meat products to the wholesaler/trader based on estimates, who will keep an inventory of these products, and waits for a pull order from the retailer.
- The LDDP is at wholesaler/trader; in this case the farmer/breeder sells the animal to a wholesaler/trader that will slaughter the animal and sells (pushes based on estimates) fresh meat products to the retailer, who will keep an inventory of these products, and waits for a pull order from the customer.
- The LDDP is at the inbound site of the retailer; in this case the farmer/breeder sells the animal to the wholesaler/trader that will sell the animal to the retailer that will slaughter the animal and processes based on his estimates and keep an inventory of these products and waits for real customer orders to pull the fresh meat products from the shop.
- The LDDP is at the outbound site of the retailer, in this case the farmer/breeder sells the animal to the wholesaler/trader that will sell the animal to the retailer that will keep an inventory of these products and waits for a real customer order then will slaughter the animal for this specific customer that in this case pulls the slaughtered animal from the shop.
- The LDDP is at the inbound site of the customer. This is the same as above only the customer buys the animal alive and will slaughter it at his home.

To reduce the risk of inventory and lost sales, slaughtering the chicken customer specific at the retail location has the lowest risk, but this is not very practical because every customer has to wait for the processing. More clear is that demand is estimated via historical data, marketing (buying motivation via brochures) and research. By means of a specific pricing policy an ideal mixture of processed and cut products can be produced.

Decoupling and Business Models in Livestock & Fresh Meat Supply Chains;

The last example that is also based on the 5 described decoupling points. In this case five business models will be described each based on a specific decoupling point in the supply chain.

<u>DP 1 Business Model:</u>

- This is the traditional supply chain where for example a whole frozen chicken is sold in the supermarket. This is towards the retail a complete push based supply chain and the customer pulls the frozen chicken from the supermarket.

DP 2 Business Model:

- This is a supply chain where the retailer has chilled chicken, already proportioned in the products that you may find in all or most of the supermarkets at the distribution c.q. processing centre. Based on the demand of the different supermarkets, that may have different demand, depending on the spending potential of the consumers that life close to a specific supermarket, the retailer processes the fresh meat to better supply the independent supermarkets.

DP 3 Business Model:

- This supply chains looks more or less as the one discussed above. But in this case the chicken is kept uncut and is processed after the real order from the individual supermarkets comes in. Also this models is found in traditional butcher shops.

DP 4 Business Model:

- In this supply chain chickens are ordered from the farmer/breeder and instructions are given to process the chicken in such way that it fulfils the anticipated customer demand to the best.

DP 5 Business Model:

- In this supply chain the independent supermarkets orders specific types of chickens to be processed in a dedicated way. Think about chicken of a specific size, meat structure or chickens that are fed specific feed, such a special herbs or additives that will make the meat more specific (as demanded by the supermarket).

Conclusions, Recommendation and Discussion

Handling of perishable fresh food products within supply chains is dedicated and complex. More and more the customers want to decide the type of products he or she wants to buy. Push-based supply chains are not suitable for these changes. The industry has to move more and more towards a pull based logistics approach. Together with this change the information infrastructure has to be improved keeping and monitoring temperature data to secure better shelf-life conditions. The decoupling point has to more upstream to deliver more customer specific products. The vertical alignment of companies in these supply chains has to improve together with an increased transparency to secure in time delivery of more customer specific products. Based on the different positions of the customer order decoupling point several business models are possible. This paper investigates several of these models.

That need to further developed so see if they can lead to feasible business in an industry that makes the transition from a push towards a pull approach.

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Development of Green Concentrate Indigofera in Indonesia

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Introduction

Productivity and profibatility of livestock enterprises is determined by the availability of high-quality and economical feed. The proportion of feed costs in total production costs has tended to increase over the last decade, due to the influence of imported components and the utilization of biomass by other industries. Feed cost increase from 65% to 76% for ruminants, and from 74% to around 80% for poultry and fish. Dominant ingredients such as cereals, grains and agro industrial by products has triggered a rise in the price of rations. A high price of feed concentrates is caused by import ingredients such as soybean meal, fish meal and corn gluten meal. About 2 millions tons of soybean is imported to fulfill national feed demand as much 15 million tonnes (Sudirman. 2014). On the other hand, an important local concentrate ingredient such as palm kernel cake are also not easily obtained by farmers, as it is estimated that more than 1.5 million tons per year is exported with more favorable prices to meet a need of industrial countries. Other concentrate ingredient supply such as rice bran is fluctuating depending on the harvest season, and its quality varies depended on rice varieties and hulling process.

Utilization of agroindustrial waste by non livestock industry is predicted to continue since biorefinery technolgy has proven to convert biomass substrate and produce broadspectrum substances, which is more profitable for industries like pharmaceuticals (drugs and cosmetics) and food sectors. Feed industry will compete with these industries in using high quality ingredients. An alternative ingredients is high quality forage derived from legumes. Use of legumes enables application of organic livestock production systems and may reduce feed cost. Australia developed the area of lamtoro (McSweeney *et al*., 2011) to improve feed quality intake and feeding efficiency. The use of leucaena in Indonesia has been successfully done in Amarasi Nusa Tenggara Timur Province. The results of the study during dry season in Merbun village, West Amarasi sub-district and Oesena village, Amarasi subdistrict, Kupang showed that the use of 72% and 53% lamtoro leaves in rations can result in daily weight gain of bali cattle 0.74 kg/day and 0.76 kg/day, respectively and 0.2-0.26 kg higher than Bali cattle fed with non legume feed in other villages (Lani, 2014).

Utilization of legume feed in Indonesia has been succesful to substitute conventional concentrate ingredients. Tropical legume contains high protein and TDN 20-38% and 65-80%, respectively. Leaves are the best source of nutrients in any legume species. The crude protein content of legume leaves ranges from 21-38% and the stem to the petiole contains crude protein with a range of 14-18%. It is widely known that legume leaves are a high-protein and low-fiber source, but have ideal NDF and ADF contents, especially for ruminants. The legume characteristics enable it to be categorized as sources of nonconventional concentrates, which then called Green Concentrate (GC). GC is a new term that comes with the notion " nutritious single or mixture ingredient with a crude fiber content of less than 18% whose raw material comes from the leaves of feed plants" (Abdullah, 2014). One of the advantages of the GC besides the nutritional content also has a herbal functions for livestock because it contains chlorophyll and secondary compounds that are beneficial to livestock. Most of the ingridient of GC made from from legume feed plants

Development of Green Concentrate Based on Indigofera

Indigofera as Nutrient Source for Green Concentrate

Indigofera has been known since the era of Japanese colonization for the natural dye industry. A total of 64 species of Indigofera were found to contain aliphatic nitro compounds in concentrations of 2 to 12 mg NO_2/g plant (William *et al*., 1981), quite toxic to chicks aged one week. Approximately 20 species have been studied for feed plants such as: *Indigofera zollingeriana*, *Indigofera arrecta, Indigofera tinctoria*, *Indigofera spicata and Indigofera nigritana*. They have been tested in livestock and rats and, do not show histologically abnormalities. The most common active substance in the Indigofera genus is Indospicin, as found in *Indigofera spicata* (Aylward *et al*., 1987) or 3-nitro propionic acid in Indigofera carlessii *and* Indigofera kirilowii (Su *et al*., 2008).

One species of fodder legume that has been developed and utilized by community in Indonesia is *Indigofera zollingeriana*. It is a prospective feed legume plant as a protein source with high total digestible nutrient (Abdullah *et al*., 2012a). Indigofera is selected as a source of GC, because of its quality and palatability. It grows and regrows rapidly with cutting intervals about 40 days, is strongly adaptable to drought and produces high edible biomass compared to other legumes. The nutritional content of *I. zollingeriana* are depicted in Table 1. Value of essential amino acid index of Indigofera leaves was 21.45%, compared to those of soybean meal (36.34%) (Palupi *et al*., 2014).

Tabel 1. Nutrient content of leaf and edible part of *Indigofera zollingeriana*

Nutrient content	Value
Dry matter (%)	88.11 ± 2.7
Ash (%)	6,14 ± 1.45
Crude fat (%)	3.62 ± 0.23
Crud protein (%)	29.16 ± 2.37
Crude fiber (%)	14.02 ± 2.48
NDF (%)	47- 61
ADF (%)	21- 39
TDN (%)	75-78
Celulosa (%)	11-16
Lignin (%)	2.4-4.6
Ca (%)	1.78 – 2.04
P(%)	0.34 – 0.46
K (%)	1.46 – 4.21
Mg (%)	0.32 - 0.51
Vitamin A (IU/100mg)	5054
Vitamin D (mg/100g)	34.7
Vitamin E (mg/100g)	13.32
IVDMD in goat rumen (%)	78 – 82
IVOMD in goat rement (%)	77 – 80
Protein digestibility (%)	82.3 – 86.3
Ruminal Undegradable Protein (%)*	11.65 ± 0.12
Ruminal Degradable Protein (%)*	9.79 ± 0.54
Tannin (%)	0.03 – 0.14
Saponine (%)	2.24 – 4.20

*Sumber : (Abdullah et al.,2010); * Andi Tarigan et al., 2018*

Agronomical characteristics of Indigofera zollingeriana

Indigofera zollingeriana (Indigofera) is productive herbaceouse legumes that produce as much as 36 t DM /ha/year. The forage contains high protein (22-24%), depended on proportion of leaf and edible twigs. Higher cuts up to 1.5 m above ground reported by Andi *et al* (2010) showed more forage production than those of shorter cuts, but forage quality is lower. The production and quality of forage is influenced by composition of young- and old leaf of Indigofera plant. Change in the proportion of young- and old leaves occurred over the different cutting interval. Change in cutting interval from 38 days to 88 days increased the proportion of old leaves from 58.4% to 75.3% and decreased the proportion of young leaves from 41.6% to 24.7% (Abdullah, 2010). However, increasing cutting interval promoted forage production from 2.7 tons kg DM/ha/harvest to 5.4 kg DM/ha/harvest. Change leaf proportion led to alter total forage quality, indicated by decreasing protein content from 27-31% to 25%-27%, decreased dry matter digestibility from 74.52%

to 67.39% and decrease in organic matter digestibility from 73.79% to 69.63% (Abdullah and Suharlina, 2010). Propagation of Indigofera plant is more effective with seeds, resulting more twigs and leaves production. A physiological mature seeds color are dark brown and black. Germination of the seed has been improved up to 89% by soaking them in water with temperature 40^{o}C. Water content of the seed at 8-9% might conserve dormancy of the seed for 2 months (Girsang, 2012), but needs efferts to stimulate seed germination.

Ecophysiological studies showed that *I zollingeriana* is tolerant of drought stress. The ability of *I. zollingeriana* to drought stress is indicated by leaf potential water values up to - 7.9 mPa (Sowmen, 2013). The value denoted very low water content in leaf cells of growing plants, indicating high ability of the plant to adapt various extreme drought conditions. Other field experiment reported edible production decreases up to 33.96% as the plant grown on the soil with only 25% of the field capacity, but this plant still produced canopy, and recovered when the plants were going to be watered (Herdiawan *et al*., 2012). Indigofera proved highly interactive with Mychorriza in terms of nutrient transfer from *Setaria italica* planted simultaneously in intercropping pattern to maintain forage production (Dianita, 2012). Indigofera was also reported had capability to maintain soil N, P and C content, as well as increasing the population of solublelizing-phosphate bacteria in the rhizosphere (Suharlina and Abdullah, 2012). Improvement of Indigofera productivity has been conducted by innoculation of indiginous rhizobia. *Bradyrhizobium sp.* P8 828, *Bradyrhizobium sp.* PZS_A08, and *Roseomonas sp*. CMS4Y-2-2 significantly increased shoot production of Indigofera plant. Subsequent experiment showed significant increased in dry matter content when plants were innoculated with *Bradyrhizobium sp*. PZS_A08 at 105 cfu/mL. Inoculation with *Bradyrhizobium sp*. PZS_A08 and *Roseomonas sp*. CMS4Y-2-2 at 107 cfu/mL resulted in higher crude protein contents, which were better than the application of nitrogen fertilizer. Inoculation treatment with *Bradyrhizobium sp*. P8 828 at 105 cfu/mL was the most effective in improving methionine content (Hutapea *et al*., 2018). Aplication of Indigo-Fertilizer, a foliar fertilizer for Indigofera produced at our laboratory, at 50 ppm directly to leaf surface increased total amino acid content of the leaf 1,31% to 1,65% or increade about 25,47% (Abdullah dan Kumalasari, 2012).

Use of Green Concentrate Indigofera in Animal Feed

Green concentrate was used in dairy goat ration in Cikarawang and Cijeruk Bogor, and dairy cattle ration in Lembang Bandung. Feeding dairy goats with GC Indigofera at 40-80% in ration increased milk production of 14-28% and improve milk production persistence prior to dry period (Abdullah *et al*., 2012b). Milk production (a month prior to the dry period) of Saanen and Peranakan Etawah (PE) yielded higher (100 and 70%, respectively) than goat milk fed commercial ration without BC indigofera (Fig. 1). Feeding meat goat (Boerka) with GC in iso protein and energy ration up to 90% resulted in similar *in vivo* dry matter digestibility (77.60% vs 77.76%), *in vivo* organic matter digestibility (63.43% vs 68.52%), *in vivo* crude protein digestibility (82.2% vs 83.5%) with ration containing 63% conventional concentrate. Use more GC Indigofera led to reduce blood- and meat cholesterol content of the goats up to 1.5 times and 16% respectively (Andi Tarigan *et al*., 2018).

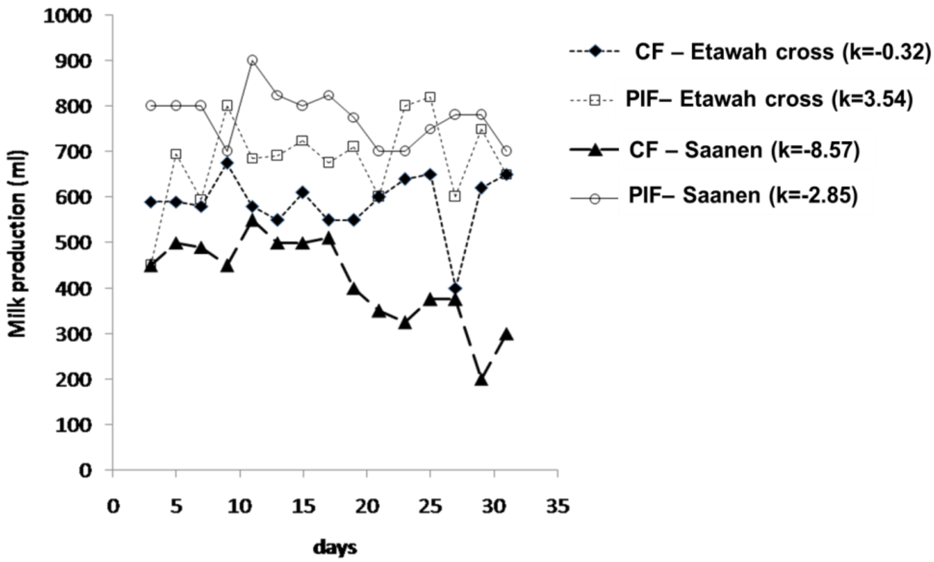

Fig 1. Milk roduction of dairy goats fed by green concentrate Indigofera CF = 40% comercial concentrate + 60% napier grass, CIF = 40% green concentrate Indigofera + 60% napier grass

Feeding sheep with green concentrate indigofera up to 30% in ration led to lower feed intake (667 ± 86 g/ head/day) compared with ration containing 30% of bean sprouts (914 ± 175 g / head / day), but protein digestibility of ration with green concentrat was relatively higher than those of ration with sprouts (73% vs 71%). The average weight gain of sheep fed with 30% BC was 118 -151 g / head / day higher 17,59% than control and increade efficiency of protein use in meat 5,18% (Dewiyana, 2012). The economic calculations were made to evaluate profitability of GC compared to commercial feed. Producing one liter of milk of goat fed with 40% GC Indigofera saved about 55% feed cost (Fig 2). Efficiency of protein utilization for of milk protein sinthesis has been tested. Rations containing GC were 30% higher in protein utilization efficiency (6.5%) than controls (5%) (Abdullah *et al*., 2013). As much as 60-80% of GC indigofera fed to dairy cows in Lembang increased milk production and improve milk production persistence (Fig 3).

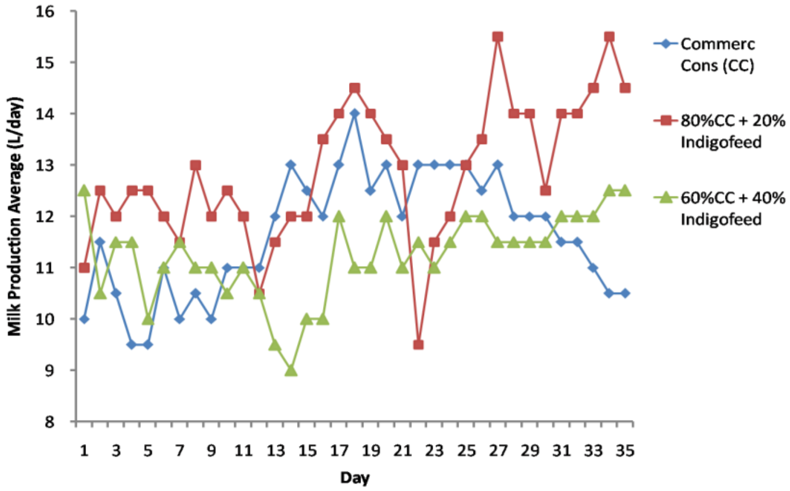

Fig 2. Effect of green concentrate Indigofera (Indigofeed) on milk production

Effect of GC indigofera utilization in goat ration on ruminal microbes populations and methane gas production was tested (Suharlina *et al*., 2016). The results showed that rations containing GC Indigofera up to 40% increased rumen bacterial population and suppress protozoa populations, and are able to suppress methane gas production from 18.2 %(v/v) to 15.2 %v/v compared to rations containing soybean meal. Another study on GC utilization in rabbit ration was conducted to evaluate an effect of feed on sperm quality (Marina, 2012). The rabbit fed with indigofera up to 30% in ration (iso protein & energy) produced better quality of sperm than the rabbit fed with control feed. Spermatozoa motility of rabit fed with 30% GC indigofera increased 6 times than rabbit sperm motility consumed commercial ration. Sperm vigority increase up to 20% and the spermatozoa abnormality decreased rate by 5% by feeding rabit at 30% of GC. Feeding rabit with indigofera at 30% in ration resulted in 47% lower cholesterol content in rabbit meat (Nofisa, 2012). Income over feed cost (IOFC) of rabbit ration containing GC Indigofera 30% was Rp. 9003, higher than those of commercial ration Rp. 1616.

GC indigofera up to 15% was applied in layer ration (Palupi *et al*., 2014). Use of GC indigofera on the level resulted in higher hen day production, higher yolk color score, 46% higher β-caroten content of the yolk and 41% lower cholesterol content in the yolk (Table 2.). Application of GC Indigofera in grasscarp ration imrpved fertility of the fish, by increasing size of fish Gonad (Mulyaningsih, 2015).

Table 2. Production and quality of egg produced from layer fed with green concentrate Indigofera in iso protein and energy ration

	Indigofera content in ration (%)*			
	0*	5	10	15
Hen day production (%)	83,63 a	93,05 b	91,36 b	92,65 b
Fresh egg weight (g/egg)	43,00	51,90	49,50	49,60
Yolk color	8,50 a	11,50 b	12,15 b	13,25 c
B-caroten of yolk (mg/100g)	56,7 a	85,9 b	109,5 c	124,0 d
Vitamin A of yolk (mg/100g)	2297 a	2536 b	2776 c	3380 d
Egg cholesterol (mg/kuning telur)	375 d	280 c	220 b	172 a
Feed conversion	2.23	2.08	2.20	2.19

source: Palupi et al., 2014.

Green Concentrate Business Development

GC indigofera is as a profitable product. Cost of good production ranges Rp. 1.989 - 2.372/kg. Accepted price in market ranges Rp. 2.800 – 4.000/kg depending on its quality. GC prices are quite economical since the protein content reached 26-31%, which means the price of protein between IDR 133 - 153 per 1% protein is comparable to the price of soy bean meal protein around Rp. 145 per 1% protein. Economical scale of GC production in farmer level is about 2.5 ton/day, which equivalent to total minimum area of Indigofera arround 40 ha with harvesting interval each 40 days.

GC is sold in the form of flour and pellets and used currently by farmers in Java, Sumatra and parts of South Sulawesi. In 2014 GC has been introduced to farmer community, and adopted in 39 region. Market scan conducted in 2014 revealed high GC demand in feedlot industry, goat and dairy farming that reach 10 thousand tons per month. This number is expected to increase since GC becomes more recognized by farmers and feedmill industry. In the development of GC business, in 2018 four companies have been established to produce GC to meet feed requirements in West Java and Central Java. Total production of GC Indigofera from these companies has not met market needs, yet. It contributes only 2 % of farmers demand.

The GC industry model seems to be designed like a palm oil industry model, with a partnership pattern between investors and farmers. Slightly different from the palm oil industry model, GC industry development involves third party landowners such as Perhutani and PTPN. The business model is still in the stage of initiation and socialization to farmers and related stakeholders. But it has been showing many progress in some areas in West Java and Central Java in term of participation of several farmer groups, cooperatives and middle-scale entrerprises. GC Indigofera development is depended on availability of forage material. For this reason development of Indigofera plantation area are widely established in 39 regions in Indonesia, and this led to increase Indigofera supply significantly within last 3 years. The next step of GC development is establishment of seed production and seedling, sertification of GC plant species and its seeds, expansion of cultivation area, business entity establishment and application of information technology in row material supply and marketing.

The main constraint in GC's business development are the limited availability of Indigofera seeds and seedlings and the manual and inefficient harvesting system, and expensive equipment investment for GC processing. Efforts made to improve the efficiency of Indigofera production include design and manufacture of Indigofera harvesting tools and research to obtain efficient processing methods.

Conclusions

Legum is a highly nutritious feed that can be used as a major ingridient of GC. Indigofera is one of the legume species already used as a GC material and is adopted by farmers and industry. Technically and economically GCs have a positive impact on livestock and poultry productivity and may reduced feed costs. Efficient production systems still need to be developed through research collaboration with industry. Development of green concentrat business in Indonesia is done with multi stakeholder partnership.

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Livestock and Greenhouse Gas Emission: Bilateral Impact and Prophylactic Modulation

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Abstract

The prophylactic effects of probiotics, prebiotics and miscellaneous to mitigate rumen methanogenesis have been developed instead of antibiotics ionophores such as monensin, lasalocid. Nitrate suppresses rumen methanogenesis by its reducing reaction in the rumen. However, excess intake of nitrate causes the intoxication due to ruminal accumulation of nitrite, which induces methaemoglobinemia after prompt absorption *via* rumen mucosa. The *in vitro* and *in vivo* trials have been conducted to clarify the prophylactic effects of L-cysteine, some strains of lactic acid bacteria and yeast and/or β1-4 galacto-oligosaccharides on nitrate-nitrite intoxication and methanogenesis. For prebiotics, the nisin which is a bacteriocin produced by *Lactococcus lactis subsp. lactis* has been demonstrated to abate rumen methanogenesis in the same manner of monensin. A protein resistant anti-microbes (PRA) has been isolated from *Lactobacillus plantarum* as a manipulator to mitigate rumen methanogenesis. Hydrogen peroxide was identified as a part of the manipulating effect of PRA to rumen methanogenesis. The suppressing effects of secondary metabolites from plants such as saponin and tannin on rumen methanogenesis have been examined. Especially, *Yucca schidigera* extract, sarsaponin (steroidal glycosides) can suppress rumen methanogenesis improving protein utilization efficiency. The mechanism for accreditation of manipulators must be established to mitigate global CH_4 emission.

Biogas plant has been widely spread over the world as one of the renewable energies generated from anaerobic CH_4 fermentation of bio-wastes recycling such as livestock manures. Furthermore, in advanced new biogas system, the ammonia stripping from digested slurry of livestock manure in biogas plant was examined to apply to nitrogen recycling-options mitigating N_2O emission.

In an attempt to seek the mitigation option of heat stress in lactating dairy cow exposed to hot environment, mitigating effect of rumen mechanical stimulating brush (Rumenfibe) was examined in pasture-based lactating cows in Australian spring and summer inspecting plasm parameters as oxidative stress markers. Consequently, relatively higher value of biological antioxidant potential (BAP) in Rumenfibe administered cows.

Keywords: methane, nitrous oxide, probiotics, GHG, biogas plant, heat stress

Introduction

The mitigation of anthropogenic four GHG, CO_2, CH_4, N_2O and sulphur hexafluoride (SF_6) and two groups of GHG, hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) have been established as legally binding the first commitment (2008-2012) in The Kyoto Protocol (IPCC, 1996). In the second commitment period (2013-2020) nitrogen trifluodide (NF_3) was added to six GHG. Paris climate agreement based on pledge and review system was adopted at COP21 of the UNFCCC in 2016 as a global treaty instead of Kyoto Protocol. Important GHG attributable to animal agriculture are CH_4 and N_2O. Rumen fermentation of ruminant livestock and anaerobic fermentation of agricultural organic wastes including animal manures are major contributors of CH_4 emission as anthropogenic sources (Moss, 1993).

To abate the GHG, the development of mitigation methods of rumen CH_4 is the most significant issue in the world ruminant livestock production. The prompt increase of atmospheric N_2O since last century is closely related to abrupt expansion of human and animal population after an innovation of Haber-Bosch process. Severe environmental pollutions were caused at the same time though the reactive nitrogen withdrawn from atmosphere as stable paired nitrogen brought about prosperous food production. To secure food production preventing environmental catalyses by global warming sustainable development of animal agriculture should be sought in not only developed but also developing and emerging countries as an alternative way. Inventories of emitters and their abatements should be accurately assessed in both GHG. The key element of these recycling must be low-input for sustainable animal agriculture. Carbon and nitrogen recycling in the agricultural biomass as alternative feeds, renewable energy and nitrogen resources might contribute mitigation of CH_4 and N_2O (Takahashi, et al., 2003; Takahashi, 2014). The mechanism for accreditation of manipulators must be established to mitigate global CH_4 and N_2O emission.

Recent climate change has amplified a risk to expose dairy cattle to hot environment (Nidumolu et al., 2014). In consequence, milk production and reproductive proficiency of dairy cows suffer from heat stress due to their strong stress sensitivity (West, 2003). Heat stress might induce oxidative stress on the animals as an external inducer (Bernabucci, et al., 2002). To alleviate these stresses on livestock the establishment of mitigation strategies of GHG is an urgent issue, effect of climate change induced by GHG emission on stress corrosion.

The present paper deals with perspective on bilateral impact between livestock and GHG emission and their mitigation options with biotechnological and physical approaches.

Possible control of indirect action of prebiotics, probiotics secondly metabolites on rumen methanogenesis

The stoichiometric balance of VFA, CO_2 and CH_4 indicates that acetate and butyrate promote CH_4 production whereas propionate formation conserves H_2, thereby reducing CH_4 production. Therefore, a strategy to mitigate ruminal CH_4 emission in direct manner is to promote alternative metabolic pathway to dispose of the reducing power, competing with methanogenesis for H_2 uptake. Rumen manipulation with ionophores such as monensin has been reported to abate rumen methanogenesis (Mwenya *et al*., 2005). However, there is an increasing interest in exploiting plant secondary metabolites such as saponin and tannin, prebiotics and probiotics as natural feed additives to solve problems in animal nutrition and livestock production as alternatives of the antibiotics due to concerns about incidences of resistant bacteria and environmental pollution by the excreted active-antibacterial substances (Mwenya *et al*., 2006). Particular interest concerning bacteriocins which produced by lactic acid bacteria has increased recently. Table 1 shows supplementing β1-4 galactooligosaccharides, *Yucca Schidigera* and nisin on methanogenesis, nitrogen and energy metabolism in sheep. *In vivo* trial using sheep as an experimental animal, *Yucca schidigera* rich in sarsaponin which was a plant steroidal saponin significantly could reduce 7% and nisin mitigated 10% rumen methane emission. Consequently, nisin improved 24% feed energy efficiency, whereas there was no improving effect of *Yucca schidigera* on feed energy efficiency. Bacteriocins, antimicrobial proteinaceous polymeric material substances, are ubiquitous in nature being produced by a variety of Gram-negative and Gram-positive bacteria, and typically narrow spectrum antibacterial substances under the control of plasmid. Nisin is produced by *Lactococcus lactis* ssp. *lactis* which is an amphiphilic peptide composed by 34 amino acids with two structural domains that are connected by a flexible hinge, and is classified into the group of lantibiotics. Nisin has a mode of action similar to ionophores, which show antimicrobial activity against a broad spectrum of Gram-positive bacteria and is widely used in the food industry as a safe and natural preservative. It is generally recognized as safe (GRAS) and given international acceptance in 1969 by the joint Food and Agriculture Organization/World Health Organization (FAO/WHO) Expert Committee on Food Additives. Recent works have indicated that *Lactococcus lactis* subsp. *lactis* produce nisin Z, which has been identified from Korean traditional fermented food “Kimchi” besides nisin A. They have similar antibacterial ability to mitigate methane emission (Santoso *et al*., 2004; Sar *et al*., 2006), to inhibit growth both of *Clostridium amoniphilum*, which is obligate amino-acid fermenting bacteria and lactic acid-producing ruminal Staphylococci and Enterococci. *Leuconostoc mesenteroides* ssp. *mesenteroides, Leuconostoc lactis* and *Lactococcus lactis* ssp. *lactis* were isolated from “Laban” which was a traditional fermented milk product in Yemen and determined the mitigating effect on in vitro rumen methane production. These strains isolated from Laban enhanced propionate production and decreased acetate/propionate ratio. In consequence, they reduced methane production remarkably. For *Leuconostoc mesenteroides* ssp. *mesenteroides,* in particular, the mitigating effect was amplified with □1-4 galactooligosaccharides, which was degradable about 80% within 1 hour incubation in the artificial rumen fluid due to the stimulation of reduction reactions consuming metabolic hydrogen. However, direct involvement of bacteriocin or lower molecular substances produced by the strain on rumen methanogenesis remains to be elucidated.

Table 1. Effects of supplementing β1-4 galactooligosaccharides, *Yucca Schidigera* and nisin on methanogenesis, nitrogen and energy metabolism in sheep

	Treatments				
Item	CTL	GOS	YS	NS	SE
Energy balance (kcal $BW^{-0.75}day^{-1}$)					
Gross energy intake	233.4	241.9^{a}	234.2^{b}	236.1	1.24
Fecal energy	67.4	73.3	70.6	74.1	2.58
Digestible energy	166.0	168.6	163.6	162.0	2.36
Urinary energy	13.3	14.2	12.7	14.1	0.76
CH_4 energy	16.9^{a}	16.6^{ab}	15.7^{bc}	15.2^{c}	0.28
Metabolizable energy	135.9	137.9	135.2	132.8	1.76
Heat production	120.4	120.1	119.8	113.4	2.96
Retained energy	15.5	17.8	15.4	19.4	3.73
Energy partition (% of GE intake)					
Fecal energy	28.9	30.3	30.2	31.4	1.03
Urinary energy	5.7	5.9	5.4	6.0	0.32
CH_4 energy	7.2^{p}	6.8^{pq}	6.7^{q}	6.4^{q}	0.09
Heat production	51.6	49.6	51.1	48.0	1.32
Retained energy	6.6	7.4	6.6	8.2	0.66

Adapted from Takahashi and Santoso (2010);
^{a,b,c} $P<0.05$, ^{p,q} $P<0.01$;
CTL: control, GOS: b1-4 galactooligosaccharides, YS: *Yucca schidigera*, NS: nisin

Abatement of rumen methanogenesis by direct action of lactic acid bacteria as prebiotics producer

For low molecular compounds, small amounts of volatile fatty acids (acetic acid, formic acid), hydrogen peroxide, β-hydroxy-propionaldehyde (reuterin) are produced by lactic acid bacteria as antibacterial substances in addition to lactic acid. Because lactic acid bacteria themselves don't have a group of catalase, considerable amount of hydrogen peroxide accumulates in the bacterial cells. Many strains of the genus *Lactobacillus* are commonly referred to as having high ability to produce hydrogen peroxide. Its antimicrobial activity is effective against numerous Gram-positive bacteria. Although it has been reported that nisin suppress rumen methanogenesis, the suppressing efficacy of nisin on rumen methanogenesis may not be sustained, because proteinaceous nisin is degradable in the rumen due to bacterial protease. One of protease-resistant antimicrobial substances (PRA) has been identified from *Lactobacillus plantarum* isolated from tomato as a direct suppressor of rumen methanogens (Asa, et al., 2010; O'Brien, et al., 2913). The PRA maintained their antimicrobial effects after incubation with proteases, while nisin lost its activity. Therefore, the PRA was hypothesized to be a more sustained agent than nisin for the mitigation of rumen methane emission. Although *Lactobacillus plantarum* produces bacteriocin from many plant foods, the PRA was the antibacterial substance produced from a strain of *Lactobacillus plantarum* TUA1490L that was isolated from tomato in Japan. However, methane suppressing activity of PRA was not inactivated by protease treatment. Moreover, aeration cultivation is an essential process for activation of PRA to abate methanogenesis. Therefore, possible mechanism of PRA produced by *Lactobacillus plantarum* TUA1490L on rumen methane production might be assumed as resulting from the direct involvement of low molecule substance such as hydrogen peroxide due to the requirement of aeration for the preparation (Takahashi, 2013).

Creation of renewable energy from anaerobic fermentation (biogas plant) of animal manures and the innovative reuse of the digested slurry to mitigate N_2O

The increased emissions of CH_4 and N_2O from decomposing unmanaged and bio-based industrial wastes including livestock wastes along with the expansion of human activities contribute to climate change as GHG. The biogas plant produce biogas including combustible CH_4 as renewable energy using unused resources like animal manures, can provide fuel, heat and electricity (Umetsu et al., 2005), and minimize the impact on the environment thus reducing the amount of pollutants discharged.

Global warming potential of N_2O is 298 in the second commitment period in Kyoto protocol. To mitigate N_2O emission, the ammonia stripping from digested slurry of animal manure in new concept of the advanced biogas plant was implemented to apply to nitrogen recycling-options (Takahashi, 2017).

Bilateral impact of GHG derived from livestock production and climate change induced by GHG emission-Heat stress and oxidative stress induced by hot environment and the mitigation option

Global warming, especially, critical or subcritical hot summer attributable to the abrupt increase in GHG emission has adversely affected the performances of livestock productivities due to the susceptibility to heat stress. According to Daramola's commentary (2012), heat stress results from the animal's inability to dissipate sufficient heat to maintain homeothermy. High ambient temperature, relative humidity and radiant energy compromise the ability of animals to dissipate heat. Consequently, body temperature will increase, and in turn initiates compensatory and adaptive mechanisms to re-establish homeothermy and homeostasis. Heat stress could adversely affect feed consumption, then animal production and reproduction efficiencies. However, the physiological mechanism of the effect of heat stress on the decline of production performance of livestock remain to be elucidated. Relationship between heat stress and oxidative stress has been reported in the various livestock species including poultry. Heat stress suffered hen has induced oxidative stress (Lin et al., 2008). Swine exposed hot environment has accelerated oxidative stress (Katsumata et al., 2004). Moreover, for primiparous cow exposed hot environment, oxidative stress markers, ascorbic acid and sulfhydryl (SH) residue concentration in plasma have declined due to oxidative stress (Tanaka et al., 2007). Thus, oxidative stress can be assumed as part of the heat stress. Therefore, the mitigation of heat stress might be achieved by the abatement of oxidative stress.

Table 2. Effect of Rumenfibe on the oxidative markers in the plasma of pasture-based lactating cows in the Australian (Tasmania) spring and summer

Parameter	Control	Rumenfibe
Reactive oxygen metabolites (Carrelli units)	107 ± 6	118 ± 6
Biological antioxidant potentials (mM)	4282 ± 92	4686* ± 100
Oxidative stress index (arbitrary unites)	2.5 ± 0.13	2.5 ± 0.14
Ceruloplasmin (g/L)	0.17 ± 0.01	0.19 ± 0.01
Thiol group (mM)	326 ± 15	347 ± 16
Glutathione (mM)	3.4 ± 0.17	3.6 ± 0.19
Advanced oxidative products (mM Chloramine, T equivalent)	36 ± 0.9	37 ± 0.9

Adapted from Golder *et al*. (2017)

* P<0.05

Accordingly, mitigating effect of rumen mechanical stimulating brush (Rumenfibe, Meiwa Sangyo, Kyoto) on oxidative stress in pasture-based lactating dairy cow has been investigated in the Australian spring and summer (Table 2). Plasma contents of oxidative stress markers (Golder, et al., 2016). Only biological antioxidant potential (BAP) concentration in Rumenfibe treated cows was significantly (P<0.05) higher than that of control. Furthermore, the relatively higher values in plasma BAP concentrations were determined even in control cows than those reported in dairy cows (Celi and Raadsma, 2010; Golder et al., 2013; Talukder et al., 2014). However, no any significant improvements of productive performance and rumen parameters were observed by Rumenfibe administration, because the meteorological measurement suggested inadequate hot-environmental temperature and temperature-humidity index to induce heat stress due to the cool summer. T, the increased plasma biological antioxidant potentials (BAP) concentration in Rumenfibe treated cows may support the hypothesis that oxidative balance induced by heat stress under hot and humid environment will be improved by Rumenfibe administration.

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Genetic Marker of Indonesian Local Livestock

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Abstract

Livestock is a very valuable asset for the development of national agriculture. Livestock subsector greatly contributes to the income value of national agricultural development as well as become an important foundation in building food self-reliance. Indonesia has a wealth of genetic resources of native and local livestock with abundant genetic diversity, but has not been managed and utilized properly. The purpose of this paper is to discuss the use of markers of functional genes to improve the productivity and quality of local livestock products. Based on national meat production data from Livestock and Animal Health Statistics (2017), the contribution of local cattle, buffalo, goat, sheep and pork respectively is 15.9%, 0.98%, 2.09% 1.64% 10.29%. Contribution from local chicken/native chicken 8.86%, duck, 1.29%, layer 3.41% and largest from broiler 55.26%. Egg production is dominated by 72.48% layer, 14.65% duck and 10.01% local chicken. Limitations of superior indigenous breed and local livestock is one of the factors that led to the development of livestock agribusiness in Indonesia. Biotechnology of molecular genetics as a form of modern biotechnology that continues to experience rapid development can serve as an alternative to genetic improvement, utilization, and conservation of native and local livestock in sustainable livestock production systems. Molecular technology can be utilized to explore genetic diversity at DNA levels, gene mapping, MAS (marker assisted selection), gene assisted selection, and molecular-based conservation. When appropriately applied, this technology can be an effective way of managing, genetic improvement, and livestock conservation. Priority needs to be considered in applying this molecular biotechnology, based on convenience, performance, time, cost, and impact factors. The development of SNP (single nucleotide polymorphism) markers using high capacity techniques opens further opportunities to label livestock in single assay to identify hundreds of thousands of SNPs that provide adequate genomic information for use in estimating breeding values. Genomic selection is based on the principle of associating many genetic markers with phenotypic look. The availability of large databases of animals that are genotyped with relevant phenotypes related to existing production systems is of great importance to provide accurate results. Thus the reference population can be digenotype with high capacity SNP panels and precise genomic predicting algorithms. If developed countries can do the development and application of biotechnology for genetic improvement of the quantitative nature of many species, on the contrary many of the complexity of the problems facing developing countries to be able to integrate various forms of molecular biotechnology for genetic improvement of livestock. The use of MAS techniques to assist in the

selection of quantitative traits in livestock is limited and new to the study and research area. The national livestock business is a series of livestock activities determined by many factors. Genetic resources of native and local livestock with high levels of genetic diversity have a strategic role as a genetic material source to meet the availability of quality seeds to meet the needs of the animal food community and market demand.

Keywords: Markers genes, ainmal genetic resource and selection

Introduction

In providing high livestock products, livestock business becomes an opportunity to improve the welfare of many poor people by making livestock as a livelihood. Similarly, it will encourage increased demand in the labor sector, less fertile land use, non-agricultural goods and services, thereby boosting overall economic growth. On the other hand, more complex issues will be faced in livestock management, such as erosion of animal genetic resources (AnGR), land degradation, depletion of natural resources, environmental pollution, water shortages, global warming, and the emergence of more infectious diseases. This is a new challenge in developing sustainable livestock production systems and in achieving animal food security especially in developing countries (FAO 2007, 2009. The rapid growth of population, increased purchasing power, the improving economic and social conditions of society, bring the consequences of the need for animal protein with ever greater quantity, quality and variety. In fulfilling the requirement of animal protein of society, the import of meat, egg, and milk still have to be done, due to limited production in the country. The importation is done in the form of live cattle, such as beef cattle, broiler seeds for broiler and laying or livestock products such as frozen meat and powdered milk. The policy of importation with an increasing tendency, bringing the consequences of national food availability stability becomes vulnerable due to dependence on outsiders. These conditions can become a threat in realizing national food self-sufficiency.

Molecular genetic biotechnology opens opportunities to serve as a way for genetic, genetic management, and conservation of native and local livestock to build sustainable livestock production systems. Molecular technology can be used, among others, to explore genetic diversity at the DNA stage, gene mapping, marker assisted selection, gene assisted selection, and molecular-based conservation. When appropriately applied, this technology can be an effective way of managing, genetic improvement, and livestock conservation. The integration of molecular biotechnology in an appropriate selection program will increase productivity, adaptation to the environment, and maintain genetic diversity of native and local livestock (Naqvi 2007). Priority needs to be considered in applying this molecular biotechnology in the order that it may be possible on the basis of convenience, performance, time, cost, and impact factors.

Genetic Diversity and Breed of Livestock

The existence of genetic resources of indigenous and local livestock (SDGT) is a national germplasm that provides abundant genetic diversity, including species, breed and livestock populations. The livestock genetic resources live on a wide variety of agroecosystems in Indonesia, making it a very valuable gene pool for genetic improvement of national livestock. The natural interaction process between livestock with specific agroecosystems, making native and local livestock have many advantages, such as adaptive in tough environments, good converters for high fiber forages, disease-resistant and local parasites, and resistant to wet tropical climate stress. The tropical cattle have unique characteristics and many advantages, such as unique production characteristics, adaptive low input production systems, low cost-per-unit production, low-fat meat, wide genetic diversity, heat tolerance and local diseases, potential for biopharmaceutical development, production systems, local conditions integration, and potential to integrate knowledge areas and industrial areas (Madan 2005). Therefore, it is essential to be able to identify the existence of various local and local livestock species. In developed countries, identification of breeds or clumps of livestock is relatively clear.

To develop a sustainable livestock production system under specific agro-ecosystem conditions, genetic improvements of locally adapted clumps are necessary. However, in conditions in developing countries it is very often found the fact that the recognition of a clump by farmers and the community, has not guaranteed that there has been a difference until the genetic makeup of the livestock. In conditions in developing countries, as in Indonesia, formal breeding organizations are virtually non-existent or if there is not yet functioning as expected. The establishment of livestock can therefore be considered as an isolated population due to geographical, ecological, social, and cultural factors (FAO 2003). Geographical, ecological, social, and cultural information is also often used in establishing livestock breed and strains in Indonesia. To provide certainty in recognition that a livestock population as a breed, then under conditions of limited origin and relevant supporting information, so that the uniqueness of genetic characters can be done with the help of molecular biotechnology. Biotechnology of molecular genetics opens great opportunities for verifying genetic diversity at levels. Characterization through the use of molecular technology provides an opportunity to gain a better understanding of genetic variation, increase genetic variability, genetic improvement, and genetic conservation to DNA polymorphism levels between and within species, clumps, and livestock populations. The genetic variation of each individual has a series of DNAs with unique characters, except for identical twins. DNA variation occurs due to mutations that include substitution, insertion, or deletion at various sizes of DNA fragments, ranging from one to thousands of nucleotides.

There are many molecular markers that can be used for genetic characterization, among others: Microsatellite, Minisatelit, Mitochondria, and Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP), Amplified Fragment Length Polymorphism (AFLP), and Single Nucleotide Polymorphism (SNP). These molecular markers are often used for the purpose of identifying genetic diversity and phylogenetic analysis (Sumantri et al., 2007, Ebegbulem and Ozung 2013). SNP as a single variation of nucleotides, does not alter the overall length of DNA sequences from the genome. SNP mutations are mostly in neutral territory or not codes of the genome and in smaller numbers are in coding or functional sequencing. Functional DNA mutations produce new alleles that can increase or decrease metabolic efficiency compared with wild type alleles (FAO 2007). The genetic diversity indicator can be explained against the variation of allele and genotype expressed by observed heterozygosity values and expectations and mean number of alleles (or MNA) for examination in clumps; genetic differentiation, fixation index, and variance analysis molecular for examination between clumps; as well as analysis of Bayesian mixes and clusters for examination between populations.

(i) Genetic marker in improving milk production and quality of Holstein Frisian

In dairy cows major genes such as κ-casein gene|Pst1, κ-casein| EcoRV, β-lactoglobulin|HindIII gives a significant influence on the increase of milk protein content. DGAT|Eae1 gene for fatty acid composition, GH gene, and Pit-1 in addition to the effect on milk protein also on milk production are shown in (Table 1). The κ-casein gene has recently become one of the additional genetic information of female FH cattle imported seeds contained in the National BET. This suggests that the uniqueness of the κ-casein gene in determining the biochemical properties of milk as a feedstock for the processing of cheese and other dairy products adds value to beef cattle in exporting countries (New Zealand and Australia).

Table 1 List of genes that affect milk production and milk quality

Name of Gene and Mutation	Result	References
κ-casein|Pst1 Mutation in exson 4, the allele A (0,47) and B(0,53)	In HF genotipe BB has milk protein > AB >AA	Sumantri *et al* (2005) and Anggraeni *et al* (2010)
κ-casein| EcoRV Mutation in exon 4, Ile23Thr, The alele C (0,88) alele T (0,12) Mutation in exson 4, Alele A (0,43) and alele B (0,57)	Moderate polymorphics In Dairy buffaloes	Rini *et al.* (2014)
β-lactoglobulin|HindIII	High polymorphics in HF dairy cattle	Anggraeni *et al.* (2010)
Pit-1|Hinf1 Mutation in exon 6 1256 c G>A In HF Alele A (0,25) and B (0,75). However monomorfic in buffaloes alele B (1,0)	In HF Alele affect milk production and milk protein	Misrianti *et al* (2010)
GH|AluI Mutation in 1758 c C>G Leusin to Valin. Allele L (0,94) and V (0,06)	In HF allele L affect milk production and milk protein	Misrianti et al.(2012)
DGAT Mutation in exon 8 allele A (0,37) alele K (0,63)	In HF genotipe AK Has milk fatty composition Nervonat fatty acid > KK	Asmarasari et al. (2013)
Pit-1|HinfI Mutation in 1083 cC>A., A(0,81) , B (0,19)	In Jonggol sheep genotipe AB has milk protein > AA > BB. However monomorphic in garut sheep	Sumantri et al. (2009)
PRL|Rsa1 Mutation in exon 3. Alelle A (0,95) and B (0,05)	Genetic variation is low in Bali cattle	Paramitasari et al. (2015)
PRL|Rsa1 Mutation in exson 4. Alele A(0,05) and G (0,95)	Genetic variation is low in Bali cattle	Paramitasari et al. (2015)

(ii) The Improvement of Meat Production and Quality in Ruminant

In Beef and sheep the genes governing meat tenderness, such as the calpastatin and calpain genes and for the fatty acid composition of SCD-1 gene, Lipoprotein Lipase, and Leptin. The IGF-1 and STAT5.The use of SNP variant analysis to examine the genetic characteristics of local livestock has been done for example in local sheep type fat and thin tail by exploring SNP in exon 6 of the Lecithin Cholesterol Acyltransferase LCAT). Three new SNPs detected at base position c.742C> T, c.770 T> A, and c.882C> T. SNP c.742 is known as a synonym mutation, otherwise c.770 is a non-synonymous mutation. This indicates the potential of LCAT gene DNA polymorphism in local sheep populations (Hidayati et al., 2011). Examination of allele variants of a number of major genes of growth trait. Alawiyah et al (2016) Association analysis showed that g.10428C>T SNP significantly affected marbling score (MS) and percentage of intramuscular fat (PIMF) ($P<0.05$). Based on these results, g.10428C>T SNP of the SCD gene may be used as a candidate marker to select meat quality traits in Bali cattle. Khasanah et al (2016) Myostatin (MSTN) gene plays a key role in skletal muscle homeostasis such as inducing muscle athrophy, poliferation of myoblast, increasing ubiquitin-proteasomal, downregulating IGF pathway, and glucolysis.. The association result showed that 2 SNPs (g.-7799T>C and g.-7941C>T) were significantly associated with intramuscular fat percentage ($P\leq0.05$) in Bali cattle. It could be concluded that MSTN promoter gene was polymorphic in Bali cattle and there were 2 SNPs associated with carcass quality.

Pratiwi et al (2016) Calpain-1 gene (CAPN1) produces a calpain enzyme controlling structure of meat protein and tenderness. Sequencing analysis at exon 5-6 of CAPN1 gene in Bali cattle resulted in eight polymorphic SNPs. They are c.3669T>C, c.3854G>A, c.3881T>C, c.3899C>T, c.3908C>G, c.4002C>A, c.4021G>T and Calpain-1 Gene, Carcass and Meat Characteristics in Bali Cattle c.4037A>C. The SNPs c.3669T>C, c.3854G>A and c.3899C>T were significantly ($P<0.05$) associated with rump thickness (RT), rump fat thickness (RFT) and marbling score (MS), while SNP c.4037A>C was not significantly associated with carcass and meat characteristic traits. The SNPs were significantly associated with carcass and meat characteristic traits namely c.3669T>C, c.3854G>A and c.3899C>T. Those SNPs may be used as candidate marker for Marker Assisted Selection (MAS) in Bali cattle. Genes controlling meat production and quality are shown in Table 2

Table 2 a list of genes that affect meat production and meat quality in ruminant

Name of gene and mutation	Result	References
Myostatin c.960delG Allele G (1,0) (1,0) and Allele delG (0,0)	No genetic variatian in Indonesian local sheep	Sumantri *et al.* (2011a)
Calpastatin (CAST) Allele M (0,13) and Allele N (0,87)	MN Genotipe has body weight > NN in Jonggol sheep male	Sumantri *et al.* (2008b) Bramada *et al.* (2013)
Calpastatin (CAST) Mutation in exon 5, allele 1 (0,48), allele 2 (0,48), dan allele 3 (0,04)	Cast 22 genotipe has highest meat percentage hihger in local sheep	Dagong *et al.* (2011); Dagong *et al.* (2012)
Insulin Like Growth Factor-1 IGF-1 Mutation in exon 4 which alele C (0,82) and T (0,18)	In Bali cattle, CC genotipe has daily birth weight, weaning weight and daily gain higher than CT and TT.	Maskur et al. (2012)
Lecithin Cholesterol Acyltransferase (LCAT) Mutation in exon 6,. SNP c742 C>T (alleleC 0,96 and T0,04), SNP c770 T>A (allele A 0,1 andT 0, 9) and c882, SNP C>T (allele C 0,95 and T 0,05)	genetic variation is very low in local sheep has effect in meat fatty acid composition	Hidayati et al. (2014)
Lipoprotein Lipase (LPL) SNP c.192 T>C, allele C (0,59) and allele T (0,41)	Genetic variation is highin garut sheep. Genotipe CC has fatty acid henekosanoat > CT > TT	Hidayati *et al.* (2014)
Leptin SNPs Arg25Cys and Arg25Hys, allele C (0,56), T (0,29), and H (0,15) as new allele	Genetic variation is high, hower there are no effect on meat fatty acid in pasundan cattle.	Hilmia *et al* (2013)
SCD-1 SNP Val239Ala, allele C (0,74) and T (0,26)	Genetic variation is medium, hower there are no effect on meat fatty acid in pasundan cattle.	Hilmia *et al* (2013)
STAT5A |AvaIMutation in exson 7, allele C (1,00) andT (0,00)	There is not genetic variation found in bali cattle	Paramitasari et al. (2015)
The stearoyl-CoA desaturase (SCD) g.10428C>T	SNP significantly affected marbling score (MS) and percentage of intramuscular fat (PIMF) ($P<0.05$). in Bali cattle.	Alawiyah et al (2016)
Myostatin (MSTN) 2 SNPs (g.-7799T>C and g.-7941C>T)	SNPs were significantly associated with intramuscular fat percentage ($P\leq0.05$) in Bali cattle	Khasanah et al (2016)
Calpain-1 gene (CAPN1) Sequencing analysis at exon 5-6 of SNPs. They are c.3669T>C, c.3854G>A, c.3881T>C, c.3899C>T, c.3908C>G, c.4002C>A, c.4021G>T	CAPN1 gene in Bali cattle resulted in eight polymorphic were significantly ($P<0.05$) associated with rump thickness (RT), rump fat thickness (RFT) and marbling score (MS),	Pratiwi et al (2016)

2.1. Genes Controlling Sheep Meat Odour

Gunawan et al. (2018a) reported unplesant flavour and odour in sheepmeat is often associated with lower consumer acceptance and complain. Branched chain fatty acid (BCFA: 4-methylnonanoic), 4-methylphenol, and skatole (3-methylindole) are the chemical compound that are suggested as the main contributor for sheepmeat flavour and odour. Therefore, muscle samples of sheepmeat from Javanese fat tailed were analysed for BCFAs (4-methylnonanoic acid), 4-methylphenol, and skatole (3-methylindole). The result showed the percentage of fat content was significantly difference between high and low sample. The percentage of fat content showed for each sheep sample ranged from 1.95 to 6.7%. The average of fat content in high and low sample were 4.49 and 2.57. In muscle tissue different concentrations of BCFAs (4-methylnonanoicacid), 4-methylphenol, and skatole were not significantly different between high and low fat content. Therefore, it seems likely that the chemical compound were too low or other substances are involved in causing the sheep meat flavour and odour in Javanese fat tailed. In this study for the very first time NGS technology has been used to analyze the expression profiles of Sheepmeat Odour and Flavour in Javanese Fat Tailed Sheep by using RNA Sequencing. Several of the SNPs (JAML, CYP2A6, SEPW1, and KIF12) were founded in this study could be included as suitable markers in genotyping platforms to perform association analyses in commercial populations and apply genomic selection protocols in the sheepmeat production. This transcriptome, polymorphisms and alternative splicing analysis using RNA deep sequencing revealed potential candidate genes affecting odour and flavour of sheepmeat in Javanese fat tailed sheep. It is exhibited that in future these polymorphisms could be used as markers for sheepmeat related with odour and flavour traits. However, further research and evidenvces are required to confirm the effect of these genetic markers in other sheepmeat populations. High-throughput sequencing RNA (RNA-Seq) reveals new challenges for the detection of transcriptome variants (SNPs) in different tissues and species. .Among them, about 90.8% of genes had multiple polymorphismswithin 13 genes (JAML, ANGPTL8, LOC101103463, SEPW1, SCN5A, LOC101113036, DOCK6, GTSE1, LOC101119620, KIF12, KCTD17, KANK2, CYP2A6). Several of the SNPs (JAML, CYP2A6, SEPW1, and KIF12) found in this study could be included as suitable markers in genotyping platforms to perform association analyses in commercial populations and apply genomic selection protocols in the sheepmeat production. Furtheremore Gunawan et al.(2018), has reported approximately 103 genes were differentially expressed (DEGs) with significance level of p-adjusted value <0.05. Among them, 60 genes were up-regulated, and 43 were down-regulated (p<0.01. FC>1.5) in higher MOF group. Differentially regulated genes in high MOF liver samples were enriched in in biological proceses with celluler response to chemical stimulus and endegenous stimulus; cellular components such as such as basement membrance and extracelluler matrix; molecular functions such as heme binding and oxidoreductase activity. Among the DEGs, metabolic phase I related genes belonging to the cytochrome P450 CYP2A6 were dominantly expressed.

Listiany et al 2018 investigate the expression of some of the key enzymes involved in liver sample of sheep with high and low sheepmeat flavour and odour. The study was conducted with Indonesian Javanese fat tailed sheep. Sheep having a fat branched chain fatty acids 4-methylnonanoic (MNA) greater and less than 215 μg g-1 and 229 will be defined as low and sheep meat odour, respectively. For the flavour, sheep having a fat skatole level less than 0.25 μg g-1 and greater than 0.25 μg g-1 will be defined as low and high flavour samples, respectively. The enzymes investigated were cytochrome P450 2A13 (CYP2A6), kinesin-like protein KIF12 (KIF12), and sulfotransferase 1C1 (SULT1C1). Expression of CYP2A6 in liver had differ between animals with high and low sheep meat flavour. Expression of CYP2A6, which catalyses the first stage of oxidation degradation, was increased in high sheep meat flavour and odour ($P > 0.05$). Similar pattern, the expression of SULT1C1, which catalyse the second stage of conjugation steroid catabolism, was increase in high sheep meat flavour and odour ($P > 0.05$). In contrast, the expression of KIF12 was decreased in high sheep meat flavour and odour animals. It is suggested that accumulation sheep meat flavour and odour in liver tissue of Indonesian Javanese fat tailed might be related to a high rate of oxidation in metabolic stage I and conjugation degradation in metabolic stage II.

3. Marker genetic for improvement meat production and quality in chicken and duck

Insuline-like growth factor binding protein 2 (IGFBP2) is one of the principal binding proteins that has biological functions involved in growth, development, and differentiation. Furqon et al (2018) have reported that c.1032C>T SNP of the IGFBP2 gene polymorphism was significantly associated with body, carcass, breast, breast muscle, pectoralis minor, leg, and wings weight in kampung chicken population ($P < 0.05$). IGFBP2 gene could be a candidate gene that affects growth and body composition traits in chicken.

Stearoyl-CoA desaturase (SCD) is an integral membrane protein of endoplasmic reticulum (ER) that catalyzes the rate limiting step in the monounsaturated fatty acids from saturated fatty acids. Furqon et al (2017) have reported the SCD|AciI SNP g.37284A>G polymorphism was significantly associated with palmitoleic acid (C16:1), fatty acids total and saturated fatty acid in 26 weeks old of F2 kampung-broiler chicken cross ($P<0.05$). The SCD gene was expressed for polyunsaturated fatty acids in liver tissue in two groups of chickens. SCD gene could be a candidate gene that affects fatty acids traits in F2 kampung-broiler chicken cross. Gunawan et al (2018b) reported novel single nucleotide polymorphism from RNA sequencing in coding region c.17492542 C>G of SCD was associated with FA composition, including both unsaturated [linoleic (C18:2n6c) and eicosadienoic (C20:2) acids] and saturated [lauric acid (C12:0)] forms. Furthermore, SCD expression was higher ($P < 0.05$) in tissues collected from high FA chickens than low FA chickens

SLC23A3 is one of the key genes which control the properties of the of fatty acids content in the meat. Gunawan et al (2018c) reported . A SNP in coding region c.22385690 A>C of the SLC23A3 gene was associated ($P<0.05$) with fatty acid composition including stearic acid (C18:0), elaidic acid (C18:1n9t), and linoleic acid (C18:2n6c). The SLC23A3 was detected in liver from high fatty acids (HFA) and low fatty acid composition (LFA). However, gene expression of SLC23A3 were not differentially expressed between HFA and LFA ($P>0.05$). These results will explain better understanding of the key important role of the SLC23A3 in fatty acid traits within the liver and will propose SLC23A3 as a potential genomic selection for selection of chickens with fatty acid composition.

Very low density lipoproteins (VLDLs) is a major class of lipoprotein particles that is synthesized and secreted by the liver. Furqon et al (2017) had reported that A G634A SNP of the ApoVLDLII polymorphism was significantly associated with body, carcass, breast, thigh, back and thigh muscle weight in 26 weeks old kampung chicken population ($p<0.05$).

The chicken growth hormone (GH) and its receptor (growth hormone receptor, GHR) play important roles in chicken performances due to their crucial functions in growth. Khaerunnisa et al (2017) had screened g.2248G>A GH and the g.565G>A GHR loci were polymorphic with two alleles (G and A) and three genotypes (GG, AG, and AA). The GG genotype and the G allele of GH locus were predominant in all chicken populations. While in GHR locus, the AA genotype and the A allele were found to be higher in all chicken populations. The association study showed that the g.565G>A GHR locus polymorphism had significant effect on carcass components, including live weight, carcass weight, breast weight, thighs weight, breast muscle weight, and thighs muscle weight. There was no significant association was found between the g.2248G>A GH genotype and carcass components.

Myostatin, or growth and differentiation factor-8 (GDF-8), is a member of the Transforming Growth Factor (TGF)-β superfamily. This family functions as a negative regulator of skeletal muscle. Khaerunisa et al (2017) have reported mutations in exon 2 convert Thymine into Guanine (T4842G) that alters the amino acid leucine into arginine, which is associated with body weight in kampung chickens. The myostatin|BsrI locus was polymorphic in all populations, producing two alleles (G and T) and three genotypes (GG, GT, TT). Results from the analysis of the allele and genotype frequency showed that the T allele had a higher frequency than the G allele in all populations, except for the F1 crossbreed of the kampung x Cobb broiler chicken population, which had equal allele frequencies. A significant effect was found between genotype and carcass characteristics in the F2 crossbreed kampung x Cobb broiler chickens. A SNP in the coding region of myostatin in exon 2 was associated with live weight, carcass weight, breast weight, thighs weight, drum sticks weight, wings weight, breast muscle weight, thighs muscle weight, drum sticks muscle weight and free water.

The stearoyl-CoA desaturase (SCD) gene encodes an enzyme involved in fatty acid (FA) biosynthesis. Gunawan et al. (2018). Have reported A small nucleotide polymorphism in coding region c.17492542 C>G of SCD was associated with FA composition, including both unsaturated [linoleic (C18:2n6c) and eicosadienoic (C20:2) acids] and saturated [lauric acid (C12:0)] forms. These results will improve the understanding of SCD function in FA composition and will shed light on SCD as a potential candidate in the selection of chickens with higher levels of unsaturated and lower levels of saturated FA.

Ghrelin receptor (GHSR) gene is candidate gene for growth performance in chicken by modulating growth hormone release from the pituitary by binding to its ligand of ghrelin. Ghrelin, or growth hormone secretagogue (GHS), is well known as feed intake and energy homeostasis regulator in mammals and birds.. Khaerunisa et al (2017) have reported that this locus was polymorphic with two alleles (T and C) and three genotypes (TT, CT, and CC). The T allele and TT genotype were predominant in all populations. Furthermore, association of the T1857C GHSR locus polymorphism with chicken carcass traits has been described in Indonesian chicken, providing evidence that GHSR might be an important candidate gene for chicken carcass traits.

Flavin-containing monooxygenase 3 (FMO3) is an excellent candidate gene that affects fish odor and fatty acid composition. It has been reported that downregulation of FMO3 can inhibit fatty acid oxidation. Angraeni et al. (2018) had repoerted the SNP g.849A>G was highly significantly associated with unsaturated fatty acids (palmitoleic, oleic, linoleic, linolenic and arachidonic acid) and saturated fatty acids (lauric, palmitic, and arachidic acid). Compared to the GG genotype, the AG genotype exhibited greater levels ($P < 0.05$) of lauric acid (C14:0), palmitic acid (C16:0), arachidonic acid (C20:4n6) palmitoleic acid (C16:1), oleic acid (C18:1), linolenic acid (C18:3) and linoleic acid (C18:2; $P<0.05$) but not pentadecanoic acid (C15:0). Furthermore, Anggraeni et al. (2018b) had reported that the SNP g.849A>G was highly significantly associated ($P<0.01$) with live weight (LW), carcass weight (CW), breast muscle weight (BMW), pH, cooking loss, drip loss (DL), lightness and redness, TBARS and TMA. Compared to the GG genotype, the AG genotype exhibited greater levels ($P < 0.05$) LW, CW, pH, TBARS and TMA but not DL FMO3 mRNA expression was higher ($p < 0.01$) in animals with the AG genotype. The results will improve the understanding of the functions of the FMO3 gene in carcass and meat quality within the liver and will shed light on FMO3 as a candidate gene in the selection of ducks with good carcass and meat quality traits. All genes that have effect on meat production and quality in chicken and duck have summarized in Table 4.

Table. 3. List of genes effect on meat production and quality in chicken and duck

Name of Gene and mutation	Result	References
Insuline-like growth factor binding protein 2 (IGFBP2) A c.1032C>T SNP	This SNP was significantly associated with live weight, carcass and carcass component traits in local chiken	Furqon *et a*l., (2017)
Stearoyl-CoA desaturase (SCD). The SCD|AciI. c.17492542 C>G SNP	This SNP was significantly associated with Fatty Acid composition in local chiken	Furqon *et al.*, (2017). Gunawan *et al.*, (2018)
Very low density lipoproteins (VLDLs) A G634A SNP	This SNP was significantly associated with live weight, carcass and carcass component traits in local chiken	Furqon *et al.*, (2017)
Myostatin, or growth and differentiation factor-8 (GDF-8), Mutations in exon 2 (T4842G) SNP	This SNP was associated with live weight, carcass and carcass component traits in local chiken	Khaerunisa *et al.*, (2017)
Growth hormone receptor, GHR| Eco72I g.565G>A SNP	this SNP has significant effect on live weight, and carcass component traits in local chiken	Khaerunnisa *et al.*, (2017).
Ghrelin receptor (GHSR) T1857C SNP	This SNP was significantly associated with carcass componen traits in local chiken	Khaerunnisa *et al.*, (2017).
Flavin-containing monooxygenase 3 (FMO3) the SNP g.849A>G	This SNP was significantly associated with carcass componen traits and affects fish odor and fatty acid composition in cihateup duck.	Anggraeni *et al.*, 2018a, b)

4. Genetik marker for heat tolerance and resistent to disease in local chicken

Identification of the candidate genes to improve the immune response may be useful for marker-assisted selection to enhance disease resistance. Breeding for resistance to Salmonella Pullorum and viral diease could be an effective approach to control salmonellosis in poultry. The candidate gene approach is a useful method to investigate genes that are involved in genetic resistance.

TLR4 is a phagocytes cell surface receptor that plays a role to recognize lipopolysaccharide of gram negative bacteria including Salmonella enteritidis. It is transcribed by TLR4 gene and conserved in the activation of the non-specific immune system. Ulupi et al (2013) have identified 3 genotypes of TLR4 gene: AA, AG and GG. All parameters including expression of TLR4 gene, concentration of leucocytes, differentiation of leucocytes, macrophages activity and capacity were not significantly different in AG and GG genotypes. There was no S. enteritidis finding in blood and eggs produced by AA, AG and GG chickens. There was found IgY specific to S. enteritidis in eggs yolk with very high concentration (2.94-3.89 mg/mL). The study proved that Kampung chicken resistant to S. enteritidis infection in all condition (Ulupi et al., 2014).

Natural resistance-associated macrophage protein-1 gene (NRAMP1) plays an important role in immune response against intracellular pathogens. Muhsinin et al., (2016) have reported that NRAMP1 was polymorphic in all native chickens. The CC genotype was significantly higher than CT and TT genotypes ($p<0.05$) in Sentul chickens resistant to Salmonella pullorum. Although, the concentrations of leukocytes and differentiation in chickens with all three of NRAMP1 genotypes (CC, CT and TT) were not statistically different, there was a significant correlation between different NRAMP1 genotypes and immune traits.

Muhsinin et al., (2018) have reported the iNOS locus was polymorphic in sentul chicken producing two alleles (T and C) and three genotypes (TT, TC and CC). The result from the analysis of the allele and genotype frequency showed that the C allele had a higher frequency than the T allele in all Sentul chicken (0.729). The association result showed that CC genotype was significantly associated ($p<0.05$) with S. Pullorum disease resistance in Sentul chicken, while the association was not found for TC and TT genotypes. The numbers of leukocytes and differentiation in Sentul chicken with three of iNOS genotypes (TT, TC and CC) were not statistically different ($p>0.05$).

Muhsinin et al., (2018) have reported that TGF-β2| RsaI locus was polymorphic in all populations, producing two alleles (T and C) and three genotypes (TT, CT, and CC). The result showed that the T allele had a higher frequency than the C allele in all populations. The association result showed that TT genotype was significantly associated with S. pullorum resistance in Sentul chicken. Although the leukocyte concentration, leukocyte differentiation and H/L ratio in sentul chicken with three of TGF-β2 genotypes (TT, TC, and CC) were not statistically different. In conclusion, polymorphism in the TGF-β2 chicken gene can be used as a candidate marker to increase S. pullorum immune response.

The study of interaction between chicken lines and HSP 70 genotypes in heat resistance has reported Tamzil et al .,(2015) The highest response on panting frequency, rectal temperature, serum corticosterone concentration and expression of

HSP 70 was found in the DD genotype and the lowest in AD genotype. The most rapid onset of panting occurred in DD genotype and the slowest in AD genotype. Kampung chicken had the highest heat resistance as compared to Arabic and commercial chickens but HSP 70 genotypes that was the most tolerant to high ambient temperature was AD genotype where as the lowest tolerant was DD genotype

Table 4. List of genes have effect on heat resistant and resistant to diseases.

Name of gene and SNP Functional	**Results**	**References**
TLR4|Msc1 Mutation in exson 2 glu3924lys, allele A (0,20) and G (0,80)	In kampung chicken genotipe GG has more resistance to salmonella than AA and AG	Ulupi et al. (2013 and 2014)
Mx|Hpy81 mutation in exson 13, ser2032asp, allele A/ Mx+ (0,74) and G/Mx- (0,26)	In Tolaki Chicken genotipe AA has more resistance to ND virus than GG and AG	Pagala et al. (2013)
Natural resistance-associated macrophage protein-1 gene (NRAMP1). Mutation in exson 11, allele C (0,94) and T (0,06)	in Sentul chickens The CC genotype was significantly resistant to Salmonella pullorum ($p<0.05$) compare than CT and TT	Muhsinin *et al* (2017)
inducible nitric oxide synthase (iNOS)	The association result showed that CC genotype was significantly associated with S. Pullorum disease resistance in Sentul chicken.	Muhsinin *et al* (2018)
Transforming growth factor β2 (TGF-β2| RsaI)	genotype TT was significantly associated with S. pullorum resistance in Sentul chicken.	Muhsinin et al (2017)
HSP 70 gene in kampung chiken have found 4 allele. allele A (0,54), B (0,06), C (0,11), and D (0,29). And I layer all aliele D (1,0	Kampung chicken has the highest heat resistance as compared to Arabic and commercial chickens	Tamzil et al (2015)

Consideration and direction of policy in application of molecular genetics in the genetic improvment of sustainable animal breeding

Biotechnology molecular that can be applied easily, quickly, and low cost but can provide good results and real impact. It will certainly be a consideration in efforts to make a breakthrough to be able to increase the production of animal food sources quickly. Similarly, the technology can be used to meet other essential needs for genetic improvement programs from indigenous and local breeding programs conducted in sustainable livestock systems.

- A number of molecular markers such as microsatellite, minisatellite, mitochondrial DNA, and PCR-RFLP will continue to be used for the utilization and management of the genetic resources of various breeds from native and local livestock, such as for exploration of genetic diversity, phylogenetics, genetic disorders.
- Increased knowledge of the specificity of DNA sequencing and the development of a way to measure the specificity open up wide opportunities in areas of livestock product identification in the trading system, such as mixed technology of livestock products or falsification of other livestock products.
- Selection of single gene-based and major genes to enhance important traits will continue to be assessed to verify the consistency of positive allelic variants on the improved properties of native and local species and livestock species. Important properties will be considered not only on increasing livestock production, but also on bioactive livestock products (meat, eggs and milk) as functional food.
- Maintaining genetic diversity will remain a target for the future because genetic diversity is essential for genetic improvement in breeding programs especially selection activities to produce superior clumps of specific agroecosystems. Genome mapping and DNA fingerprint (DNA finger print) will be well applied in local and native livestock conservation programs.
- Epigenetic studies such as nutrigenomics to study the genetic interactions of the environment, especially feeding, are particularly important in native and local animals that have high genetic potential, but their gene expression does not occur because they are fed less optimally.
- Biotechnology of molecular genetics to be applied needs to be integrated into the breeding scheme in genetic improvement of breeds in certain species in order to provide a faster genetic response and economic value to farmers and businesses.

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Sheep and Goat Industry in Indonesia: The Prospect, Potency and Challenges

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Abstract

Sheep and goats in Indonesia have been popular as one of national livestock production, although this is still run by small holders, farmers and community in rural areas. The farm activities are still subsistent, traditional and a noncommercial business. However, recently, The sheep and goat population have been increased in relation to better national economic growth, as well as increase in meat consumptions. Number of business in sheep production especially in sheep fattening farms, have been rapidly grown. It is mainly to cover demand of local restaurant selling satay, *gulai*, soup or *tongseng*. This is also to fulfill *aqiqah* demands, which is a religion practice demands to gratitude new baby born. Larger annual religious festive (*Iedhul Adha*) also needs adult male sheep and goats s to be killed as a sacrifice symbol. All of the culture and religious activities stimulated business development of sheep and goats. The Positive trend of sheep and goat business development may have inspired government to open export market to Asian countries such as Malaysia and Thailand through Agriculture Minister Decree (no 02, 2018). Is this opportunity to be a prospect to develop sustainable sheep and goat industry in Indonesia? What are the potencies supporting the industry? What are the challenges to Indonesia, to farmers and to local sheep and goats genetic resources. This paper will discuss all of this issues.

Introduction

Sheep and goats in Indonesia have been popular as one of national livestock production, although this is still run by small holders, farmers and community in rural areas. The farm activities are still subsistent, traditional and a noncommercial business. However, recently, The sheep and goat population have been increased in relation to better national economic growth, as well as increase in meat consumptions. The increase of the population mainly related to business of sheep fattening, because the business is easier, chepaer, profitable, and smaller area compared to sheep breeding farms.

The marketing of fattening business for local restaurant selling satay, *gulai*, soup or *tongseng* and other traditional food. This is also to fulfill *aqiqah* demands, which is a religion practice demands to gratitude new baby born. Larger annual religious festival (*Iedhul Adha*) also needs adult male sheep and goats to be slaughtered as a sacrifice symbol. All of the culture and religious activities stimulated business development of sheep and goats. However, the consumption of sheep nationally was about 2%, lower than consumption of beef or chicken meat. Recently, the tendency of qurban meat demand is beef. This may related to local negative image of consuming sheep and goat meat, higher cholesterol and specific flavour.

The good population increase with limited sheep consumption make an opportunity to export the national sheep, especially in asian regions such as, Malaysia and Thailand. With the support of availabe Association of Indonesian Sheep and Goat Farmers (HPDKI) and other government regulation of export. The supply of national sheep to support either and university institution, goverment make national or international market make sheep and goat production management should be professional and industry system. This paper discuss the prospect of sheep industry, potency and challanges of the sheep industry.

Prospect of sheep and goat industry

Prospect of sheep industry in Indonesia is discussed in some aspects including profitable business, available and sustainable business, sustainable area, and continued supply and demand, professional organization and good human resources . The prospect to become Industry level are as follows:

(i) Profitable business. The sheep business has shown to be profitable as in the last decade, population of sheep have been increased significantly. In recently, number of commercial farms have been also increased . In sheep espescially, the population increase per year between 1996-2006 was 1.65%. However, in the last decade, 2007-2016 the increase was about 7.11% per year. This shows that great increase indicate that the sheep is ready to scale up into industry level.

(ii) Available and sustainable area. In certain areas in Indonesia including in Jawa, available unused lands are still available either as specific either in animal grazing area or in unused land area as well as for possible integrated forest and palm oil plantation. Collaboration between agricultute and animal farm must be developed to gain more optimal.

(iii) Continue supply and demand. The prospect of continue supply and demand in sheep/goats are quite good. Their sheep and goat are mow conducted by professional farmers and educated young farmers. Market to overseas is also more opened. MEA will guarantee that marketing local sheep/goats to overseas as well to fill the requirements will become good opportunity.

(iv) Proffesional organization. In national organizasation, it has been realized importance of farmers organisasation. It is called as HPDKI (Association of Indonesian Sheep and Goat Farmers (HPDKI). There are 6 clubs under HPDKI that have independent and professional activities with consisted of 100 proffesional farmers, 2500 heads of sheep and goats, and have 558.225 people active members in facebook group.

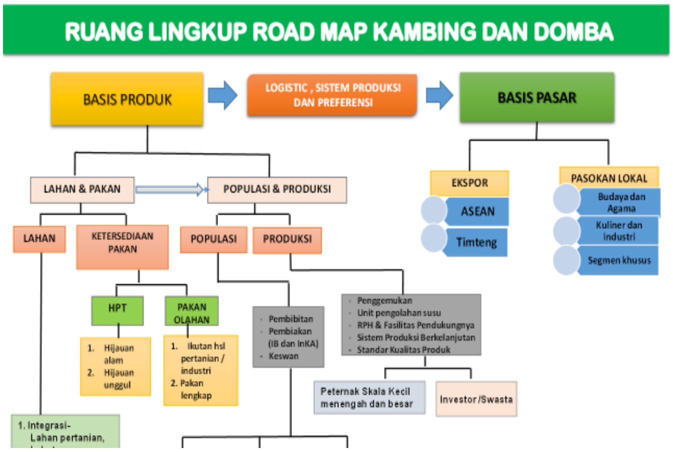
a. ASPAQIN : Asosisasi Pengusaha Aqiqah Indonesia (Indonesia Association of Aqiqah businessman)
b. ASPEKPIN : Asosiasi Peternak Kambing Perah Indonesia (Indonesian Association of Dairy Gote Farmers).
c. ASPETINDO : Asosiasi Pengusaha Ternak Indonesia (Indonesian Association of Animal Farmers)
d. PERKANAS : Perkumpulan Peternak Kambing Kaligesing Nasional (National Group of
e. PPKDY : Perserikatan Peternak Kambing dan Domba Yogyakarta (Yogyakarta Assocation of Goat and Sheep Farmers)
f. IGB : Indonesia Goat Breeders (Indonesian Goat Breeders)

(v) Good HRD (human resources development. Farmers as well the organization of HPDKI are many aducated young generations, some of them are gradute of animal science graduates and veterinary science graduates. Also number of their graduate candidates are available. They can become Sarjana Peternakan dan Kedokteran Hewan

Potency of Sheep/Goat Industry

Potency of making sheep and goat industry can be discussed as follows:

1. Indonesian local sheep and goat are prolific. In 2 years they can give birth 3 times and litter size per birth can be more than 2, 3 even 4, heads per birth per ewe with the average of litter size is around 1.7 heads/birth.
2. Although the sheep/goat growth is not super, but the variation of local sheep of huge, so it is potential to conduct selection program of elite flock local between local sheep/goats. Cross breeding is also the chance to produce sheep/goats production in industry level with excellent quality of animal quality.
3. Government priority for producing priority of sheep and goat start to be developed. There are some of the policy as follows:
   a. National sheep and goat road map is already formulated so the long plan of development is already clear.



b. Production of export regulation with tough regulation is a potency to protect animal breeding recources. The regulation as follow to develop and support the policy through Agriculture Minister Decree, number 02, 2018.

c. Corporation of sheep and goat farmers wby claster model.

Challenges of Industry

Chalenges of industrialization may raise some matters:

1. It needs studi of a comprehensive approach to have a balance between the need and export.
2. Development of export institution to manage the process of industry so it be beneficial for for every practicitianer to ease 'traceability' of the business

3. To control sheep and goat breeding to protect genetic stocks of sheep and goats.
4. Imbalance between export and industry purposes and benefits for farmers welfare
5. Development of people animal business
6. Development of cooperatiom to support industry need
7. It neds to develop of facilitis and resources of sheep/goat business development with priority of pople benefits too.

Conclusion

Prospect and Potency of sheep and goats in Indonesia to become industry level are great with local sheep and goat availability as well as the better intensive organization and better human resources quality. There are some challenges to face, however there are some solutions to develop.

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Optimising sheep production in the tropics

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Introduction

Sheep production in the tropics is limited by available infrastructure, clear market signals and a dominance of small holder production system. Indeed, sheep are often kept to provide families with financial security, cash income, manure for fertiliser, and for festivals such as the Muslim Idul Adah. Regardless of the reason for keeping sheep, lamb prices in many tropical countries reflect world prices which are higher than chicken, pork and beef. Thus, a focus on productivity is important for all producers.

Simple measures that can be put in place to increase productivity include *ad libitum* water, feeding increased levels of digestible feed leading up to joining and lambing, use of feed supplements at key times of the year and production cycle, and relatively simple animal health protocols. Potential productivity is driven by genetic improvement and this is the focus of this paper.

Government programs for sheep breeding in the tropics have often not been successful as they have a tendency to see the look to developed countries as an example and end up viewing introduction of exotic genotypes as a potential “saviour”, require an over-reliance on artificial breeding technologies, lack engagement of local breeders and lack appropriate methods for disseminating superior genetics. An alternative model of intimate involvement of small holders in decision making and use of local breeds is proposed as a superior alternative. Indonesia is the focus but the principles can be used in any region with a large proportion of small holders.

A number of reviews of production of local breeds have been conducted during the past 60 years (Table 1).

Table 1. Historical reports of productivity of Indonesian sheep breeds

Local thin-tailed	Priangan	Fat tailed
Ma’sum (?) 1.58	Kurnadi (1976) 1.45	BPPP (1955) Pri x FT 1.69
Koesnan (1972) 1.60	Sugihen (1974) 1.93	Wardojo and Adinata (1956) 1.56
Usri (1971) 1.16	BPPP (1955) 2.07	
Nurmanaf (1973) 1.19	Supan (1977) 1.51	
Harahap (1973) 1.04	IPB (1977) 1.83	
Pasaribu (1973) 1.39		
Average 1.26	Average 1.81	Average 1.56

Source: FAO

Table 2. Recent productivity measures of Thin Tail and crossbred sheep

Trait	Sumatra Thin Tail	STT x St Croix	STT x Barbados Blackbelly	Composite STT / StC / BB
Litter size	1.50	1.49	1.67	1.46
Survival to weaning (%)	86	85	91	98
Weaning weight (kg)	8.7	11.7	11.7	13.1
Productivity (kg/ewe/yr)	16	22	24	22
Calculated weaning rate	1.29	1.27	1.52	1.43
Calculated litters per year	1.43	1.48	1.35	1.17

Most sheep breeds are seasonal breeders in that their ovulation rate increases during periods of reduced day length. This is driven by melatonin that is release by the pituitary during darkness. Thus, as day length decreases, night length increases, melatonin increases and ovulation rate increases also. This is ideal in temperate and Mediterranean environments as ewes will conceive after periods of feed surplus and lamb prior to periods of feed surplus. However, in the tropics there is negligible variation in day length and, hence, ovulation rate of ewes. That said, in the sub-tropics there is likely to be variation in ovulation throughout the year due to variation in body composition from variable feed supply and quality. In the tropics if ewes are fed appropriately, there is potential for more than 1 parity per year and this is evident from the productivity measures presented in Table 2 where the calculated number of litters per year was 1.17-1.48.

The data presented in Tables 1 and 2 demonstrate that Indonesian sheep breeds are both fertile and fecund.

Don't put too much emphasis on size

In the developed world most lamb markets have minimum carcass weights so that processors can butcher them to have the full range of meat cuts and labour costs are minimised per kg of lamb. In this scenario, often bigger genotypes are more efficient because genetically bigger lambs will reach market specification earlier. Even though larger lambs eat more than smaller ones, feed requirements are a function of both maintenance and production (growth). If lambs take less time to reach a specific market weight then they will eat more per day to achieve the greater production, but having less days of maintenance means that a greater proportion of feed is used for production, thus increasing efficiency.

If there are no minimum weight specifications as is often the case in the tropics, then lambs can be marketed either when cash is needed or at a given age. In this scenario a bigger lamb that eats more is no more efficient. Thus, while heavier lambs among those in a contemporary group are likely to be those with greater health and vitality, a strong emphasis on selection for size or growth is not warranted. Furthermore, reproductive rate in terms of number of lambs weaned per year becomes a far stronger profit driver.

Historical traits of importance

Many sheep producing nations have a history of wool production being an important part of the production system. Wool has the advantage of being able to be harvested from live animals multiple times and so provides cash flow that is not available relative to meat. However, in the tropics wool production, harvesting and marketing is not well organised despite being used in some local handicrafts. Furthermore, high quality wool from breeds such as Merino cannot be produced in the tropics. Lastly, while the energy cost of wool growth in ewes is small relative to maintenance and lamb production, it still comes at a significant cost in energy and protein, both of which are often limited in production systems of all scales. Thus, given the available of cheaper fibres (cotton, polyester), it is suggested that breeders aim to decrease rather than increase wool production. The result will be both easier care sheep and greater feed resources for meat production.

In some regions of Indonesia (e.g. West Java), fighting rams is a popular sport and rams are bred to be winners at this sport. These rams are likely to be bigger, stronger, healthier and with greater intent for fighting. In many ways this is complementary to selecting sheep for fitness and growth. However, Indonesia is a country with a large number of people and rapidly developing economy. An aspiration of many Indonesians and their government is to be viewed internationally as an emerging economic powerhouse. This is quite appropriate but, put bluntly, there will not be international support for the practice of fighting rams and certainly not international funding for breeding programs that support that. Thus, selection for fighting ability will be practiced by individuals but should be not be supported by public programs such as Government funding and University research.

It is proposed that this be extended to focus on:

1. More lambs each year through increased number of litters, increased fecundity and increased lamb survival;
2. Conception at 7-8 months of age as only ewe lambs that have thrived will achieve this so this allows for a focus on reproduction, growth and health;
3. Parasite resistance either as measured as faecal counts, occurrence of scours or maintenance of body condition; and
4. Visual desirability which will cover size, structural correctness and preferred colour markings as well as engaging breeders and increasing ownership of breeding decisions.

Ponzoni (xxxx) stated that the steps in developing a breeding program are 1) define the breeding, production and marketing system, 2) choose appropriate selection criteria by identify the biological traits affecting income and expense, 3) organise the performance recording system, 3) calculate an economic value (direct or desired gains), 4) estimate the economic merit of the available animals, and 5) use the selected animals in the breeding program.

What has been discussed to this point is the development of the breeding objective and choice of appropriate selection criteria. However, an equally important part of a breeding program is the performance recording system. Individual small holders have, by definition, almost no power in their selection programs as they lack numbers to select from, lack intensity of selection of rams which is driven by the number of ewes per ram and are often under pressure when money is needed to sell the most valuable rams so the minimal selection pressure that does exist can actually be going in the wrong direction. More specifically, more ewes per ram means smaller proportion of rams to be kept and, therefore, a greater intensity of selection.

Farmer extension programs in many countries recognise the value of working in groups and have developed a variety of group structures. In recent years this has been particularly well done in Indonesia with the establishment of Sentra Peternaken Rakyat (SPR, Community Livestock Centres). These have had government financial support which has helped provide incentive and have brought together small holders commonly with 4-20 sheep that combined run 2000 sheep, so they often involve 100-

300 hundred small holders. The structure is relatively formal with a group of leaders and overall leader elected by the people.

These SPR provide the ideal structure for sheep breeding programs in that they are organised with clear leadership, by their nature have strong engagement of stakeholders and have sufficient scale of livestock to facilitate genetic progress. It is proposed that approximately 10% of the ewes represented in the group are run centrally to form a nucleus with intensive measurements recorded and selection undertaken. Ideally SPR across the nation would benchmark performance and share genetic material.

In addition to a national network of groups, it would be even better to form an international network of similar groups. This would be ideal for attracting government and business investment as well as for capacity building of community leaders, Government and University staff and students. The elite nucleus would be ideal also for application of genomic selection to improve selection accuracy and assisted reproductive technologies to both multiply superior animals and shorten generation interval. Even if countries differ slightly in breeding objectives and disease challenges, there are likely to be sufficiently common goals of increasing weight of lamb weaned per ewe per year that would ensure maximising overall genetic merit and hence productivity.

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FULL PAPERS

PARALLEL SESSIONS

SUBTHEME: ANIMAL PRODUCT TECHNOLOGY

Quality of *Lactobacillus plantarum* in Goat and UHT Milk

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Abstract

The study aimed to investigate the ability of Lactobacillus plantarum in showing the characteristics of fermented milk quality when applied to different types of milk. This research was arranged in completely randomized design with factorial patterns, consisting of 2 factors. The first factor was milk type (cow milk processed by UHT and goat) milk and the second factor was level of starter (2.5, 5 and 7.5%) and each treatment was repeated 3 times. The observed variable were pH, lactic acid and protein level and total of lactic acid bacteria (LAB). Data were analyzed by ANOVA and differences between treatments tested by DMRT. The results revealed that milk type and starter level have a very significantly ($P<0.01$) effect on the pH value and protein content of each type of fermented milk and interaction occurs between the combination of the two treatments. Milk type had a very significantly ($P<0.01$) effect on lactic acid levels and total LAB. It can be concluded that Lactobacillus plantarum use in UHT and goat milk resulted different quality of fermented milk produced. Furthermore, the final result shows that L. plantarum is grown more optimum in goat's milk at level 2.5 and 5%.

Keywords: Quality, fermented milk, LAB, lactic acid and characteristic

Introduction

One food that became known in the community because of its good health benefits is fermented milk that uses various types of starter lactic acid bacteria known as probiotics. Various quality studies on probiotic supplementation in fermented milk has been widely used, but in its development it is necessary to produce products containing probiotics with sufficient quantities and can survive longer in the digestive system.Utilization of *Lactobacillus plantarum* in this study aims to see its development in other milk whether the activity remains optimal. *L. plantarum* used in this study is the result of the isolation of Setyawardani (2012), which has been tested through stages such as morphological characteristics such as Gram staining, physiological characteristics (endurance and temperature, pH and certain salts (Ayad *et al* .) Furthermore, the test of biochemical characteristics includes catalase test, CO2 production test of glucose, dextran production from sucrose, NH 3 production of arginine.

Research conducted by Hanum (2010), shows the ability of *Lactobacillus plantarum* in improving the characteristics of fermented milk such as pH, lactic acid content, protein content, total BAL and the ability to inhibit Salmonella sp. The addition of starter to fermented milk must meet health standards, fermented milk can be prepared by adding 1.5-3% culture of lactic acid bacteria (Muawanah 2000). The addition of cultures of 1-5% mixed cultures *L. bulgaricus and S. thermophillus* were able to produce lactic acid of 0.85-0.90% (Darmajana, 2011).

Material and Method

Two types of milk used in this study were Ettawa goat milk obtained from UD Aceh Livestock farm and UHT milk obtained from the local market. Preparation of fermented milk has been done at the Laboratory of Milk Science and Processing Technology, Faculty of Agriculture, Department of Animal Husbandry of Syiah Kuala University. Preparation of culture done in three stages (Zakaria 2009), namely making of culture store, parent culture then followed by intermediate culture and work culture. Work culture is a starter culture ready for use in the manufacture of fermented milk. The stock culture grown on a sloping agar is rejuvenated into bacterial culture, by means of being scratched on the MRS medium to be evenly and incubated for 48 hours at 42 ° C. *L. plantarum* which grows further, is examined for its uniformity through re-growth on MRS agar, this stage aims to maintain the purity of culture. Furthermore, isolates that have grown ready to be used as a culture for the manufacture of mother culture. One ose stock culture is grown in sterile milk and incubated at 42 °C for 18 hours. Furthermore, 1-2% culture was re-inoculated in sterile milk and incubated for 48 hours at 42 °C, referred to as mother culture. 5% mother culture is grown back into sterile milk to get intermediate culture, which has high activity. A very important stage is the production of bulk cultures, by taking as much as 5% intermediate culture inoculated into milk to get a bulk culture (working culture) that is ready to be used as starter culture in the manufacture of fermented milk.

Research Design

The research design used was a complete randomized design of factorial pattern consisting of 2 factors (2x3) the first factor was Goat milk and UHT (Ultra High Temperature)milk and B (2.5, 5, 7.5%) starter *L. plantarum* with 5 repetitions. Bacteria used as starter have been probiotically re-examined for morphological characteristics (Prescott 2002), physiological characteristics such as resistance to temperature, pH and salt (Harrigan 1998). Biochemical Characteristics of catalase (Harrigan 1998). Lactic Acid Bacteria Population Test - Pouring Method refers to Sudarwanto 2012, to see the total number of BAL cells present in the product.

The pH measurement (Sanjaya et al. 2007). The pH was measured using pH meter (ToA), previously pH meter was calibrated with buffer solution (pH 6.8 and pH 4.0).

As much as 10 ml of sample in test tube is measured with electrode and then the result can be read on monitor pH meter

Lactic Acid Level Test (Method of Acidi-alkalimetry). A total of 15 ml samples were added two to three drops of 1.0% phenolphthalein indicator then titrated using 0.1 N NaOH solution until the end point of the titration was reached, which is a fixed pink color. Total acid (w / v) was calculated as percent of lactic acid (Sudarwanto 2012).

The Total Plate Count (TPC) Lactobacillus plantarum. The TPC test was performed on fermented milk by the pour plate method and used for deMan Ragosa Sharpe Agar (MRSA) aiming to see the number of *L. plantarum* cells present in milk after fermentation.

Data Analysis

The experimental design used was Completely Randomized Design of a factorial pattern consisting of 6 treatments and 3 replications. Data were analyzed with ANOVA and continued with DMRT.

Result and Discussion

Figure 1a shows that there is significant effect (P <0.01) on fermented milk on pH of both milk. Differences in pH values due to *L.plantarum* activity in both types of milk are evident at level 5 and 7.5% starter. Fermented goat milk has a lower pH at 5% starter level and increased at 7.5% starter level, whereas pH of UHT milk is higher at 5% and decreases at 7.5% starter level. Metabolism of lactic acid bacteria during fermentation will produce lactic acid in considerable amounts which then increases lactate acid concentration in the medium and results in a decrease in pH (Saccaro *et al*. 2012). During the exponential phase the bacterium undergoes cell division with maximum speed. Energy requirements in this phase are higher so that many lactose and other carbohydrate sources are fermented by LAB (Salle, 1982; Shafiee *et al*., 2010). The breakdown of lactose and other carbohydrate sources produces acids, especially lactic acid. The formation of lactic acid in the fermentation process causes milk become acidic and decreases pH (Salle, 1982; Tamime *et al*. 2005).

Increased acidity equivalent of lactic acid during the fermentation process indicates bacterial growth (Tamime *et al*. 2005; Tamime, 1990). Figure 1b shows the characteristics of enhancement of lactic acid level during fermentation between UHT and goat's milk. This is because in its metabolism, lactic acid bacteria produce lactic acid as the final product (Korbekandi *et al*. 2009).

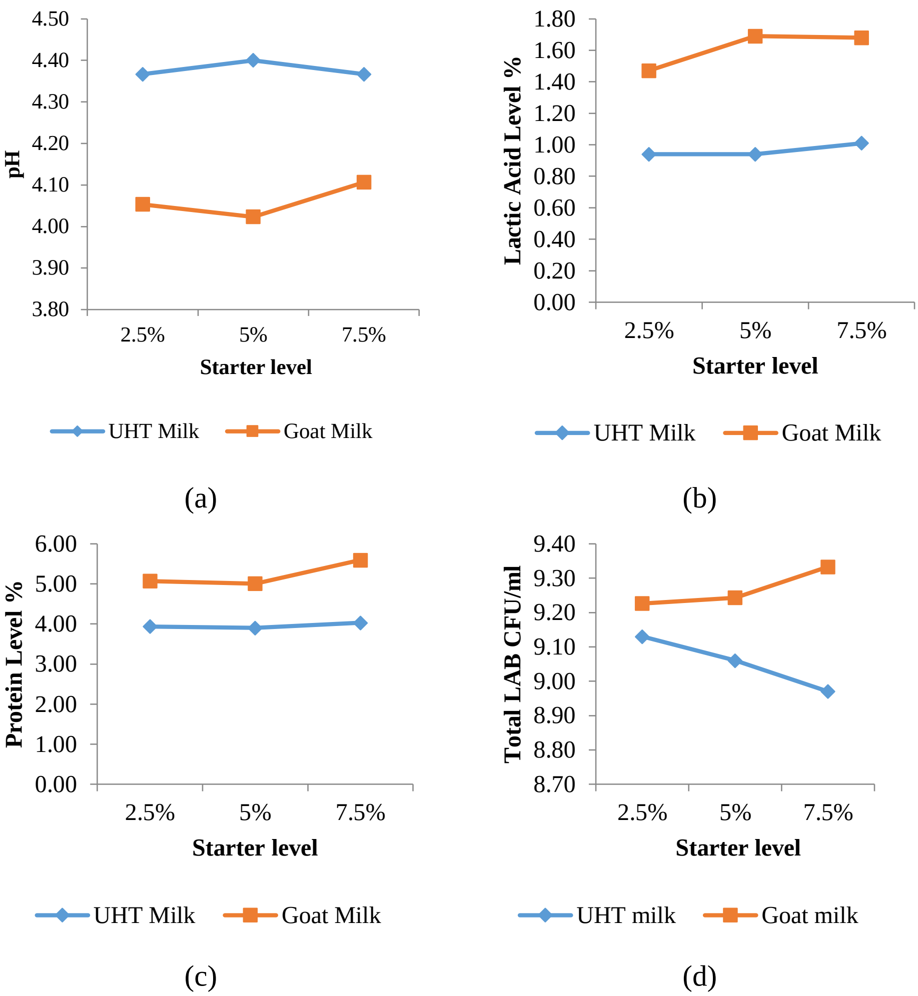

Figure 1. Graph of average pH (a), lactic acid level (b), protein content (c) and total BAL (d) in UHT milk and fermented goat milk with starter level *L. plantarum* (2.5, 5 and 7, 5%)

The high production of lactic acid is closely related to the lactose content in the medium and is associated with increased concentrations of bacterial nutrients. In accordance with Santo. *et al*. (2012) which states that the concentration of dry matter in fermentation is directly proportional to the velocity and concentration of acids formed in fermentation. Lactose hydrolysis by lactase can decrease lactose concentration that changes into glucose and galactose together with the process of lactic acid formation in the fermentation medium (Shafiee *et al*. 2010). Both types of milk showed elevated lactic acid levels at 5 and 7.5% starter levels. In line with research conducted by (Santo *et al*. 2012; Mortazavian and Sohrabvandi 2006) states that the amount of bacteria determines the amount of lactic acid formed in milk, the accumulation of lactic acid that develops faster when more bacteria are present. However goat's milk has higher levels of lactic acid at each starter level of *L. plantarum*. In stable pH the growth of lactic acid bacteria is more optimal because it is not exposed to acidity shock (Santo *et al*. 2012).

Figure 1c explains that the type of milk and starter level have a very significant effect (P <0.01) on protein content of fermented milk. The content of goat milk protein is higher at each starter level used. Protein content is determined by the quality of fresh milk as its basic ingredients, the higher the milk protein the better the quality of the yogurt produced.

The increase in the number of LAB cells occurs during the fermentation process, due to the nutrients rich growth media (Figure 1d). A very rapid exponential growth phase supported by the availability of nutrients (Salle, 1982). Furthermore, (Malessha., 2010) also explains that the incubation period, pH, moisture and nutrients greatly affect the growth of LAB.

Conclusion

Utilization of *L. plantarum* as a starter for fermented milk is more effective and better in goat milk with good results on pH values, lactic acid level, protein content and total LAB.

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The Effect of Curing on Physicochemical Properties, Nitrite Residu, Malonaldehyde Level and Browning of Dendeng

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Abstract

The purpose of this research is to see the effect of curing and non-curing treatment on physical, chemical and physicochemical characteristics of dendeng. Each treatment using beef as much as 500 g and each treatment made 3 times repetition. Beef with curing treatment was soaked for 12 hours in a solution of sodium nitrite (NaNO2) as much as 75 mg / 500 ml of water. The variables observed were browning intensity, MDA level, nitrite residue water content, aw, temperature and pH. Physicochemical quality data, browning intensity and MDA content were analyzed by using t-student test, and presented descriptively. Curing treatment did not cause changes in physicochemical component (P>0.05), but can decrease MDA level and browning intensity (P<0.05) on dendeng. The conclusion of this research is curing treatment on dendeng able to inhibit oxidation and browning reactions without affecting physicochemical properties in dendeng.

Keywords: Browning, Curing, dendeng, MDA content, Physicochemical properties

Introduction

Processing is an important key in livestock-derived food as it is highly perishable. One of perishable food derived from livestock is meat. Proper processing is necessary to extend the shelf-life of meat by inhibiting the growth of pathogenic and spoilage bacteria, besides produce product with distinctive characterisrics. One of processed meat products known in Indonesia is dendeng.

Dendeng can be made from various types of meat such as beef, chicken, goat or pork, but the most common in Indonesia is beef. Dendeng is a food product in the form of slab made from slices or fresh beef cattle derived from fresh or frozen beef that has been seasoned and dried (BNI, 2013). Food additives that commonly used in dendeng is sodium nitrate/nitrite with a process called curing. Curing is one of the ripening process by using salt (nitrate) which is usually in the form of $NaNO_2$ or $NaNO_3$ in order to preserve the meat and to maintain the color of the meat (Suryati *et al.*, 2012). The addition of nitrites to the process of making dendeng has the function to stabilize the color of cured meat, act as an antibacterial agent and slower oxidative rancidity (Martin, 2001). The reaction that occurs during curing process is the interaction between nitrite compounds and myoglobin which forms methyoglobin. The methyoglobin is red brown and then reduced to form nitrosomyoglobin compounds during the heating process. Nitrosomioglobin plays a role in the formation of bright red color in curing meat (Chasco *et al*., 1996; Honikel, 2008).

Curing process can affect the characteristics of dendeng such as physicochemical properties, browning intensity, nitrite residues and malonaldehyde levels. Nitrites can react with secondary and tertiary amines contained in the flesh to form carcinogenic compounds nitrosamine (Lawrie, 2003). Toxic and mutagenic compounds such as nitrosamine and malonaldehyde (MDA) are very likely to form on dendeng due to oxidation reactions (Suryati *et al*., 2014). Therefore, this study was conducted to evaulate the effect of curing and non-curing treatment on physicochemical properties, browning intensity, nitrite residue and malonaldehyde content of dendeng.

Materials and Methods

Dendeng was produced using procedure described by Suryati *et al*. (2014). The formulas of spices consist of 12.5 g salt, 42.5 g galangal, 5 g coriander, 25 g garlic, 82.5 brown sugar, 82.5 g sugar, 1.5 g tamarind and 1.5 g pepper that brought from local market, Bogor, Indonesia. Beef was obtained from Ciampea traditional Market, Bogor, Indonesia. Beef was sliced about 5 mm thickness and then soaked in sodium nitrite solution for 12 h at room temperature for curing treatments. Then beef was mixed with spices and held for 12 h. The beef was finally dried using oven at 60 ^{o}C for 3 h, and it was reversed in such a way that the bottom side is in up position, and the drying was continued at 70^{o}C for 5 h. Dried beef was fried and stored at refrigerator until analysis.

Physicochemical properties of dendeng was determined for its moisture content, pH and water activity. Moisture content of dendeng was determined by oven drying at 105^{o}C according to AOAC (2005). The pH of dendeng was measured using pH meter Hanna HI 99163 (Romania, Europe). Water activity of dendeng was measured using aw meter Novasina ms-1 (Swiss). Browning intensity was analysed according to the method described by Yilmaz and Toledo (2005). Amount of 0.5 g sample were homogenized with 10 mL of aquadest using vortex for 30 second, the mixture was centrifugated at 10.000 rpm, 4 ^{o}C, 30 minutes. The supernatant was read for its absorbance at λ 420 nm using spectrophotometer (GeneQuant 1300, Sweden). The intensity of absorbance showed the browning intensity of sample. Residual nitrite in dendeng was analysed according to the method described by AOAC (2005). The results were expressed as mg ntrite per kg of dendeng. Malonaldehyde analysis of dendeng was carried out using analysis of thiobarbituric acid reactive substances (TBARS) according to the method as described by Sorensen and Jorgensen (1996). TBARS analysis by spectrophotometer (GeneQuant 1300, Sweden) was done after 5 mL of sample distillate was reacted with 5 mL TBA 0.02 M and then incubated at 100°C for 40 min. Absorbance at λ 532 nm was measured using two replications for each sample. TBARS was expressed as mg of malonaldehyde (MDA) per kg of dendeng using TEP as a standard.

The experimental design used in this study was completely randomized design. Statistical analysis was performed for all measurement data using SAS version 9.1.3 using T-test (Mattjik and Sumertajaya, 2013). Significance level was determined at 5%.

Results and Discussion

Physicochemical properties

The results show that moisture content, pH and water activity of dendeng were not significantly affected by curing processed. Moisture content of dendeng obtained in this study were 14.47 % for cured dendeng and 12.5 % for non cured dendeng. Soeparno (2005) stated that moisture content of dendeng ranged from 8 to 15 %. Moisture content of dendeng in this study in accordance with Suryati *et al*. (2014) who obtained moisture content ranged from 8.93 to 15.53%. Moisture content of dendeng is mostly affected by method, time and temperature of drying process in oven. Since both curing and non curing dendeng in this study using the same method, time and temperature of drying, moisture content obtained was not significantly different. The pH values of dendeng in this study were 5.19 for cured dendeng and 5.46 for non cured dendeng. The pH values obtained are on the normal ranged according to Feiner (2006) who stated that pH of meat and meat product ranged from 4.6 to 6.4. Accroding to Soeparno (2005), pH value of meat product affected by pre-slaughter stress, type of animal, content of glycogen in muscle, enzyme activity, and drugs or hormone administration.

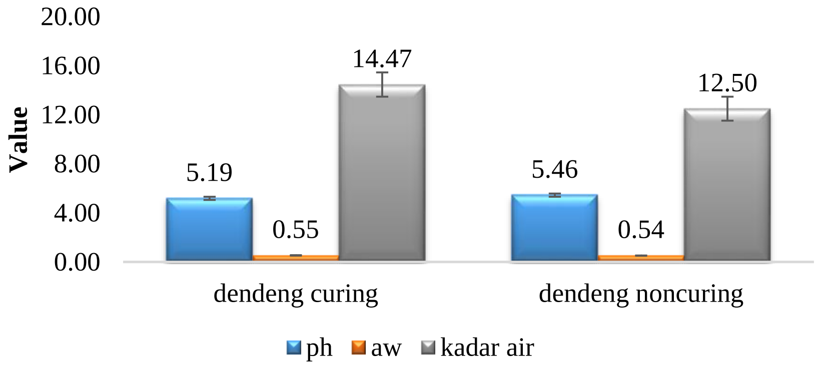

Figure 1. Physicochemical quality of dendeng with curing and non curing treatment)

Browning Intensity, Nitrite Residue Content and Malonaldehyde content

Results show that cured dendeng significantly has a lower browning intensity than non cured dendeng. Cured dendeng has a browning intensity value 0.08, meanwhile non cured dendeng 0.19. Honikel (2008) stated that final results of cured meat product is bright red color because of the reaction of curing process. The fixation of a desirable red color, shaded pink, is the most effect from nitrite addition (Cornforth and Jayasingh 2004). Thus, cured dendeng has a lower browning intensity than non cured dendeng. Brown-colour in dendeng occurs might be due to the non enzymatic browning reaction during production.

Nitrite is recognized as a potentially toxic compound. The issue of carcinogenic nitrosamines formed from nitrite in cured meat was a very serious concern. Ingested nitrate or nitrite under conditions that result in endogenous nitrosation is probably carcinogenic to humans (Group 2A) (Grosse *et al*. 2006). Results show that cured dendeng significantly has a higher nitrite residue than non cured dendeng. Cured dendeng contains 2.40 ppm meanwhile non cured dendeng contains 1.08 ppm. The presence of nitrite residue in non cured dendeng might due to the used of salt as a spice. Nitrite residue of dendeng in this study was still under maximum level (100 ppm) for meat product (Directive, 2006).

Malonaldehyde was produced in dendeng due to lipid oxidation that occurred during processing especially during drying and frying process that involved heating (Suryati *et al*. 2014). The results indicated that lipid oxidation potentially occurred in dendeng. Cured dendeng significantly has a lower malonaldehyde content than non cured dendeng. Cured dendeng contanins 3.88 ppm meanwhile non cured dendeng contains 4.98 ppm. The lower content of malonaldehyde in cured dendeng might be due to the presence of nitrite. Nitrite can acts as an antioxidant. Morrisey and Tichivagana (1984) found that low concentrations of nitrite (20 ppm) caused significant inhibition of lipid oxidation based on TBA test. Suggestion have been made that nitrite probably functons as an antioxidant by converting haem proteins to their catalytically inactive and stable nitric oxide haem proteins, as a metal chelator which ties up trace metals present in meat, by stabilizing the lipids per se in the muscle against oxidation and by the formation of nitroso-compounds in meat which possess antioxidative properties.

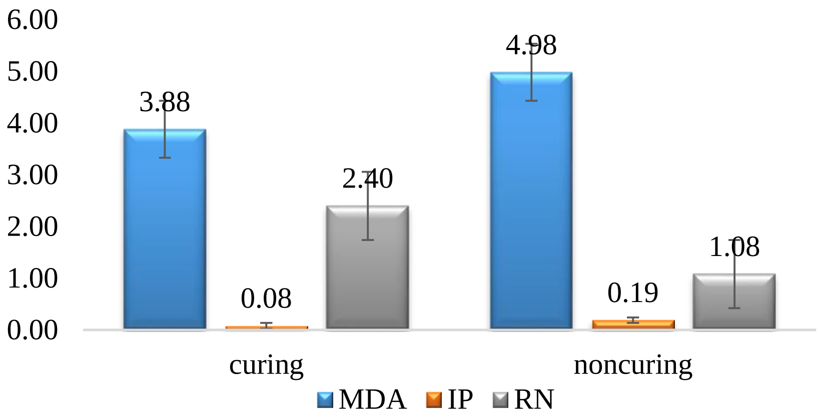

Figure 2. MDA level, brown intensity and nitrite residue of cured dendeng and non cured dendeng

Conclusions

Curing treatment using sodium nitrite in the production of dendeng is recommended, because it produces dendeng with good physicochemical properties, nitrite residue that is still below the maximum limit, brown intensity and malonaldehyde level that significantly lower than dendeng without curing process.

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Lactobacillus Casei 2.12 Isolated from Ettawa Goat Milk Showed Milk Clotting Activity

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Abstract

Lactobacillus casei 2.12 isolated from Ettawa goat milk has the potential to produce rennin like protease (RLP). Screening is done gradually using a modified method of skim milk for and milk clotting activity test. The results showed that *L casei* 2.12 had hydrolysis characteristic and casein precipitation with 1.5 cm diameter clotting zone in the Skim Milk Agar (SMA) test. The crude extract enzyme produced by this isolate showed milk clotting activity (MCA) of 18 SU/ mL, so RLP produced potential as an alternative to rennin replacement in cheese making process.

Keywords: lactobacillus, milk clotting activity, rennin-like protease

Introduction

Lactic acid bacteria in the fermentation of food in addition to providing a distinctive flavor, this bacteria also extend durability due to its ability to produce metabolite products that can inhibit the growth of bacterial decay and bacterial pathogens. The antimicrobial properties possessed by lactic acid bacteria are due to their suitable conditions with the available nutrients, which can lead to competition with other bacteria especially pathogenic bacteria (Suryono, 2003). Lactic acid bacteria (LAB) produce lactic acid as the end of sugar metabolism (carbohydrate). Lactic acid produced in such a way will decrease the pH value of its growth environment and cause a sour taste.

Lactic acid bacteria can be isolated from various food products including Ettawa goat milk. Indonesia has germplasm of microorganisms that are priceless. Lactic acid bacteria (LAB) "friendly bacteria" has great potential in the development of biotechnology-based food industry. Some bioactive components (bioactive compounds) are produced by these bacteria, such as protease enzymes. The protease enzyme that has the characteristics of milk coagulation has the potential as an alternative to rennin in cheese making. A protease enzyme that has characteristics such as rennin is known as rennin like protease (RLP). RLP produced from lactic acid bacteria has not been widely produced.

Efforts to explore potential isolates of lactic acid bacteria in producing milk clotting enzymes through the screening stage. Screening of bacterial isolates in the early stages can use Agar Media with the addition of casein substrate. This method has been widely used to obtain potential isolates in extracellular proteases. Some researchers used casein substrates for the screening of protease-producing microbes (Verma *et a*l. 2001; Chi *et al*. 2007; Sindhu *et al*, 2009). Furthermore, to know the activity of enzyme in coagulation Milk Clotting Activity (MCA) milk is using casein substrate (in $CaCl_2$ and incubated for 5 minutes at 35 ºC, and then rennin enzyme extract added). The time required since enzyme extract added until coagulation casein showed enzyme activity (Ottani *et al*., 1991). The screenning steps taken to obtain potential microbes resulted in PLR through MCA testing (Milk Clotting Activity) and PA (Proteolytic Activity) (El-Tanboly *et al*., 2013). a simple method for determining the ability of microbial isolates to produce extracellular protease enzymes is more quantified in terms of the hydrolysis zone diameter of the casein substrate (clear zone) (Wendry *et al*., 2015). This study aims to determine the potential isolates of *Lactobacillus casei* 2.12 (Wendry *et al*, 2016) that have been isolated from Ettawa goat milk in producing extracellular protease enzymes that have the ability to agglomerate milk.

Methods

Screening Skim Milk Agar

L casei 2.12 was screened using MRS (deMan Rogosa and Sharpe) agar medium containing 3% skim. *L casei* 2.12 colonies capable of coagulating casein.

Screenning Block Agar

1. Media A: Isolate *L casei* 2.12 cultured uniformly (swab) on MRSA incubation media 37 ºC, 24 hours.
2. Media B: Prepare MRSA that has been added substrate (casein) 2-3 percent and make a plug hole.
3. Create a plug on Media A that has been overgrown isolate evenly and move on the hole plug in Media B such as installing Block Agar, then incubated 37 ºC for 24 hours and measure the clear zone and the resulting clotting zone (cm)

Milk Clotting Activity (MCA)

The milk clotting activity (MCA) test was carried out using method described by El-Taboly *et al*. (2013). As much as 2.5 mL of the substrate (10% skim milk in 10 mM $CaCl_2$) was incubated for 5 min at 37 °C followed by adding of 0.5 mL enzyme extract. Mesurement of time length was started from the addition of enzyme extract to the formation of the first particles. MCA was calculated as: $SU = 2400 \times 5 \times D/T \times 0.5$ (1) as described by Kawai and Mukai (1970), in which T is milk-clotting time (s), and D is dilution of the enzyme. One Soxhlet unit (SU) of milk-clotting activity was defined as the amount of enzyme required for clot formation of 1 mL of substrate in 40 min at 35 °C.

Results and Discussion

Morphological Characteristics of L casei 2.12

Characteristic of clotting around the LAB colony is an indication of the protease produced having activity capable of coagulating casein. The indication of clotting zone around the LAB colony provides a strong initial indication that the bacterial isolates are capable of producing extracellular proteases that have the milk clotting activity. Furthermore, LAB isolates showing the characteristics of clotting zone then performed further testing to observe the activity with modification of SMA method (Skim Milk Agar). The *L casei* 2.12 colony exhibited protein hydrolisis circle around with clotting zone on MRSA skim agar (Fig.1.B) indicating milk clotting activity. The *L casei* 2.12 cell were 1.83 µm length.

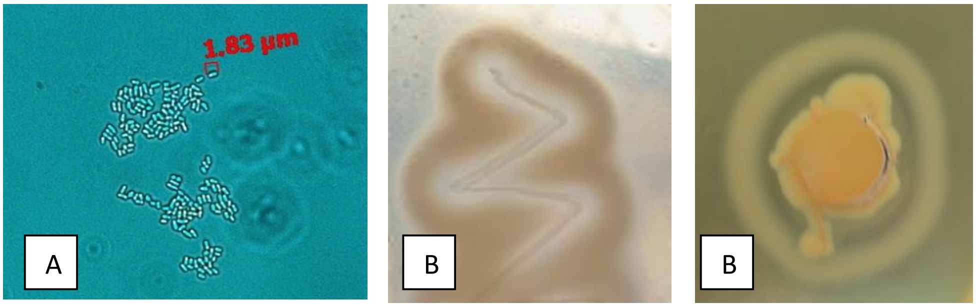

Fig.1. The hydrolisis and clotting zone of single colony *L casei* 2.12 on MRS skim milk agar (B) and micrographic characteristic (1000x) (A)

To obtain the quantification of coagulation activity of casein on MRSA then modification of SMA method and obtained clotting diameter (clotting zone). Clotting zone measurement results are presented in Table 1. Based on the results of clotting zone measurements showed that isolate 2.12 has the diameter of 1.5 cm. This shows that the isolates of LAB are potential to produce RLP. Modification of SMA method by using Blocks In order to provide an initial description of potential LAB isolates in producing RLP. The magnitude of the clotting zone diameter gives an indication that the RLP has a high clotting activity as well. So that modification of this method can be used as one of the approaches in screening microbial potential in generating RLP and early indication of MCA activity. The characteristics of LAB isolates with the ability to produce RLP are similar to those of *Paenibacillus* spp. BD3526 strain showing clear zone around colony and precipitation zone (Hang F *et al*., 2016).

Milk Clotting Activity (Kumara et al., 2005)

BAL isolates which have characteristic of clotting zone on SMA test and SMA modification (Block Agar) that is isolate 2.12 at next stage is done by Milk Clotting Activity (MCA) activity from RLP resulted. In the MCA testing, the production of crude enzyme from RLP of BAL isolates was performed. Production using MRS broth at incubation temperature 37 ºC for 24 hours. Crude enzyme RLP is obtained by centrifugation of 10,000 g for 30 minutes at 40C, the supernatant is a crude enzyme. Some researchers in RLP's potential screenning approach by conducting MCA testing directly from identified isolates.

MCA testing is a quantitative quantitative test of quantitative enzyme activity. The main factor that determines the value of MCA is the speed of milk clotting (skim). The faster the coagulation occurs, the higher the MCA value. A total of 5 ml (10% skim solution in 0.01 M $CaCl_2$.2H2O) added enzyme to be tested as much as 0.5 ml. The incubation at 37 ° C at the waterbath and the timing of curd (t) is formed.

Fig.2. Milk clotting activity of RLP from *L casei* 2.12 and curd products

In MCA testing the factor that becomes the measure is the clotting velocity (t) in second (seconds). If we compare the clotting characteristics because the RLP activity is different from the coagulation caused by acid. One Unit (SU) is 1 Soxhlet Unit (SU) = number of enzymes needed to coagulate 1 ml of substrate for 40 min at 35ºC.

Table.1. Milk clotting activity and clotting zone

No	Isolate	Sources	*Clotting zone* (cm)	Milk Clotting Activity (SU/mL)
1.	2.12	Ettawa Goat Milk	1.5	18

RLP from *Enterococcus faecium* 1.15 isolated from Bakasam exhibited milk clotting activity (MCA) of 20 SU / mL (Wendry *et al.*, 2017). Several researchers conducted a screenning approach by directly testing the MCA crude enzyme activity resulting from 19 identified isolates (El-Tanboly ES et al., 2013). As a comparison reported *Mucor pusillus* QM436 produces crude rennin like protease with MCA 50 SU / ml (El-Tanboly *et al*., 2013). The rough enzymes produced by *Bacillus stearothermophilus* (MCA) of 24.23 SU / ml, and *Bacillus subtilis* and MTCC 10422 have the potential to cause curd casein (Narwal *et al*., 2016).

Conclusion

Lactobacillus casei 2.12 isolated from Ettawa goat milk has the potential to produce rennin like protease (RLP) showed milk clotting activity (MCA) of 18 SU/ mL, so RLP produced potential as an alternative to rennin replacement in cheese making process.

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Chemical Quality and Sensory Evaluation of Salted Eggs with Addition of Black Grass Jelly (*Mesona palustris BL.*)

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Abstract

The objective of this research was to determine the best percentage of addition black grass jelly to improve the quality of salted eggs in fat content, free fatty acid (FFA), and sensory evaluation. The method used was laboratory experimental with Completely Randomized Design with five treatments and three replications that is (P0) without black grass jelly, (P1) 2% black grass jelly, (P2) 4% black grass jelly (P3) 6% black grass jelly, (P4) 8% black grass jelly addition. The variables measured were fat content, free fatty acid content (FFA) and sensory evaluation. The data were analyzed by Analysis of Variance (ANOVA) and if there were significant different would be continued by Duncan's Multiple Range Test (DMRT). The result showed that using of black grass jelly gave highly significant different effect ($P<0.01$) on yolk fat and free fatty acid, gave significant different effect ($P<0.05$) on color and taste, however, didn't give significant different effect ($P>0.05$) on aroma. It can be concluded that salted egg with the used 8% black grass jelly gave the best quality salted eggs with fat content 38.40%, free fatty acid (FFA) 0.96%, and score color 4.27, taste 4.53, and aroma 4.13.

Keywords: Salted egg, black grass jelly, free fatty acid, sensory evaluation

Introduction

Duck eggs are one of the livestock food products with high nutritional value and easily digested. Duck eggs are easily damaged, short shelf life and have a fishy odor so that further processing is needed to overcome these weaknesses. One way that can be done to improve egg storage is by preservation technology through marinating. Egg salting can be done in two ways. It was soaking the eggs in the salt solution (wet method) or wrapping the eggs with dough from a mixture of salt, brick, and ash (dry method). Each method has advantages and disadvantages. The wet method has the excess of salt penetration into the eggs are faster, but the weakness of the egg albumen becomes wetter. Instead, the dry method of penetrating salt into the eggs is slower, but the egg albumen becomes more dense (Lukman, 2008). Salted eggs have a higher fat content than fresh eggs. Egg marinating technology can be enriched with the addition of black grass jelly to lower the fat content of salted eggs.

Black grass jelly has a multifunction in the health field. Black grass jelly contains bioactive compounds were flavonoids, polyphenols, and saponins. The phenol compounds contained in black grass jelly act as antioxidants and the effect of scavenging on free radicals to treat certain diseases such as internal heat, fever, abdominal pain, high blood pressure and can serve as an anticancer (Maslukhah, Widyaningsih, Waziiroh, Wijayanti and Sriherfyna, 2016). There is limited research on the production of salted eggs with the addition of black grass jelly (*Mesona palustris BL*). Therefore, the objective of this research was to determine the effect of black grass jelly addition on fat content, free fatty acid content and sensory evaluation of salted eggs.

Materials and Methods

The material used in the research was 180 days old duck eggs with egg weight of 60-70 g and greenish-brown colored from duck farm located in Ampeldento village, Karangploso, Malang. The materials used to make salted eggs were duck eggs, salt, brick powder, water and black grass jelly (*Mesona palustris BL.*) of 1200g from the traditional market, Malang. The materials used for the analysis were fat solvents (Hexane), 95% alcohol, pp indicator, and 0.1N NaOH. The equipment to make salted eggs was a portable digital Quatro type Macs scale, basin, bucket, sandpaper, pot, Rinnai gas stove. The equipment used for the analysis was the portable Quatro type portable digital scales Macs, filter paper, Kirin KBO-90M electrical oven, Soxhlet, Mitrakultiva volumetric flask, Erlenmeyer, burette, measuring pipette, plastic, label paper and ballpoint pen. The method used was laboratory experimental with Completely Randomized Design with 5 treatments and 3 replications. The salted eggs production by dry salt method according to Lesmayati and Rohaeni (2014) is washed duck eggs cleanly, scrub the surface of eggshell with sandpaper slowly, made paste dough from mixture of powder brick or ash, salt and a little water, added black grass jelly which has been smoothed with a percentage of 0%, 2%, 4%, 6%, 8% of the total dough ingredients, duck eggs wrapped with the dough evenly paste, done curing for 10 days at room temperature 25°C, washed eggs clean and then steamed for 45 minutes, analyzed fat content, free fatty acid (FFA) and sensory evaluation (color, flavor and aroma).The variables measured in this research were fat content (AOAC,2005), free fatty acid content (FFA) and sensory evaluation. Testing of sensory evaluation is done through the assessment panelists of the product (Lawless and Heymann, 2010): Presented samples tested randomly, coded in each sample, panelists sampled samples that have been provided, panelists fill the assessment sheet of color, taste and the scents of each sample in accordance with the code, assessment data from all panelists processed statistically. The data were analyzed by Analysis of Variance (ANOVA) and if there were significant different would be continued by Duncan’s Multiple Range Test (DMRT).

Results and Discussion

The result showed that using of black grass jelly gave highly significant different effect ($P<0.01$) on yolk fat and free fatty acid, gave significant different effect (P<0.05) on color and taste, however, didn't give significant different effect (P>0.05) on aroma. The average value of the fat content is shown in Table 1.

Table 1. The average value of the fat content and FFA content with the addition of black grass jelly

Treatment	Fat Content (%)	FFA Content (%)
P4	$38.40^{a} \pm 0.64$	$0.96^{a} \pm 0.09$
P3	$41.28^{b} \pm 0.49$	$1.00^{a} \pm 0.12$
P2	$42.50^{b} \pm 0.82$	$1.35^{ab} \pm 0.10$
P1	$43.52^{b} \pm 0.86$	$1.82^{ab} \pm 0.09$
P0	$45.33^{c} \pm 0.57$	$2.28^{b} \pm 0.13$

Description: ^{a,b,c} Different superscripts in the same column show highly significant different effect (P<0,01). P0 = without the addition of black grass jelly (control), P1 = Addition of 2% black grass jelly, P2 = Addition of 4% black grass jelly, P3 = Addition of 6% black grass jelly, P4 = Addition of 8% black grass jelly from the total dough ingredient.

The highest fat content value was obtained at treatment P0 that is 45.33 without the addition of black grass jelly, while the lowest fat content value was obtained at the treatment of P4 that is 38.40 with the addition of black grass jelly as much as 8%. Decreased levels of salty egg yolks are caused by the presence of polyphenol compounds in the leaves of black grass jelly that can bind the fat so that the fat content decreases. This is in accordance with the opinion of Hidayati and Sulistyawati, (2015) which states that polyphenol compounds can bind the fat contained in salted eggs so that the fat content in salted eggs will be reduced. Reduced levels of fat in salted eggs will be followed by reduced cholesterol levels in salted eggs. The statement is also supported by Septiana et al. (2012) which states that the use of medicinal plants containing high antioxidants as solvents in egg salting medium can increase lipase enzyme activity. Lipase enzyme activity will convert fat to fatty acid and glycerol so as to decrease fat content in the salted egg.

The free fatty acid content of salted eggs with the addition of black grass jelly showed a decrease with an average value ranging from 0.96 to 2.28. Polyphenol compounds in black grass jelly can prevent the process of hydrolysis in fat so that free fatty acid content will decrease. This is in accordance with the statement of Novia et al. (2012) that phenol is a compound that acts as an antioxidant. Phenol compounds capable of stabilizing free radicals that can inhibit the process of fat oxidation and prevent loss of flavor caused by fat oxidation.

The Effect of Addition Black Grass Jelly to The Sensory Evaluation (Color, Taste, Aroma) of Salted egg

The result of variance analysis showed that the addition of black grass jelly with different concentration gave significant different effect (P<0.05) on color and flavor, however, didn't give significant different effect (P>0.05) on aroma. The average yolk color score, taste and aroma of salted egg yolk is shown in Table 2.

Table 2. The average score of the yolk color, taste and aroma of salted egg with the addition of black grass jelly

Treatment	Color	Taste	Aroma
P0	$3.33^{a} \pm 1.01$	$3.47^{a} \pm 0.81$	3.13 ± 0.88
P1	$3.60^{a} \pm 0.87$	$3.73^{a} \pm 1.00$	3.40 ± 1.14
P2	$3.93^{a} \pm 0.85$	$4.07^{a} \pm 0.85$	3.53 ± 1.15
P3	$4.07^{b} \pm 0.77$	$4.20^{b} \pm 0.75$	3.87 ± 1.09
P4	$4.27^{b} \pm 0.93$	$4.53^{b} \pm 0.62$	4.13 ± 0.96

Description: ^{a,b} Different superscripts in the same column show a significantly different effect ($P<0.05$)

The highest score obtained in treatment P4 is 4.27 (yellow) with the addition of black grass jelly as much as 8%, while the lowest score obtained at treatment P0 is 3.33 (slightly yellow) without the addition of black grass jelly. The increase of yellow color value in the salted egg is caused by the increasing of black grass jelly concentration. The content of chlorophyll contained in black grass jelly will enter into the eggs by diffusion through the pores of the egg so the egg yolk color is darkened. This is in accordance with the explanation Yahya et al. (2014) which states that the panelists prefer the yolk color that resembles orange. The color is caused by the penetration of the leaf dye into the eggs by the diffusion of egg pores. The highest score taste was obtained at the P4 treatment of 4.53 (strong) with the addition of black grass jelly as much as 8%, while the lowest score obtained at treatment P0 was 3.47 (rather like) without the addition of black grass jelly. Salted eggs generally have flavor with different salinity level, which is caused by the difference of salt concentration and length of curing. This is supported by the explanation Black grass jelly contains saponins which have a bitter taste, but with a low percentage of black grass jelly, it will not cause a bitter taste in salted eggs. While in research conducted by Kartina (2017) the use of soursop leaf extract in making salted eggs with percentage up to 50% produce bitter taste which increasingly compared with the percentage of 25% soursop leaf. The taste is caused by the presence of saponin compounds that are bitter.

The result of variance analysis showed that the addition of black grass jelly with different concentration didn't give significant different effect ($P> 0.01$) on aroma. Panelists prefer the aroma of salted eggs with the addition of 8% black grass jelly. The presence of phenol compounds contained in the leaves of black grass jelly can reduce the fishy odor. This is in accordance with the statement Apendi et al. (2013) which states that phenol is a compound that role in the formation aroma of a product, siringiol content on the phenol component is able to reduce the fishy odor on the resulting product. Lesmayati and Rohaeni (2014) added that during the process of egg salting, the duration of curing time will affect the aroma produced in salted egg products. The longer of curing time resulting increasing aroma favored by the panelists, this is because the fishy odor will decrease.

Conclusion

It could be concluded that the use of black grass jelly as much as 8% gave the best quality salted eggs with fat content 38.40%, free fatty acid content (FFA) 0.96%, score color 4.27 (yellow), flavor 4.53 (very like) and aroma 4.13 (likes).

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FULL PAPERS

PARALLEL SESSIONS

SUBTHEME: FEED, NUTRITION, & NUTRIGENOMIC

Milk Production and Feed Efficiency of Dairy Cow Fed Concentrate Containing *Durio zibethinus* Peel Flour Fermented with *Pleurotus ostreatus*

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Abstract

The aim of this study was to evaluate diet with concentrate containing *Durio zibethinus* peel flour fermented with Pleurotus ostreatus on milk yield and feed efficiency of dairy cows. The fermented Durio zibethinus peel flour with *Pleurotus ostreatus* has been applied to improve its nutrient content. There were four different ratios of *Durio zibethinus* peel flour fermented with *Pleurotus ostreatus* and rice bran in concentrate. Those were FD 0/30, FD 10/20, FD 20/10, and FD 30/0. Averages of milk yields were 12.38, 9.12, 11.52, 10.49 kg/d, for each treatment, respectively. Dry matter intakes were 14.43, 14.39, 14.16, 14.04 kg/d, respectively. The feed efficiencies of milk production toward dry matter intake were 0.86, 0.63, 0.81, and 0.75, respectively. There was a decrease of 1.89 kg/day of milk production between high rice brand and high fermented *Durio zibethinus* peel flour concentrate provided in dairy cows. In conclusion, diet containing fermented *Durio zibethinus* peel flour concentrate 10% and rice straw 20% (FD 10/20) showed the lowest milk yield and feed efficiency, while FD 20/10 was better.

Keywords: Durio zibethinus peel, dairy cow milk, *Pleurotus ostreatus*

Introduction

In an effort of utilizing an abundant amount of *Durio zibethinus* by-product, their inner skin peel could be potentially converted as feed resources. In Bengkulu Province, its harvest is around 5. 10^3 ton/yr, with its peel waste equals to about 3. 10^3 ton/yr or 0.5 10^3 ton/yr durio peel flour (Sulistyowati *et al*, 2016). However, it needs a combination of treatments (flour and fermentation with *Pleurotus ostreatus*) to improve its nutrient content. This fermented Durio then can be used as an ingredient with a certain level in concentrate provided in diet for dairy cows which then is expected to be able to increase milk production and milk efficiency.

Being fermented with *Pleurotus ostreatus*, *Durio zibethinus* peel flour was reported to get improved its nutrient contents (Sucianti *et al*., 2015) and Sulistyowati *et al*. (2016). Badarina *et al*. (2013) reported that coffee husk fermented *Pleurotus ostratus improved crude* protein from 10.36 to 12.14%, decreased hemicelulosa, lignin, tanin and cafein. Utilizing high starch in diet of dairy cow was reported to have higher milk yield than it was with low starch diet in early and late lactation dairy cow (Piccioli-Cappelli *et al*., 2014). The use of supplements, such as yeast will improve nutrient metabolism as reported in some results. Supplementation of 2% yeast in the concentrate was reported to improve milk production in dairy goat (Sulistyowati *et al*., 2014), increased milk yield and feed efficiency of dairy cow (Neal *et al*., 2014).

Based on these results, a research has been conducted to evaluate the use of *Durio zibethinus* peel flour fermented with *Pleurotus ostreatus* in substitution with rice bran in concentrate in diet on milk production and feed efficiency of dairy cow.

Methodology

Preparation of fermented *Durio zibethinus* peel flour concentrate was started from taking off the spiky outer peel of the fruit, then slicing thinly the inner skin peel, drying it under the sun until it was about 10-15% moisture content, finally ground it coarsely. The next step was fermentation using *Pleurotus ostreatus*. Preparation of 600g/bag log containing of 85% *Durio zibethinus* peel flour, 13% rice bran, and 2% CaCO3 were mixed with 90% water then composted for 24 hours, after that sterilized in 120^0C for 4 hours, then inoculated with 0.5% of *Pleurotus ostreatus* starter. After two days, the inoculation seemed do not work. This might be due to methane gas-like coming out of the bag. Then, we redid the process by taking out the bag logs, put them in the deep water for four hours, then composting overnight, sterilized, then inoculated with *P. ostreatus* for two weeks. The fermentation process was ended by taking out the substrate from the bag logs then air dried for one day before using it as an ingredient in the concentrate.

Concentrate containing fermented *Durio zibethinus* peel flour was prepared according to the formula in Table 1. *Curcuma xanthorrhiza* Roxb flour and yeast were prepared as reported by Sulistyowati *et al*. (2013). Experimental design used in this research was 4 x 4 Latin Square with four cows, four treatments, and four periods, 14 days each period. Milk production was recorded daily in the morning and afternoon milkings.

The treatments were the inclusion of fermented *Durio zibethinus* (abbreviated as FD) peel flour in different ratios to rice bran. They were no (0%) fermented durio and 30% rice bran (FD0/30), 10% fermented durio and 20% rice bran (FD10/20), 20% fermented durio and 10% rice bran (FD20/10), and 30% fermented durio and 0% rice bran (FD30/0).

The average of body weight of Fries Holland (FH) dairy cows was 444.81 ± 17.21 kg with 4- 5 months of lactation with average milk production before treatment was 13.6 ± 1.67 kg/d. Diets were consisted of fermented Durio concentrate (11.35%), farm concentrate (24.12%), corn hay (25.46%), King Grass (31.28%), and rice straw (7.79%). The fermented concentrate was provided 2 kg/d and farm concentrate was given 4 kg/d, served in morning and afternoon feedings. These fractions in diet equaled to 64.52% of forage and 35.48% concentrate. The feed left over was weighted daily in the morning. Their dry matter contents were listed in Table 2.

Table 1. Composition of diet containing concentrate fermented *Durio zibehinus* peel flour

Ingredients (%)	FD0/30	FD10/20	FD20/10	FD30/0
Rice bran	30	20	10	0
Fermented durio peel flour	0	10	20	30
Ground corn	30	30	30	30
Soybean	32	32	32	32
Palm oil	3.5	3.5	3.5	3.5
Mineral mix	0.5	0.5	0.5	0.5
Curcuma xanthorrhiza Roxb	1.5	1.5	1.5	1.5
Yeast	1	1	1	1
NaCl	0.5	0.5	0.5	0.5
CaCO3	0.5	0.5	0.5	0.5
TSP	0.5	0.5	0.5	0.5

Table 2. Dry matter content (DM) of diet containing concentrate fermented *Durio zibehinus* peel flour

Nutrient Content (%)	FD0/30	FD10/20	FD20/10	FD30/0
DM of fermented Durio concentrate	89.74	87.72	76.42	70.58
DM of on farm concentrate	85.88	85.88	85.88	85.88
DM of corn hay	20.14	20.14	20.14	20.14
DM of King Grass	24.77	24.77	24.77	24.77
DM of rice straw	12.37	12.37	12.37	12.37

Results and Discussion

Productive performance, dry matter intake, milk production, and feed efficiency, of lactating dairy cows fed diet with concentrate containing fermented *Durio zibehinus* peel flour are listed on Table 3. Dry matter intake (DMI) is decreasing with increasing fermented *Durio zibehinus* peel flour added in the concentrate. This might be due to the fact that the fermented Durio peel flour is decreasing in crude fiber so that the total intake of dry matter is decreasing with increasing the flour, even though the quantity was not that much (0.39 kg/d). With the body weight less than 500 kg and milk production less than 15 kg/d, these DMI were higher than the recommended one (2.8%) in NRC (1989).

Milk yield, ECM, 3.5% FCM, and feed efficiency (ratio of milk yield, ECM, 3.5% FCM to DMI) were found significantly the lowest in FD 10/20, while in FD 0/30 or no fermented FD was being the highest with 3.26 kg/d difference, respectively. However, these parameters are increasing with increasing FD20/10 and FD30/0, that there was 1.89 kg/d difference, respectively. This performance is quite interesting as rice straw supposed to have lower nutrient contents than those of fermented concentrate.

Table 3. Dry matter intake, milk production, and feed efficiency of lactating dairy cows fed diet with concentrate containing fermented *Durio zibehinus* peel flour

Variables	FD0/30	FD10/20	FD20/10	FD30/0
Dry matter intake (DMI), kg/d	14.43	14.39	14.16	14.04
Body weight (BW), kg	436.81	457.96	460.1	426.36
DMI, % BW	3.30	3.14	3.08	3.31
Milk yield, kg/d	12.38[a]	9.12[b]	11.52[ab]	10.49[b]
ECM, kg/d	13.79 [a]	9.60 [b]	13.15 [ab]	11.53 [b]
3.5% FCM, kg/d	14.08 [a]	9.69 [c]	13.56 [ab]	11.71[bc]
Feed efficiency:				
Milk yield/DMI	0.86 [a]	0.63 [c]	0.81 [abc]	0.75[bc]
ECM/DMI	0.96 [a]	0.67[c]	0.93[ab]	0.82[bc]
FCM/DMI	0.98[a]	0.67 [c]	0.96 [ab]	0.83 [bc]

Formulas: [1]ECM = [(0.327 x kg of milk) + (12.95 x kg of milk fat) + (7.20 x kg of milk protein)] according to Tyrrell and Reid (1965); [2] 3.5% FCM = [(0.4324 x kg of milk) + (16.216 x kg of milk protein)] according to Boerman *et al*. (2014); Means with different superscript, showed different very significantly (P<0.01).

Other research result with corn oil (0.7- 2.8%) on antioxidant supplementations showed that the dry matter intakes were 29.9 vs 27.8 kg/d, respectively with higher milk production and higher feed efficiency (1.49) in lower corn oil supplementation (Boerman *et al*., 2014). This suggested that increasing corn oil addition could decrease intakes, as the density of the diet might be higher. As of the palm oil supplemented in this research was much higher (4%), this might cause lower intakes, milk yield and milk efficiency.

As it is in this fermented Durio- concentrate that yeast was supplemented as an effort to improve nutrient metabolism; other research result reported that supplementation of yeast in Alfalfa based diet was reported to increase milk yield (1.4 kg/d) compared to those in control with higher feed efficiency (1.55) (Neal *et al*., 2014). However, dry matter intake with dry *Saccharomyces cereviseae* supplementation in low and high forage diets remained stable about 28.4- 28.5 kg/d (AlZahal *et al*., 2014).

Feed efficiency of alfalfa hay diet was reported higher (1.31) than it was in rice straw diet (1.16) as reported by Wang *et al*. (2014). In our diet that also consisted of rice straw, the feed efficiency were much lower compared to others, that milk yield/DMI (0.63), ECM/DMI (0.67), and FCM/DMI (0.67) found in fermented Durio peel flour 10% and rice straw 20%.

Conclusion

Based on the results, diet containing fermented *Durio zibethinus* peel flour concentrate 10% and rice straw 20% produced the lowest milk yield and feed efficiency, while fermented *Durio zibethinus* peel flour concentrate 10% and rice straw 20% was improved in these variables.

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The Improvement of Concentrate Diet Quality on the Lactating PE Goat Health

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Abstract

The aim of this research was to evaluate the improvement of nutrient status of PE goats and its influence on the goat health. As much as 10 lactating PE goats were used in this research. All the goats suffered subclinical mastitis. The goats were fed by the farmer the basal diet comprise with Gajah grasses (60%) and the initial concentrate (40%) previously. The initial concentrate was only consist of soybean wastes meal. The more nutritious concentrate diet were made from soybean wastes meal (34,88%), coconut wastes meal (23,26%), rice bran (23,26%), cassava wastes (11,63%) and crude palm oil (6,97%). Feeding trial lasted for 60 days consisted of the first 30 days when the goat fed with the initial concentrate (soybean wastes meal) and the second 30 days that was the time for the nutritious concentrate feeding. The result showed that there were positive effects to the health goat from nutrient improvement status. There were the improvement from their blood profile status and the decreasing of the somatic cell count after feeding the more nutritious concentrate diet.

Keywords: improvement, nutrient, health, PE goat

Introduction

The shift periodes from gestation, calving and suckling caused physiological stress to lactating animals. The physiological stress decreased the immunity of the body to the diseases attack (Larson 1985). Several factors need to be controlled to prevent the diseases, they were the animals, feeds and environmental hygiene. One of the diseases that often suffered the dairy animals is subclinical mastitis. The subclinical mastitis is one of the main problem on dairy farm caused losses such as decreased milk production, the removal of milk, maintenance cost, medical cost and the earlier culling of animal (Sudarwanto and Sudarnika 2008).

The better health can be achieved by giving enough quantity and good quality of diets. It is expected that the concept of feed giving not only related to the quantity and quality but also can support the animal health. The Hipocrates’s motto is “bring the food as medicine“, its means that food have contribute for health.

The blood profile (hematology profile) can be a reflection of health status of the animal. The blood profile condition was influenced by animal nutrient. The change of blood profile can be used as a measurement of nutrient status or physiology status of the animal (Ekenyem dan Madubuike 2007). The aim of this research was to evaluate the improvement of diet quality to the health of lactation PE goat.

Materials and Methods

This research was done in Cordero farm Ciapus Bogor. As much as 10 lactating PE goats were used in this research. All the goats suffered subclinical mastitis according to the early test with California mastitis test. The goats were in the second and the third periode of lactation with the mean of body weight 40 ± 5kg. The treatment was the improvement of diet quality that was the concentrate quality. The goats were fed by the farmer with the basal diet comprise with Gajah grasses (60%) and the concentrate (40%) previously. The farmer's concentrate was only consist of soybean seed outerskin wastes from *tempe* producer. The good quality concentrate diet treatment were made from soybean seed outerskin wastes (34.88%), coconut wastes meal (23.26%), rice bran (23.26%), cassava wastes (11.63%) and crude palm oil (6.97%). Goats were fed twice daily in amounts adequate to ensure 3.5% dry matter of body weight at the day. The diet was arranged to fullfill the nutrient for goat with crude protein 11-12% and TDN 55% (NRC, 2007). The chemical composition of the experimental diets is presented in Table 1.

Table 1. Chemical composition of good concentrate (GC) diet and Elephant grass

Chemical composition	Concentrate diet	Elephant grass
Dry Matter (%)	85.05	21.00
Ash (%)	10.38	10.60
Crude Protein (%)	15.33	9.60
Crude Fiber (%)	30.94	32.70
Extract ether (%)	5.66	1.90
Total Digestible Nutrient (%)	71.97	52.28

INMT Lab. IPB (2012)

Feeding trial lasted for 60 days distributed to the first 30 days when the goat fed with the farmer's concentrate. This periode named Farmer Concentrate (FC). The next 30 days that was the time for the good quality concentrate feeding trial, named Good Concentrate (GC).

The goats were milked every day at 07.00 and 17.00. Milk samples were obtained asceptically from udders and the initial streams of fore milk was discarded. Somatic cell count was determined according to Direct Microscopic Somatic Cell Count (Breed's Method) (Presscott and Breed, 1910) with been modified by Sanjaya *et al.* (2009). *Somatic cell count* (SCC) were tested after the first 30 days (FC period) and after the second 30days (GCperiod). Blood samples were obtained before morning feeding by venipuncture from jugular venous vein. The blood was collected into heparinized vacutainer. Blood samples were immediately placed into an ice-bath before processing. Blood samples were analyzed by standard methods (Jain,1993). Packed cell volume (PCV) was determined by microhematocrit method, hemoglobin

(Hb) concentration by spectrophotometric method, red blood cell (RBCs) and white blood cell (WBCs) counts by hemocytometer method.

All statistical analyses of the data obtained were performed to T-test (Steel and Torrie, 2003).

Results and Discussion

The haematological measurement was one of the important diagnostic procedure and the fastest diagnostic tool which can provide the important information about health (Grunwaldt *et al*., 2005). The result of this research showed that the improvement of diet quality had the positive effect to physiological-nutrition aspect ($P<0.05$). The haematological profile increased/improved after the good quality (GC) diet were applied (Table 2). The goats those had been consumed GC diet had Hb and PCV values higher than Farmer concentrate (FC) diet. This condition indicated that GC diet had more nutrient components which were required to synthesize Hb such as protein, minerals and vitamins. Haematological traits especially PCV and Hb were correlated with nutritional status of the animal (Adejumo, 2004; Ndlovu *et al*., 2007).. The higher PCV values observed might likely be a sign of healthier goats (Egbe-Nwiyi *et al*., 2000).

Table 2. The haematological profile and total somatic cell count on lactating PE goats supplied with good concentrate (GC) and farmer concentrate (FC) diets

Parameters	Farmer Concentrate (FC)	Good Concentrate (GC)	Percentage of change	Normal range
Red Blood Cells ($10^6/mm^3$)	14.34±2.52	19.38±1.53*	+35.15	9-15
White Blood Cells ($10^3/mm^3$)	13.05±2.81	18.54±3.97*	+42.07	4-12
Hb (g/dl)	6.92±1.04	8.82±1.26*	+27.46	9-15
PCV (%)	19.06±3.52	24.85±4.32*	+30.38	27-45
Total sel Somatic (cell/ml)	$3.37x10^6$	$3.10x10^5$*	-90.80	$<7.5x10^5$

Different superscript in the same line means significantly different ($P<0.05$)

Red blood cells counts on GC treatment was higher than normal range. White blood cells counts on GC and FC treatment was also higher than normal range value. The higher WBC value possibly related to the fight against disease mechanism in this case the bacterial caused mastitis. In this study, there was the improvement of udder health of the GC treatment group, where the total somatic cell counts decreased.

Success in fighting infection largely depends on the speed and efficacy of the host defense system response. Under nutrition causes disorganization in the host defense system being responsible for asymptomatic infections and even severe diseases. Maintenance of the nutritional state is therefore highly important to strengthen the host and supply elements for its defense providing then a better quality of life. In this sense, the patient's approach must always involve the three areas simultaneously: early nutritional support, specific treatment of infection, and restoration of the immune system (Pareira, 2003).

Conclusions

The result of this research suggested that feeding strategies may improve the haematological profile and thereby animal health. Supplementation good quality of diet could improve the resiliency of goat body.

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Effect of flushing diet with different fat sources on preovulatory follicle of Etawah crossbred doe

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Abstract

The objective of the present study was to evaluate the effect of flushing diet with different fat sources on preovulatory follicle of Etawah crossbred doe. Nine multiparous etawah crossbred does with average body weight 30.37 ± 2.11 kg were divided into three treatments reared for 3 weeks. The rations were formulated isocaloric (TDN = 80%) and isonitrogenous (CP = 15%) with the sources of carbohydrate from dried cassava and supplemented with fat as 5.3% tallow (R1), 5.2 % flaxseed oil (R2), 5.0% lemuru fish oil (R3). Oestrus was synchronized using two doses of prostaglandin F2α at 11 days apart. Goats were observed for next oestrus cycle (day 18th after first oestrus cycle) using a teaser buck. Design of this experiment was completely randomized design. The number and diameter of large preovulatory follicle (POF) on the day of oestrus was studied using transrectal ultrasonography. The mean interval from first oestrus cycle to the next oestrus was shorter in R1 and R2 than R3. Though the number of large POF and corpus luteum diameter were not significantly different ($P > 0.05$) in all treatments, but R2 tended to be higher than other treatments. Mean level of serum glucose and cholesterol were not significantly different ($P > 0.05$) among all treatments. It was concluded that supplementing the diet with fat from flaxseed oil accelerated the oestrus response and the number of large POF tended to be higher.

*Keywords:*doe, flushing, follicle, oestrus, synchronized

Introduction

Sufficiency and quality of nutrients is an important factor for good animal reproduction. Somchita et al. (2007), reported that nutrient is very important during reproduction phase, especially during estrus and ovulation. Energy is one of the nutrients which very important to support the process of reproduction of livestock. O'Callaghan et al. (2000) stated that the energy consumption of feed will influence the regulation of systemic hormonal concentrations and follicular fluid. The quality of energy ration can be improved by the addition of a source of essential fatty acids. Some researchers reported that the fatty acid composition of the ration, may improve animal reproduction (Cerri et al., 2009; Watches et al., 2007), can increase the number and size of ovulated follicles, increase survival and improve the fertility of the corpus luteum of cows (Staples et al. 1998). Zachut et al. (2008) stated that in dairy cows, the levels of unsaturated fatty acids increased the size of steroid hormones in the follicular phase pre-ovulatory..

Glucose is the main energy source used by the ovary (Rabiee and Lean 2000) and as a primary metabolic fuel used by the central nervous system. Astuti et al (2000), reported that glucose kinetics in different physiological state of goats were varies. The gluconeogenesis in growing, pregnant and lactating goats were 20.95; 28.06 and 26.09 $mg.min^{-1}.animal^{-1}$, while the glucose flux were 21,02; 24,63; 29,43 $mg.min^{-1}.animal^{-1}$. Glucose from gluconeogenesis process by using propionic acid as precursor is the major energy for egg cell maturation through FSH and LH activity until ovulation and corpus luteum formation (Hess et al., 2005). In condition of low glucose in cows, the availability of releasing hormone gonadotrophin (GnRH) by hypothalamus will decrease. Increasing of gluconeogenesis process will give positive effect to the energy efficiency, compare to glucose supplementation. Flushing program is addressed to increase ovulation rate and embryo survival (Abu El-Ella, 2006). Some researches in ruminant feeding management showed that flushing treatment could improve ovulation and fetus implant on uterus (Kusina et al, 2001), raise the percentage of estrous, pregnancy, calving rate, accelerate postpartum estrous and shorten the calving interval (Mithuna et al. 2015).

Improving of nutrient status may bring larger follicles and enhanced increasing follicles growth rate (Berlinguer et al. 2012). PUFAs especially omega-3 has a major impact on reproductive performance (Gulliver *et al*. 2012; Kia and Safdar 2015; Mahla *et al*. 2017). There is a strategy to stimulate follicular growth and steroid hormone production (Leroy et al 2014). The fat sources that are rich in omega-3 are fish oil and flaxseed oil. The Omega-3 are broken down into 3 separate compounds ie: ALA, EPA, and DHA. The flaxseed oil is rich in ALA (51.4%) (Zou et al. 2017), meanwhile fish oil contains high level of EPA (16.25%) and DHA (10.15%). In the body a certain of ALA (from flaxseed oil) will be converted into EPA and DHA. Lemuru fish oil is produced as a waste of fish canning industry, so that it is cheap and does not compete with food needs., The study was aimed to evaluate the efffect of flushing diet containing different fat sources on preovulatory follicle of Etawah crossbred doe.

Materials and Methods

Animals, Feeding and Experimental Design

Nine etawah crossbreddoes with average body weight of 30.37 ± 2.11 kg were divided into three treatments (n = 3 per treatment) for the period from the start of oestrus synchronization to the end of next oestrus cycle (3 weeks). The rations were formulated isocaloric (TDN = 80%) and isonitrogenous (CP = 15%) with the sources of carbohydrate from dried cassava and supplemented with fat as 5.3% tallow (R1), 5.2% flaxseed oil (R2), and 5.0% lemuru fish oil (R3) (Table 1 and 2). Oestrus was synchronized using prostaglandin F2α at two times by different in 11 days. Goats were observed for next oestrus cycle (day 18 after first oestrus cycle) using a teaser buck. Goats were fed total mixed ration 3.5% body weight with forage:concentrate ratio (based on dry matter) was 30:70, given three times daily and had free access to water. Design of this experiment was completely randomized design.

Table 1. The concentrate composition of the treatment based on 100% dry matter

Ingredients	Basal concentrate	Flushing A concentrate	Flushing B concentrate	Flushing C concentrate
			%	
Soybean meal	7.0	44.0	44.0	44.0
Corn gluten feed (CGF)	42.9	-	-	-
Dried cassava	48	34.8	35.2	36.0
CaCO3	0.7	-	-	-
Premix*	0.7	-	-	-
Salt	0.7	-	-	-
Tallow	-	21.2	-	-
Flaxseed oil	-	-	20.8	-
Lemuru fish oil	-	-		20.0

* each 1 kg contains vitamin A = 500,000 IU, vitamin D = 100,000 IU, vitamin E = 150 mg, vitamin B1, B2,B12 50, 250, 250 mg, vitamin K = 50 mg, niacinamid = 375 mg, Ca - d-panthotenate = 125mg, folic acid = 25 mg, Cholin chloride = 5000mg, L-lysine 3750 mg, Mg sulphate = 1700 mg, Fe sulphate = 1250 mg, Mn sulfate = 2500 mg, Cu sulfate = 25 mg, Zn sulphate = 500 mg and K iodine = 5 mg, antioxidant.

Table 2. Composition of ration and nutrients during flushing period

Ingredients	R1	R2	R3
		(%)	
Elephant grass	30	30	30
Basal concentrate	45	45	45
Flushing A concentrate	25	-	-
Flushing B concentrate	-	25	-
Flushing C concentrate	-	-	25
Composition of nutrients			
Crude protein	15.60	15.60	15.61
Ether extract	7.66	7.57	7.34
Crude fiber	11.28	11.28	11.29
Nitrogen free extract (NFE)	57.59	57.69	57.87
Total digestible nutrient (TDN)	80.22	79.89	79.87
Calcium	0.55	0.55	0.55
Phosphor	0.32	0.32	0.32

R1 = contains 5.3% tallow; R2 = contains 5.2% flaxseed oil; R3 = contains 5% lemuru fish oil.

Oestrus synchronization and ultrasonographic examination

Oestrus was synchronized using similar dose given two times of prostaglandin F2α by injecting Dinoprost prostaglandin (PGF2α) hormone preparations at a dose of 5 mg per doe intramuscularly by different 11 days. Goats were observed for next oestrus cycle (day 18 after first oestrus cycle) using a teaser buck. The development of follicles and corpus luteum was observed using ultrasound (USG) ALOKA model SSD-500 (ALOKA Co.LTD, Japan) equipped with a 7.5 MHz linear probe (ALOKA Co.LTD, Japan). Ultrasonographic scanning of the ovaries was done on the next oestrus cycle (day 18 after first oestrus cycle) to ascertain the population of different classes of follicles. The follicles were counted, measured and classed into 3 categories: (i) small (SF = 2-3 mm); medium (MF = 3.1-5 mm), and large follicles (LF > 5 mm) (Crozet et al. 1995). Further, ultrasonographic scanning was carried out every day until ovulation to assess the number and diameter of POF at estrus. The ovulation rate was determined on the basis of CL number.

Blood sampling

Blood samples were carried out late of the flushing period (the day of next oestrus onset), collected at the jugular vein using 5 ml disposable sterile syringe into glass tube containing anticoagulant (EDTA) to obtain plasma. The blood plasma samples was separated immediately after blood sampling using a centrifuge (3000 rpm for 15 min) and stored in microtubes inside a freezer at −20 ◦C until the time of analysis. Glucose and cholesterol levels were analysed from blood plasma using Glucose kit (Manufactured in Germany for PT. Rajawali Nursindo) Cat No 112191 and Reg No AKL 20101803460.

Data Analysis

Completely randomized design was applied which rations containing different ratio of fat : carbohydrate was used as treatments. Data of number of large POF, diameter of large POF and corpus luteum, level of plasma glucose and cholesterol were analyzed statistically using analysis of variance and was continued with Duncan Multiple Range Test (Steel and Torrie, 1980). Percentage of the next oestrus response was analysed descriptively.

Results and Discussion

The mean interval from first oestrus cycle to the next oestrus was shorter in R1 and R3 than R2, while R2 shorter than R3 (Table 3). A longer interval of behavioral estrus in ration supplemented with lemuru fish oil (R3) can be suggested that lemuru fish oil altered the dynamics of PGF2a induced CL regression. It is possible that EPA and DHA might get accumulated in the luteal cells following lemuru fish oil supplementation and reduce the vasoconstrictive effects of PGF2α as hypothesized by Mattos et al. (2000) as they are the precursor for vasodilatory PGI3, thus delaying the CL regression.

Table 3. Effect of flushing diet with different fat sources on oestrus response of Peranakan Etawah doe.

Oestrus response	R1	R2	R3
day 18 after first oestrus cycle (%)	100.00	100.00	33.33
day 19 after first oestrus cycle (%)	100.00	100.00	100.00

The different fat sources (tallow, flaxseed oil and lemuru fish oil) in the ration during flushing period did not significantly affect the number and diameter of large POF and corpus luteum (Table 4). Though the number of large POF and diameter corpus luteum were not significantly different ($P > 0.05$) in all treatments, but R2 tended to be higher than other treatments. The high number of large POF in n-3 PUFA rich flaxseed oil supplemented group is supported by previous reports in the cow receiving n-3 fatty acids in the form of flaxseed oil (Moallem et al. 2013). The larger CL diameter in flaxseed oil supplemented group because the linolenic acid from flaxseed oil is the precursor for the formation of the vasodilatory PGI, it is possible that it enhances the perfusion to CL resulting in increased growth of luteal tissue (Mahla et al. 2017). Proliferation of granulose cells induced by n-3 PUFA also might be one of the reasons for the larger CL diameter (Lucy 2001). While Moallem et al. (2013) suggest that supplementing cows with flaxseed oil, which is the most widely available botanical source of n-3 fatty acids and is preferable to fish oil in ruminant nutrition, represents a satisfactory approach to achieve improvement in folliculogenesis and oocyte fertilization.

Table 4. Effect of flushing diet with different fat sources on number and diameter of large POF, and CL diameter of Peranakan Etawah doe.

Parameters	R1	R2	R3
Number of large POF	2.33 ± 1.53	2.67 ± 1.53	2.00 ± 1.00
Large POF diameter (mm)	6.19 ± 0.41	6.15 ± 0.31	5.79 ± 0.79
CL diameter (mm)	6.43 ± 0.25	6.80 ± 0.45	5.93 ± 0.70

Mean level of serum glucose and cholesterol were not significantly different ($P > 0.05$) among all treatments. Glucose is the main energy needed by the nerve to regulate hormone of LH and FSH at the begenning the follicles formation before ovulation (Hess et al. 2005). Increased utilization of glucose for thermoregulation causes glucose levels in all treatments were not significantly different. The increased fatty acid concentrations are related to the increased mobilization of body fat reserves necessary to meet the energy requirements for the thermoregulation. Cholesterol serves as a precursor for the synthesis of progesterone by ovarian luteal cells (Safdar et al. 2016). The same cholesterol levels in all treatments indicate that modulation of cholesterol synthesis is not a major mechanism by which PUFA alters the plasma cholesterol level (Jones et al. 1998).

Table 5. Effect of flushing diet with different ratio of fat : carbohydrate on glucose and cholesterol of Peranakan Etawah doe.

Parameters	R1	R2	R3
Glucose (mg /dL)	64.79 ± 3.25	63.20 ± 8.25	58.06 ± 6.18
Cholesterol (mg /dL)	75.80 ± 19.28	70.36 ± 15.16	69.58 ± 2.88

Conclusions

It was concluded that supplementing the diet with fat from flaxseed oil accelerated the oestrus response and the number of large POF tended to be higher.

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Isolation and Identification of 2,3-Dihidroxypyridine (2,3-DHP) Degrading Bacteria from Bali Cattle Rumen Fed *Leucaena leucocephala* Leaves Based Ration

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Abstract

Lamtoro (Leucaena leucocephala) leaves contain high protein up to 25% but also contain anti-nutrition, mimosine which can toxic for ruminant. Rumen fluid from cattle that often consume leucaena leaves has microbe which capable to degrade mimosine and its derivative compounds. The purpose of this research was to isolates mimosine derivative (2,3-dihidroxypyridine) degrading bacteria from rumen Bali cattle that fed leucaena leaves based ration. The first step of isolation steps was enrichment of potential bacterial stock using selective media 2,3-DHP for 6 days. The bacterial colonies grew on a 2,3-DHP selective medium agar containing 2,3-DHP were then purified and isolated. All isolates obtained and characterized by using morphological and biochemical tests. The variables observed were colony shape, color cells, motility and reducing sugars capability. The results showed that there was a decrease of 2,3-DHP levels from 50.5 mg/L to average of 44.25 Â± 3.14 mg/ L during enrichment step for 6 days and got 2 isolates which have capability to degrade 2,3-DHP. Based on morphological test, isolate 1 was classified as Gram-positive with streptococcus shape and isolate 2 was also Gram-positive with diplococcus shape. Isolate 1 could utilize glucose, fructose, and sucrose but not starch and cellulose. Isolate 2 could utilize glucose, fructose, sucrose, starch, and cellulose, but only in small amount. Based on morphological and biochemical tests, inoculum 1 has similar characteristics with Eubacterium sp whereas inoculum 2 has similar characteristics with Peptostreptococcus sp.

Keywords: 2,3-dihidroxypyridine degrading bacteria, isolation, Leucaena leucocephala, Bali cattle

Introduction

Lamtoro (*Leucena leucocephala*) is one of the leguminous trees that contain high protein and very potential as animal feed. Utilization of lamtoro as animal feed related to protein content that is about 25% - 32% of dry matter (Askar 1997). Leaf lamtoro has a crude protein content, high productivity and palatability, but because the mimosine content becomes a limiting factor in its use (Jube and Borthakur 2010). The content of leaf mimosine lamtoro ranged from 2% -6% or about 1.40-7.19g / 100g depending on the level of maturity (D 'Mello 2000).

Mimosine is a non-protein amino acid that has a structure similar to tyrosine and it's present in some species of mimosa in the *Leucaena* genus (D'Mello 2000).

The continued consumption of DHP will increase the breakdown of iodine into a hyperplastic thyroid that has antitiroid effects (Hegarty *et al* 1979). In general, the negative effects of mimosine were loss of appetite, enlarged thyroid gland, poor reproductive performance, suppressive growth, and post-natal death (Wang *et al* 2000). Mimosine rapidly degrades in the rumen to 3,4-DHP and 2,3-DHP, which have a toxic effect on livestock (Lowry 1983). In addition to Hawaii, Bali cattle in Indonesia, exactly in Sumbawa, West Nusa Tenggara which fed lamtoro based ration in large numbers without any toxic effects. Factors that cause resistance of the body of Bali cattle in Sumbawa with high mimosin levels, influenced by the presence of mimosine degrading bacteria in the rumen.

Based on the case, in this research attempted to isolate and identify the rumen bacteria from Bali cattle from Sumbawa, West Nusa Tenggara which fed lamtoro based ration so that can know the type of bacteria found. The purpose of this research was to isolates mimosine derivative (2,3-dihidroxypyridine) degrading bacteria from rumen Bali cattle that fed lamtoro leaves based ration.

Materials and Methods

Isolation of Individual Colonies

Preparation of research done by preparing 2,3-DHP selective media to get bacterial isolate. The preparation of liquid media was carried out by modifying the methods of Ogimoto and Imai (1981). The preparation of the medium was carried out by mixing a solution consist of 3.7 BHI, 0.1 g cysteine, 0.5 ml of Hemin and 0.05 resazurin. The composition was dissolved using aquades up to 100 ml and cooked using hot plate with CO2 gas then autoclaved, while the preparation of agar media made by the same composition with the addition of 2 g agar.

The first step of isolation steps was enrichment of potential bacterial stock using selective media 2,3-DHP for 6 days. Microbes grown at enrichment stage are transferred again of 0.5 ml into a hungate tube containing 4.5 ml of diluent medium. Then transfer each of the colonies as much as 0.1 ml into agar medium start from 10-5 dilution. Insert it into the roller tube until it hardened and incubated for 2-3 days. The same procedure repeated until a uniform colony was formed. All isolates obtained and characterized by using morphological and biochemical tests. The variables observed were colony shape, cells color, motility and reducing sugars capability.

Analysis of 2,3-DHP

The first step to analyze 2,3-DHP was prepare of standard and calibration curve. A total of 0.001 g of 2,3-DHP was prepared, then dissolved with 10 ml of 0.1 N HCl in a 100 ml erlenmeyer glass. 0.1 N HCl solution was prepared by dissolving 9.9 ml of 37% HCl in 990.1 ml of water in 1 liter glass erlenmeyer. The series of 2,3-DHP concentration formed was 0 (blank) -20-40-60-80-100 ppm. Each 1 ml of the 2,3-DHP solution formed was incorporated into 6 different test tubes. Each reaction tube was added 10 ml of HCl 0.1 N and 4 ml FeCl3 0.5% in HCl 0.1 N. Preparation of FeCl3 solution in 0.1 N HCl by dissolving 0.5 g of FeCl3 in 100 ml of 0.1 N HCl in 250 ml erlenmeyer glass. The standard solution was analyzed by spectrophotometer at 535 nm wavelength and obtained by graphic equation (Ilham *et al* 2015).

The measurement of 2,3-DHP in potential bacterial stock was done by take bacterial stock of the rumen fluid as 1 ml, after 10 ml of 0.1 N HCl and 4 ml of FeCl3 0.5% was added in 0.1 N HCl. Samples were analyzed by spectrophotometer with a wavelength of 535 nm (Ilham *et al* 2015). The acid reaction color by FeCl3 for 3,4-DHP is purple while for 2,3-DHP is blue (Ilham *et al* 2015)

Results and Discussion

Enrichment using a selective 2,3-DHP medium after incubation for 24 hours on the enrichment process for 6 days, decreased 2.3-DHP levels from 50.5 mg / L to an average of 44.25 ± 3.14 mg / L.

Table 1 Levels of 2.3-DHP Microbial Enrichment Samples on Bacteria Stock after 24-hours incubation

Day	2,-3 DHP consentration (mg/L)		Percentage of decreasing 2,3-DHP
	0 hour	24 hours	
1	50.5	41.5	17.82
2	48	47	2.08
3	53	48	9.43
4	48	40	16.67
5	44.5	43.5	2.25
6	47	45.5	3.19
Average	48.50 ± 2.93	44.25 ± 3.14	8.57 ± 6.61

Based on data from Table 1, it can be seen that in the stock of rumen bacteria of bali cattle that fed lamtoro leaves based ration, there were bacteria that can degrade 2,3-dihydroxypyridine. This was due to the large and continuous feeding of lamtoro leaves causing rumen microbes can adapt to the mimosine content and its derivative compounds (including 2,3-DHP) to the lamtoro leaves consumed, so that 2,3-DHP degrading bacteria present in the liquid rumen can be developed.

The percentage decrease in levels of 2,3-DHP that varies for 6 days of enrichment can be caused by hydrogenase activity or pyruvate metabolism that competed with bacterial degradation reactions. Decreased degradation activity due to pyruvate catabolism and its derivatives in reducing its intermediate compounds (Rincon 1998). According to Dominguez-Bello (1997) also states that the ability of bacteria in degrading 2,3-DHP can decrease if the degradation reaction was done continuously and the 2.3-DHP content was lower.

After the isolation and selection of bacteria, two colonies were found and able to stand 2,3-DHP added in the selective medium. Colonies of white bacteria 1 were non-core while bacterial colonies 2 are small white core. Based on the Gram staining test, bacteria 1 and 2 belong to Gram positive bacteria (Table 2).

Gram-positive bacteria have higher peptidoglycan content than Gram-negative bacteria.

Table 2 Bacterial Colony Test Results

Parameters	Isolat 1	Isolat 2
Colony color	White	White
Colony shape	Dots	Circle
Cells shape	Short-bacillus	Coccus
Gram Staining	+	+
Motility	-	-
Temperature grow (^oC)	39	39
Anaerob	Obligative	Obligative
Utilizing of reducing sugars		
Glucose	+	+
Sucrose	+	+
Fructose	+	+
Starch	-	+
Cellulose	-	+

Based on the results of morphological and biochemical tests, isolate 1 has characteristics similar to *Eubacterium* sp. (Dehority 1986). According to Ogimoto and Imai (1980), *Eubacterium ruminantium* was an anaerobic Gram-positive bacteria, having a small bacillus shape to resemble coccus, arranged in pairs and or short chain, whereas according to Dehority (2003), all strains of *Eubacterium* sp. fermented glucose, cellobiose, and fructose, while starch and cellulose were not fermented. Isolate 2 has similarity characteristics with *Peptostreptococcus* sp. *Peptostreptococcus* sp was a Gram positive bacteria, anaerobic, nonmotil with diplococcus cells form and only utilizes glucose, cellobiose, maltose and sucrose in small amounts (Dehority 2003)

After 48 hours incubation, a decrease in 2,3-DHP of each selected isolate was 15.20% (Isolate 1) and 26.21% (Isolate 2). Table 3 shows that there was a decrease in 2,3-DHP levels at 24 and 48 hours.

Table 3 The concentration of 2,3-DHP bacterial inoculum was selected after 24 hours incubation (mg/L)

Hour	Isolat 1	Isolat 2
0	62.50 ± 0.00	62.00 ± 0.00
24	54.75 ± 1.77	54.75 ± 3.18
48	53.00 ± 1.41	45.75 ± 0.33

Under anaerobic conditions, 2,3-DHP can be degraded by each isolate individually. The enzymatic degradation mechanism through a pyridine ring that was reduced by bacteria and enzymatic activity induced by 2,3-DHP and 3,4-DHP (Rincon *et al* 1998). According to Jones and Megarrity (1986) and Allison *et al*

(1992), the rate of degradation and fermentation produced was slow. This was due to other derived compounds (3,4-DHP) as well as the presence of special phenolic compounds which may affect the measurement of 2,3-DHP levels. Hammond *et al* (1989) also stated that the rumen microbial population in lamtoro-consumed cattle has also identified 3.4-DHP degrading bacteria resulting in competition with 2.3-DHP degrading bacteria.

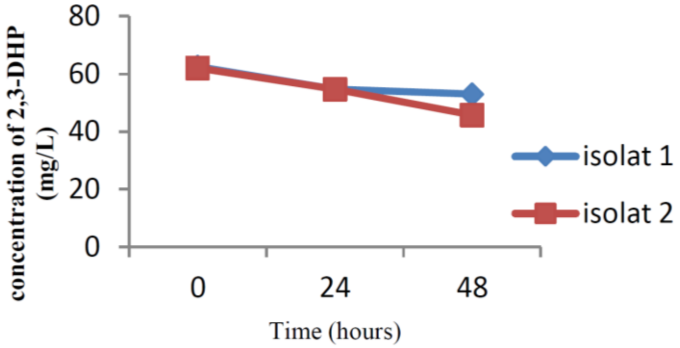

Figure 2 Graphic of decreased concentration of 2,3-DHP by isolate of selected bacteria

Smith and Fowden (1966) have identified mimosine degradation enzymes that was carbon-nitrogen (C-N) lyase that can convert mimosine to 3,4-DHP, pyruvic acid and ammonia. The enzyme was an endogenous enzyme found in lamoro leaf that reacted with rumen microbes through chemical reactions of mimosine at a certain pH and temperature. While the hydrolysis reaction of 3,4-DHP to 2,3-DHP was done by the enzyme together degrading bacteria as rumen microflora. The end result of the degradation process was non-toxic compounds with pyridone rings that have been damaged (Allison 1992; Hammond 1995; Paul *et al* 1999)

Conclusions

There were 2 isolates of bactera which capable of degrading mimosine derivative compounds 2,3-dihydroxypiridine (2,3-DHP). Both of these bacteria were anaerobic and can reduce the levels of 2.3-DHP by 15.20% (Isolate 1) and 26.21% (Isolate 2) after incubation for 48 hours. Based on the morphological and biochemical tests, isolate 1 has similarities with *Eubacterium ruminantium* while isolate 2 has similarities with *Peptostreptococcus* sp

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Chemical, Physical and Microbiological Characteristics of Fermentation Feed

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Abstract

This research was conducted to find out the chemical, physical and microbiological characteristics of fermentation feed for duck. The study used a complete randomized design of factorial pattern consisting of 2 treatment factors ie 5 fermentation time and 2 levels of crude protein content and each treatment unit had 3 replications. Each replication consists of 1 kg of wet fermented feed. The treatment consisted of T1 (fermentation 0 days), T2 (7 day fermentation), T3 (14 day fermentation), T4 (21 days fermentation) and T5 (28 day fermentation) with low protein level (18%) and high protein 21%). Physical and microbiological qualities were analyzed descriptively, while chemical quality was analyzed using analysis of variance (Anova). Parameters measured were: dry matter, crude protein, pH, total LAB, odor, texture and organic acid. The results showed that the anaerobic fermented wet feed had a significant interaction ($P < 0.05$) between the fermentation time and the protein level on dry matter, crude protein, pH and LAB. The highest dry matter was 58.93 ± 0.19%, the pH was significantly higher at 5.61 ± 0.06, the crude protein was significantly higher at 15.35 ± 0.60 and the smallest propionic acid lactic acid ratio was 2: 1. The conclusion was fermented feed with 7 days fermentation time with high protein has the characteristic of dry matter, pH, crude protein and best organic acid ratio compared to other treatment.

Keywords: Lactic acid bacteria (LAB), fermentation time, anaerobic fermentation, texture, odor

Introduction

The process of drying would increased the cost of feed processing (Indarsih and Tamsil 2012). Dry feed had hight risk of exposure to mycotoxins when was stored in areas with high humidity and it would had a negative effect on livestock health (Zain 2011: Rocha *et al* 2014; Ji *et al*. 2016). While wet feed cut drying costs but if stored without any other process it would quickly break down. Wet feed with fermented technology had a low pH due to the organic acid content produced by lactic acid bacteria (LAB), this acid state could act as an alternative antibiotic growth promoter (AGP).

The availability and variety of chemical composition of feed ingredients was a problem often encountered by livestock industry practitioners. The technology used today was a drying technology whose products were not durable. Dry feeds could last only less than 4 months in good storage conditions (Goh 2011) whereas fermentation technology could retain nutrients for more than 6 months during oxygen exposure with little decrease in quality (Saricicek *et al*., 2016).

Fermentation technology was expected to be an alternative antibiotic to maintain the productivity and health of livestock. The danger of resistance to antibiotics was a problem so the government regulates the use of antibiotics in the Law of the Republic of Indonesia No.18 of 2009 on animal husbandry and animal health that content expressly prohibits the use of antibiotics as growth promotor (AGP). The purpose of this study was to determine and analyze chemical characteristics including organic, physical and microbiological of anaerobic fermentation feed.

Materials and Methods

Feed ingredients content were: yellow corn, soybean meal, rice bran, fish meal, coconut meal, crude palm oil (CPO), $CaCO_3$, DCP, premix, liquid inoculum containing total lactic acid bacteria (LAB) 5 x 10^8 cfu/ml for the fermentation process. The formulation showed in Table 1. The equipment used was a mixer capacity of 200 kg. Plastic size 2 kg and plastic drum as silo. Electrical scales, pH meters, stirrers, incubators, High Performance Liquid Chromatography (HPLC), ovens, desiccators and glass tubes. Treatment.

Treatment of fermentation time in the study were: T0 Fermentation time 0 days, T1: 7 day fermentation time, T2: fermentation time 14 days, T3: fermentation time 21 days, T4: fermentation time 28 days.

Parameters measured

Dry matter (AOAC 1995), Protein content (Semi Kjeldahl Method) (AOAC 1995), pH, smell and texture of fermented feed, LAB population (cfu/ml) = number of colonies x dilution and organic acid.

Data design and analysis

The study used a complete randomized design consisting of 5 treatments of fermentation time and 3 replications, each replication consisting of 1 kg of wet fermented feed. The data obtained were analyzed descriptive for physical and microbiological quality. Chemical and organic acid qualities were analyzed using analysis of variance (Anova) using IBM®SPSS® version 21.0 tested by Duncan to see the real difference.

Table 1 Formulation of feed ingredients and nutrient feed of low-protein and high protein

Ration	Formulation (%)	
	Low Protein	High Protein
Ingredients		
Yellow corn	53.2	40
soybean meal	19	30
Rice bran	9	7.5
Fish meal	8	8
Coconut meal	4	5
CPO	3	3
$CaCO_3$	3	6
DCP	0.5	0.2
Feedmix B	0.3	0.3
Nutrient composition *		
DM (%)	87.6	88.5
Ash (%)	7.8	10.75
Crude protein (%)	18.13	21.01
Crude fiber (%)	3.58	3.53
Ca (%)	1.87	3.03
P total(%)	0.61	0.56
Metabolic energy (kkal/kg)**	2916.06	2743.25
Methionine (%)**	0.41	0.46
Lysin (%)**	1.18	1.50

Feedmix B: Vit A 2000,000 IU, Vit D 400,000 IU, Vit E 600 mg, Vit B1 200 mg, Vit B2 1000 mg, Vit B12 1000 mcg, Vit K 200 mg, Niacinamide 1500 mg, Ca-d-Panthotenate 500 mg, Folic acid 100 mg, Choline Chloride 20.000 mg, L-lysine 15.000 mg, DL-Methionine 20.000 mg, Magnesium Sulfate 6,800 mg, Ferrous Sulfate 5000 mg, Manganese Sulfate 10.000 mg, Cupri Sulfate 100 mg, Zinc Sulfate 2.000 mg, Potassium Iodine 20 mg, Antioxidant and Carrier ad 1 mg. * the results of the Laboratory of Animal Science and Technology Science Faculty of Animal Husbandry IPB (2015). ** based on Leeson and Summers (2005). ME formula (kkal / kg) = 53 + 38 (% PK + 2.25 x% LK + 1.1 x% starch +% sugar).

Results and Discussion

Chemical, physical and microbiological characteristics

Chemical, physical and microbiological content showed in Table 2 and 3. The real fermentation time ($P < 0.05$) decreased dry matter and the pH. Physically the fermentation time adds the smell to acid and the texture becomes soft. While the number of LAB significantly increased due to fermentation time.

Additive factors such as LAB inoculants added before fermentation of 5×10^{10} cfu/ml into the feed also resulted in a faster fermentation process (Addah *et al*., 2011). Muck (2010) adds that acid conditions could inhibit fungi, mold and aerobic microbes. Water content of 30-60% in the fermentation process could increase total acid and decrease pH (Allaily *et al*. 2011; Setapar *et al*., 2012).

Table 2. Characteristics of wet feed with high-protein anaerobic fermentation

Parameters	Fermentation Time (Day)				
	T0	T1	T2	T3	T4
DM (%)	87.6	58.93±0.19^{b}	56.27 ± 1.15^{a}	55.36±0.60^{a}	56.32± 0.34^{a}
CP (%)	21.01	15.35±0.60	15.60±0.45	16.27±0.80	15.21±0.65
pH	6.8	5.61±0.06^{a}	5.15 ± 0.04^{c}	5.31±0.03^{b}	5.33 ± 0.02^{b}
Odor	Not sour	Sour enough	acid	acid	acid
Texture	Hard	Soft enough	soft	soft	soft
LAB(cfu/g)	1.6x10^{5}	2.3x10^{11ab}	1.2 x 10^{12c}	2.8 x 10^{11ab}	4.1 x 10^{11b}

T0 = without fermentation, T1 = 7 days, T2 = 14 days, T3 = 21 days, T4 = 28 days. Different letters on the same line show significant differences (P <0.05).

Low water levels will limit dissolved carbohydrates used by LAB as energy (Ridla and Uchida 1993). Zou *et al*. (2016) states that water content determines the decomposition of the fermentation process. In general, both microbial and soluble carbohydrate additives would help the fermentation process and maintain nutrient feed (Herlinae *et al*. 2015; Seppala *et al*., 2016).

Table 3 Characteristics of wet feed with low and high-protein anaerobic fermentation

Parameters	Fermentation Time (Day)				
	T0	T1	T2	T3	T4
DM (%)					
Low	87.6	57.12±0.92^{b}	54.93±0.60^{a}	56.17±0.07^{ab}	56.36±0.35^{ab}
High	88.5	58.93±1.15^{b}	56.27±1.15^{a}	55.36±0.60^{a}	56.32±0.34^{a}
CP (%)					
Low	18.13	12.13±0.10^{a}	12.52±0.14^{bc}	12.71±0.05^{c}	12.25±0.01^{ab}
High	21.01	15.35±0.60	15.60±0.45	16.27±0.80	15.21±0.65
pH					
Low	6.8	4.47±0.02^{d}	4.01±0.02^{a}	4.24±0.01^{b}	4.37±0.03^{c}
High	6.8	5.61±0.06^{c}	5.15 ± 0.04^{a}	5.31± 0.03^{b}	5.33 ± 0.02^{b}

T0 = without fermentation, T1 = with fermentation for 7 days, T2 = 14 days, T3 = 21 days, T4 = 28 days. Different letters on the same line show significant differences (P <0.05).

The availability of optimal nutrients in fermented feeds was related to the difference in fermentation time to be an important parameter (Setapar *et al.*, 2012). The results of previous research suggest that the addition of selected LAB inoculants could improve the quality of fermentation, so that the fermentation time could be accelerated from 21 days to 7 days (Fariani and Akhadiarto 2012).

The content of organic acids

The organic acid content of high-protein anaerobic fermented feed was presented in Table 4, lactic acid and real propionic acid (P <0.05) increased by fermentation time. Butyric acid has increased not significantly due to fermentation time.

Table 4 Content of organic acid wet feed with high-protein anaerobic fermentation

Parameters	Fermentation Time (Day)				
	T0	T1	T2	T3	T4
Lactic Acid	nd	0.030±0.0005[a]	0.087±0.0019[b]	0.166±0.0020[c]	0.403±0.008[d]
Propionic Acid	nd	0.016±0.0002[a]	0.015±0.0026[a]	0.024±0.0036[b]	0.032±0.004[c]
Lactate Ratio: Propionate	nd	2:1	6:1	7:1	12:1
Butyric acid	nd	nd	nd	0.0052±0.000078	0.0048±0.000067

T0 = without fermentation, T1 = with fermentation for 7 days, T2 = 14 days, T3 = 21 days, T4 = 28 days. Different letters on the same line show significant differences (P <0.05). nd (not detected).

Anaerobic conditions and acidic atmosphere would suppress the growth of pathogenic microbes (Flythe and Russell 2006; Muck 2010), thereby increasing the quality of feed during storage (Wildfire 2005). However, the addition of LAB to the fermentation process such as *Lactobacillus plantarum*, did not significantly improve the fermentation feed characteristics, compared with the addition of organic acids directly as additives into feed (Kristine et al., 2015). The content of organic acids in addition to improving fermentation products, also able to be a factor to improve the performance of livestock (Allaily 2006; Fasina and Thanissery 2011; Milbradt et al., 2014). This was because the feeding of fermentation could improve the gastrointestinal microflora of broiler chickens so as to increase the amount of lactic acid bacteria in the small intestine (Widodo *et al.* 2015).

Conclusions

Fermentation technology for wet feed with 7 days fermentation time had the best characteristics compared to other treatments with DM content (58.93 ± 0.19%), PK (15.35 ± 0.60%), pH (5.61 ± 0.06), BAL (2.3x1011 cfu / g) and the ratio of lactic acid propionate (2: 1).

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Quality Test of Feed Supplement of Mash, Pellet, Wafer Containing Nigella Sativa Waste For Dairy Goat

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Abstract

Nigella sativa waste is industrial waste containing high protein and can be used as raw material component. High protein content of nigella sativa waste needs to be protected so as not to be easily degraded in the rumen so that needed the technique processing of feed. Feed processing through grinding, mixing, pelleting and wafering had different effects on the quality of feed produced. The aims of this research was to quality test physical and chemical of feed in the form of mash, pellet and wafer containing nigella sativa waste, and test quality of feed on the performance of dairy goat. The research was conducted in June-September 2016 in had two steps experimental, the first steps experiment quality test physical and chemical at laboratory of feed industry, the second steps of this research was test quality of feed on the performance of dairy goat in Cordero farm. This research of the first step used a complete randomized design with 3 treatment and 4 replications, i.e P1 : feed containing *nigella sativa* waste in form mash, P2: feed containing *nigella sativa* waste in form pellet, P3 : feed containing *nigella sativa* waste in form wafer. Design for the second step used a complete randomized design with 4 treatment and 3 replications, i.e R0 : conventional feed, R1 : feed containing *nigella sativa* waste in form mash, R2: feed containing *nigella sativa* waste in form pellet, R3 : feed containing *nigella sativa* waste in form wafer. Parameters were water content, particle size, water activity, density, durability index and performance of dairy goat. The result indicated that processing physically of nigella sativa waste in form mash, pellet, wafer had significant effect ($P<0.05$) on quality test physical water content, density and milk production, protein and fat milk dairy goat. Feed containing *nigella sativa* waste in form wafer yield milk production 27% higher than feed containing *nigella sativa* waste in form mash.

Keywords : quality test physical, waste, mash, *nigella sativa*, pellet, processing of feed wafer.

Introduction

Feed has very important role in livestock management on supplying nutrients requirement for the growth, production, and reproduction, so the feed given to livestock must contain good nutrients in quality and quantity. Physical quality which is affect on livestock productivity is the particle size. Particle size is an important study material because it affects on the digestion process and absorption of nutrients, which is in the process of digestion changes the size of feed particles and solubility both mechanically and chemically (Blair, 2008).

Another factor that affect on productivity is the type of livestock raising. Intensive livestock raising is a full maintenance in the cage, so nutrient intake is very important. Lack of feed can still occur despite intensive maintenance. Many standards have been used as reference feeding, but the amount of feed for livestock is not measured properly.

Etawah crossbreed is livestock produce a meat and milk normally grown in intensive cage that consume forage as the main feed. However, forage conditions are not sufficient for livestock needs in terms of quantity and quality. Unpredictable season conditions cause the resulting forage fluctuations (Retnani *et al,*. 2015). In addition, a lot of forage land that becomes over functional causes forage land to become narrow. Therefore, supplementation should be done to complement the nutrient needs of livestock. Nigella sativa waste is industrial waste containing high protein and can be used as raw material component. High protein content of nigella sativa waste needs to be protected so it can not be easily degraded in the rumen. It needed feed processing technology . Feed processing through grinding, mixing, pelleting and wafering had different effects on quality of feed that being produced.

Materials and Methods

The research was conducted in June-September 2016 in had two steps experimental, the first steps of this research was physical and chemical quality test at Feed Industry Laboratory and the second steps of this research was quality test of feed on the performance of dairy goat in Cordero Farm. This research of the first step used a complete randomized design with 3 treatment and 4 replications, i.e P1 : feed containing *Nigella sativa* waste in mash form, P2: feed containing *Nigella sativa* waste in pellet form, P3 : feed containing *Nigella sativa* waste in wafer form.

Experimental design of this research for the second step used a complete randomized design with 4 treatment and 3 replications, i.e R0 : conventional feed, R1 : feed containing *Nigella sativa* waste in mash form, R2: feed containing *Nigella sativa* waste in pellet form, R3 : feed containing *Nigella sativa* waste in wafer form. Parameters were observed are water content, particle size, water activity, bulk density, durability index and performance of dairy goat. The process of wafer of feed supplement production was conducted by chopping, drying, mixing, preassing, heating and forming with temperature of 100^0C for 10 minutes to get wafer of feed supplement and then being cooled in room temperature.

Results and Discussion

The result showed that feed supplement in the form of mash, pellet and wafer was significant effect ($P<0.05$) on particle size, water content and bulk density. The texture of feed supplemet was rough with the size of fine particle. Table 1 shows that the feed supplement in wafer form is more suitable than the other treatments. The small particle size improves feed uniformity, thereby reducing the material separation risk at the time of mixing, improving efficiency and feed quality (Behnke, 2001). Smaller particles also increase surface area and improves digestibility because it can increase substrate accessibility to digestive enzymes.

Tabel 1. Physical quality of feed in the form of mash, pellet and wafer containing *Nigella sativa* waste

Treatment	Particle Size	Water Content (%)	Water activity	Bulk density(kg/m^3)
P1	1.15 ± 0.13^b	15.23 ± 1.27^{ab}	0.75± 0.01	0.85± 0.04^b
P2	1.35 ± 0.13^a	16.80 ± 1.06^a	0.74± 0.01	0.71± 0.02^b
P3	1.13 ± 0.05^b	14.70 ± 0.52^b	0.76± 0.01	1.25± 0.02^a

P1: feed containing *Nigella sativa* waste in form mash, P2: feed containing *Nigella sativa* waste in form pellet, P3: feed containing *Nigella sativa* waste in form wafer.

Water content ranged between 14-16%. Water content of feed below 14% is suitable for storage because the microorganisms to grow are so minimal that the feed is more durable. While the bulk density of the range 0.71-1.25 kg/m^3. The feed that has a large density is thought to be easy to contact with rumen microbes and enzymes that are in rumen fluid otherwise materials that have smaller densities take longer to contact with microbes. This can cause the digestibility of materials of high specific gravity to be large.

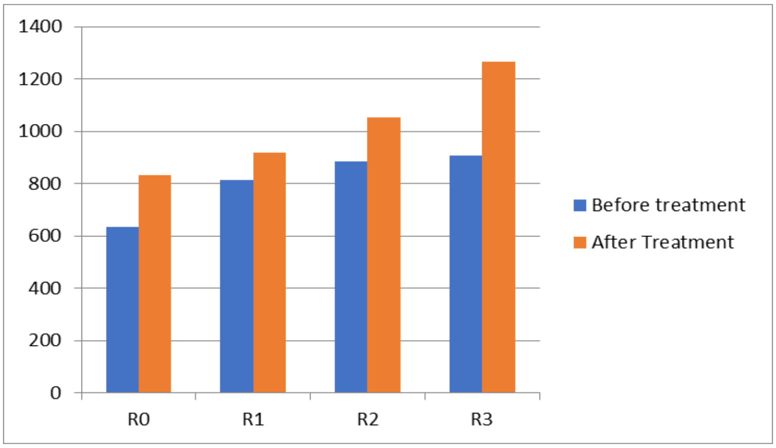
Tabel 2. Nutrien Content of feed in the form of mash, pellet and wafer containing *Nigella sativa* waste

Treatment	Ash	Crude fat	Crude Protein	Crude Fiber	NFE
R1	9.9	5.42	31.24	5.23	48.21
R2	9.56	5.32	30.88	5.39	48.85
R3	9.77	5.48	31.56	4.87	48.32

R1 : feed containing *Nigella sativa* waste in form mash, R2: feed containing *Nigella sativa* waste in form pellet, R3 : feed containing *Nigella sativa* waste in form wafer.

Feed supplement containing *Nigella sativa* had crude protein 30-31%. Supply high protein in feed supplement comes from protein content of *Nigella sativa* waste. *Nigella sativa* waste protein content was 29.88% (Barkah, 2017).

The result indicated that processing physically of *Nigella sativa* waste in form mash, pellet, wafer had significant effect ($P<0.05$) on milk production, protein and fat milk dairy goat. Feed containing *Nigella sativa* waste in form wafer yield milk production 27% higher than feed containing *Nigella sativa* waste in form mash. The range of production with the addition of dietary supplements in this study was 800-1000 mL head^{-1} day^{-1}. Milk production was higher than Retnani *et al*., 2014 with the addition of biscuit bio-supplement that has milk production of 500-600 mL head^{-1} day^{-1}. High protein content in feed supplement can increase milk production.In addition, feed supplement containing *Nigella sativa* waste can reduce the aroma of "goaty" in goat's milk and improve the taste image of goat's milk. Containing fat in the research was 7%. According to Davendra and Burns (1994) the range of goat milk fat content in the tropics is 2.6-7.8%.



R0 : conventional feed, R1 : feed containing *Nigella sativa* waste in form mash, R2: feed containing *Nigella sativa* waste in form pellet, R3 : feed containing *Nigella sativa* waste in form wafer.

Figure 1. Impact of *Nigella sativa inclusion on milk production*

Conculsion

Feed processing technology of *Nigella sativa* waste improve physical quality of feed and milk quality, also increase milk production of Etawah crossbred. Feed containing *Nigella sativa* waste in form wafer produce milk 27% higher than feed containing *Nigella sativa* waste in another form.

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Near Infrared Spectroscopy Applied to Animal Feed: Fast Analysis of Main Quality Attributes

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Abstract

The main purpose of this present study is to apply near infrared reflectance spectroscopy (NIRS) as a fast and robusta method for feed quality attributs prediction namely VFA, pH and NH3. Infrared spectra data for feed samples in form of diffuse reflectance spectra were acquired in wavelength actual range from 1000-2500 nm. On the other hand, VFA, Ph, NH3 were measured using standard laboratory procedures. Spectra data were corrected using standard normal variate (SNV) while predict models were developed using partial least square regression (PLSR). The results showed that NIRS was feasible to be applied for feed nutrition analysis, VFA, pH and NH3 can be analyzed fastly with maximum correlation coefficient (r); 0,90, 0,97 and 0,93 respectively. It may conclude that NIRS method was able to predict animal feed quality attributes fastly.

Keywords: NIRS, VFA, pH and NH3

Introduction

Application of crop residues from agro-industry by products as animal feed to reduce the cost of animal production has been known well. However, due to low nutritive values and digestibility of agro-industry as animal feed, feed technology to improve the quality agro-industry by products as animal feed should be applied (Santoso et al., 2014; Wajizah et al., 2015; Samadi et al., 2015a; Samadi et al., 2016). Fermentation is one of the feed processing technologies that was able to improve feed quality. Research carried out by Samadi et al (2015b) indicated that complete feed fermented with three different commercial by products significantly influenced the values of NH3, VFA, IVOMD, and IVDMD.

Good feed formulation for animal production depends on the results of feed analysis. Wet chemical analysis has been used to analyze animal feed since long time ago. This method has several disadvantages such as take time for sample preparation and use chemical material causing pollution. Therefore, other alternatives should be applied to avoid disadvantages aforementioned above. NIRS is one of the fast and effective methods to analyze feed quality parameters (Samadi et al., 2013; Munawar et al., 2016; Samadi et al., 2018a and Samadi et al. 2018b). There are several advantages to use NIRS as alternative methods to analyses feed quality for example no specific treatment for sample preparation, non-destructive materials and good for environment due to no pollution (Porep et al., 2015). Furthermore, this method can be applied simultaneously by using the same spectral data (Tsenkova et al., 2011). Accurate and robust prediction model are very important to predict quality characteristics of biological objects. Hence, different types of pretreatment to eliminate unrelated factors based on mathematical transformations of the spectrum should be applied in NIRS methods (Porep et al., 2015).

Several spectra pre-processing methods such as standard normal variate (SNV), baseline shift correction (BSC), spectra smoothing, orthogonal signal correction (OSC), spectra derivatives, and de-trending (DT) have been applied to obtain accurate and robust prediction of NIRS model (Nicolai et al., 2007; Cozzolino et al., 2011). In addition, regression model such as multiple linear regression (MLR), stepwise regression (SR), principal component regression (PCR), and partial least square regression (PLSR) can be also used to predict biological properties of feed based on NIRS method (Balabin & Lomakina, 2011; Nawi et al., 2013; Munawar et al., 2016). The purpose of this study is to evaluate the feasibility of NIRS as an alternative method to predict the quality attributes of fermented feed (VFA, pH and NH3). In this study, various spectra pre-processing (BSC, SNV, and DT) methods and PCR method were applied to predict quality attributes of fermented feed based on NIRS method.

Materials and Methods

Chemical Analysis for Feed Samples

Feed samples (sago residues) for this study were fermentation of sago residues with different time incubation namely 0, 7, 14, 21, and 28 days by administration of commercial fermentation product (SBP-Saus Burger Pakan®). Each treatment consisted of five replications with total of 25 samples for further chemical analysis (VFA, pH and NH_3). Fermented samples were analyzed for VFA and NH_3 (General Laboratory Procedure 1966; Soejono, 1996) at Laboratory of Nutrition and Dairy Science, Nutrition and Feed Technology Department, IPB, Bogor.

Feed Samples Prediction Based on NIR Feed Spectrum

Feed samples for near infrared spectra data were taken by irradiation of halogen lamp onto a 30 g of fermented feed samples, then collected and recorded in the form of diffuse reflectance spectra data with the wave length range from 1000 to 2500 nm or in wave numbers from 4000 to 10000 cm^{-1}. All spectra data were saved in two different file formats (*.SPA and *.CSV) for further data analysis. If there were any data outside of the ellipse after PCA followed by Hotelling T2, the spectra data were considered as outlier and removed for further analysis (Munawar et al., 2016). For spectra correction was used baseline shift correction (BSC), standard normal variate (SNV), and de-trending (DT) correction methods. Prediction models used to predict quality and nutritive parameters of feed samples were principal component regression (PCR) and validated using full leave one out cross validation. Several statistical parameters like coefficient of determination (R2), correlation coefficient (r), root mean square error (RMSE), residual predictive deviation (RPD), and the number of latent variable (LV) were applied to determine model performances, accuracy, and robustness (Nicolai et al., 2007).

Results and Discussion

Feed Samples for Chemical Analysis

Chemical analysis were used as references for prediction feed parameters in samples based on NIRS method. The results of chemical analysis VFA, pH and NH_3 for fermented sago residues at different time incubation was presented in Table 1.

Table 1. Effect of fermentation time on NH3, pH and VFA of fermented sago residues (n=5).

Fermentation Time (days)	Item		
	NH3 (%)	pH (%)	VFA (%)
F_0	4.45 ± 0.215^{a}	6.90 ± 0.003^{d}	62.67 ± 3.940^{c}
F_1	5.69 ± 0.137^{b}	6.85 ± 0.10^{c}	78.12 ± 3.241^{c}
F_2	6.04 ± 0.056^{c}	6.79 ± 0.008^{c}	89.66 ± 5.891^{bc}
F_3	6.69 ± 0.243^{d}	6.74 ± 0.008b	100.61 ± 5.694^{b}
F_4	7.25 ± 0.226^{e}	6.68 ± 0.009^{a}	117.42 ± 4.644^{a}

Means within a row with different letters differ at the P < 0.05 level.

Spectrum Analysis

After being acquisition, spectrum sample data was observed by using PCA. Hotelling T2 was applied to spectrum by using PCA to find outlier data influencing accuracy of predicted model (Cozzolino et al., 2011; Mouazen et al., 2010). As indicated in Figure 1, no outlier data were founded in the spectrum. Therefore, all spectrum data of sago residues were used to construct prediction model for prediction of VFA, pH and NH_3.

Prediction of VFA, pH and NH3

Spectrum was adjusted by using correction method (pretreatment) SNV, MN and combination of SNV and MN. Raw spectrum and pretreatment spectrum were used to construct prediction model of PCR and LOOCV. The prediction results of measured parameters (VFA, pH and NH3) are presented in the Table 2,3 and 4.

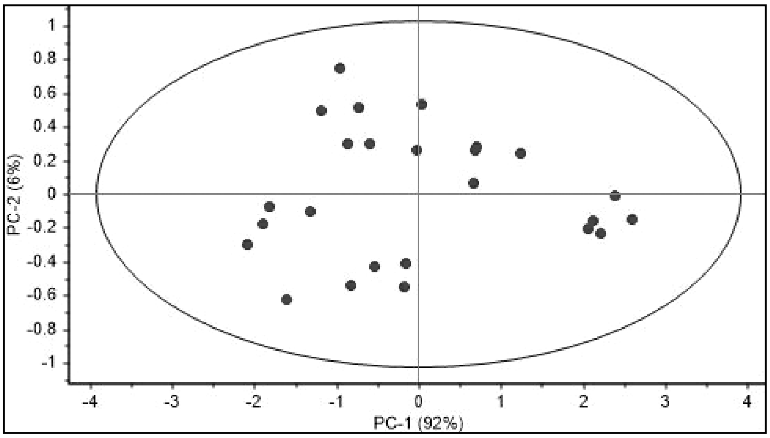

Figure 1. Feed spectra data projected onto PCA and Hotelling T^2 ellipse for outliers detection

Table 2. Prediction results for VFA nutritive value of fermented sago residues (n=5).

Spectrum	Statistical parameters				
	R^2	r	RMSE	RPD	LV
Raw	0.82	0.91	8.89	2.41	13
SNV	0.82	0.90	8.99	2.39	13
MN	0.82	0.90	9.03	2.38	13
SNV+MN	0.62	0.79	12.96	1.66	7

SNV: standard normal variate, MN: mean normalization, LV: number of latent variables, R^2: coefficient of determination, r: correlation coefficient, RMSE: root mean square error, SNV: standard normal variate.

Table 3. Prediction results for pH nutritive value of fermented sago residues (n=5).

Spectrum	Statistical parameters				
	R^2	R	RMSE	RPD	LV
Raw	0.95	0.98	0.02	4.60	13
SNV	0.95	0.97	0.02	4.50	13
MN	0.95	0.97	0.02	4.50	13
SNV+MN	0.77	0.88	0.04	2.12	7

SNV: standard normal variate, MN: mean normalization, LV: number of latent variables, R^2: coefficient of determination, r: correlation coefficient, RMSE: root mean square error, SNV: standard normal variate.

Table 4. Prediction results for VFA nutritive value of fermented sago residues (n=5).

Spectrum	Statistical parameters				
	R^2	R	RMSE	RPD	LV
Raw	0.87	0.93	0.36	2.87	13
SNV	0.87	0.93	0.36	2.87	13
MN	0.87	0.93	0.36	2.87	13
SNV+MN	0.70	0.84	0.56	1.86	7

SNV: standard normal variate, MN: mean normalization, LV: number of latent variables, R^2: coefficient of determination, r: correlation coefficient, RMSE: root mean square error, SNV: standard normal variate.

The best results for all parameters were by applying raw spectrum or spectrum prior to pretreatment. The highest values for RPD and correlation coefficient were 4.60 and 0.98 for pH with the variable latent to construct of prediction model at 13 LV. SNV and MN adjusted methods have been applied separately, but they were not able to improve prediction accuracy instead of significantly reduce accuracy. Scatter model plot graphics for all data ware presented in the Figure 2.

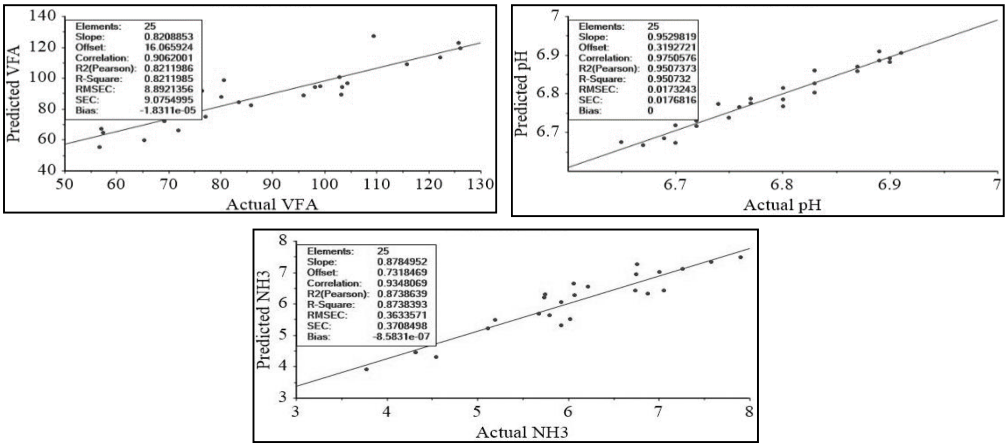

Figure 2. Actual and predicted VFA, pH and NH3 based on raw spectrum prediction model.

Discussion

One of the factors determining good fermentation products mainly agricultural by products is incubation time. Prolong incubation time results in the possibility of microbe to grow and ferment, therefore the microbe activities to degrade low quality feed such as agriculture by products is improved (Judoamidjojo et al., 1989). In this study, incubation of fermented feed for 28 d decreased pH, followed by increased consistently the values of VFA and NH_3. Reducing of pH value as indicator of feed fermentation was correlated with the increase of N-microbe and

VFA concentration (Alltech, 2012). Fermentation of feed was measured by the production of VFA as energy source supported by NH_3 availability for microbe rumen to prolific and synthesis protein microbe (Suryahadi and Amrullah, 1989). The amount of VFA production was influenced by digestibility and fermented feed quality (Baldwin, 1995). This results was in accordance with the research conducted by Mustofa et al. (2012) in which ammoniated cornborn fermented for 4 week by using commercial starter improved the values of VFA and NH_3.

Chemical bound such as C-H, C-H-O, N-H, O-H, R-O-H and C-C will be vibrated at the certain near infrared wave then will be characteristics of specific nutritive specific values (Munawar et al., 2016), since each biological sample has chemical and physical structures. In NIRS method, the first step to be conducted was spectrum data acquisition, then corrected data after spectrum data were required. Thereafter, prediction model can be constructed and developed to predict nutritive values of feed samples (Cen and He, 2007). Regression method of PCR was applied to find correlation between spectra data and actual data from VFA, pH and NH3 of fermented sago residues. Validation model to predict using cross validation of leave one out cross validation (LOOCV).

The best prediction was found in the parameters of pH and NH_3 for four kinds of treatment (raw spectrum and pretreatment) with the minimum value of RPD 2.89 for NH3 and 4.50 for pH. These values were categorized in high accuracy. This is in accordance with Nicolai et al. (2007) in which prediction with the value above 2.5 indicated that it was a good and accurate prediction. Meanwhile, the value of RPD between 1.5-1.9 was categorized as not accurate prediction and the value of RPD from 2-1.5 was indicated as feasible prediction (Williams, 2001 and Fearn, 2002).

Similar to RPD, determinant cooficient (R^2) is one of statistical parameters that can be used to determine prediction accuracy. The value of R^2 between 0.50-0.65 was indicated that about 50% of prediction can be determined and the value of R^2 between 0.82 to 0.90 was indicated as good prediction. The best prediction will be obtained, if the value of R^2 is higher than 0.91 (Williams, 2003 and Karoui et al., 2006). In this study, the best prediction was at the parameter of pH (R^2=0.95), meanwhile, the parameter of VFA and NH_3 were categorized as good accuracy with the value of R^2 between 0.82-0.87. For statistical parameter, the low value of R^2 was acquired at pretreatment combination mainly at VFA parameter (0.62).

Application of pretreatment at spectrum has been conducted and not able to improve accuracy for all parameters by using both SNV and MN. Combination of SNV+MN reduced accuracy and significantly, in which parameter VFA and NH_3 of RPD was not able to get value more than 2. Difference from other spectrum with other pretreatment, where latent variable can be used up to 13 LV, combination between SNV+MN only can be used up to 7 LV. In comparison, other research conducted by Shepherd et al. (2005) indicated that NIRS was be able to predict IVDMD in organic residues with correlation coefficient of 0.91.

Conclusions

NIRS method could be applied to measure quality of fermented sago residues for VFA, pH and NH_3 parameters with good and high accuracy results. The results indicated that the highest value for RPD was 2.4 for VFA, 4.58 for pH and 2.87 for NH_3. By appling raw spectrum, all model presented the same R^2 or higher, except for coorection model for SNV+MN. This was indicated that prediction model which has been constructed to predict the values of VFA, pH and NH_3 with a very good results. The combination method of SVN+MN was the worst one and concluded that this method was not appropriate to be applied for this study.

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Germination of *Asystasia gangetica* seeds exposed to different source, color, size, storage duration and pre-germinative treatments

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Abstract

Asystasia gangetica is a softweed species that use for ruminant feed in Indonesia and the different plant parts also use in traditional medicine to treat different diseases. However, the seeds are dormant, and the species remain undomesticated. The present work evaluated the germinability and vigor of *A. gangetica* seeds. Seeds were collected from Bogor and Purwakata then storage for 70 days, 113 days and 120 days. Seeds were sorted by color (white and brown) and were subjected to seven different pre-germination treatments followed by immersion on hot water (80^{o}C) for 30 minutes and immersion on room temperature water (25^{o}C) for 120 minutes. Brown seeds showed higher germination percentage, number of germinated seed on the first day and germination rate index. The highest first count percentages of total germination and the highest germination rate index were observed in seeds which were storage for 10 days and treated with 25^{o}C water for 120 minutes. *A. gangetica* germination affected by seed source, color, pre-germinative treatments, and storage duration on germination.

Keywords: *Asystasia gangetica*, germination, source, size, storage duration

Introduction

Asystasia gangetica (L.) T. Anderson (Acanthaceae), commonly known as "ara sungsang" is highly indicated for regenerating gallery plantation. *Asystasia gangetica* is a fast growing, spreading, perennial herb, with usually ascending, branched, quadrangular stem up to 2 m long, often rooting at the lower nodes (Shu et al, 2011). *A. gangetica* is one of the soft weed species that is widely growth as ground cover in Indonesia. *A. gangetica* can dominate in huge areas because of their high tolerance to low soil fertility and shade from the other plants canopy (Turner & Gillbanks, 2003). The plant has many medicinal, nutritional and local values include plant usage as forage.

A. gangetica growing in natural environments making it important for evaluate reproduction process to gain proper seed through the use of specific technologies developed. Seed viability has high probability to lost during storage at room temperature or during extended storage durations (Pinho et al 2009). This process results in a loss of seed quality that is directly measurable by an increase of leachates in imbibed water. Seed has been established that there are often variations in the germinative potential of seeds according to the color of their teguments, which may be a sign of their degree of ripeness (Negrelle et al. 1999, Silveira et al. 2002).

Research carried out with *A. gangetica* from Bogor and Purwakarta through different harvest time. The viability and storage potential of *Asystasia* seeds is very limited, and the present work provides information about the influence of seed source, pre-germinative treatments, and storage duration on germination.

Materials and Methods

The experiments were carried out in the Laboratory of Agrostology, Faculty of Animal Science at Bogor Agricultural University, Indonesia. The seeds were obtained from fruits collected from various plants Bogor (approx. 106°43'30" - 106°51'00" longitude and 30'30" – 6°41'00" latitude, at 190 - 350 m a.s.l.) and Purwakarta (approx. 107°30' - 107°40' " longitude and 6°25'-6° 45' latitude, at 35 - 2036 m a.s.l.). The regional climate is classifed as tropics, with an average rainfall of 4100 mm and an average annual temperature of 23.3°C in Bogor and 2712 mm and temperature of 25.6°C in Purwakarta. The fruits were collected in August and October 2017 then was drying under sunlight until their spontaneous opening released their seeds; this process took about 3 days. The seeds used in the experiments were 1100 seeds that separated into three groups according to their color: white or brown.

In the storage experiments, the recently harvested seeds were stored in plastic sacks at room temperature for 10, 70, 113 and 120 days. After each storage duration, the seeds were measured length, width, thickness and weight. The seeds were treated with 1% sodium hypochlorite for 10 minutes to disinfect them (Brasil 1992) and then submitted to a simple pre-germination treatments: 1) immersion in 80^{o}C water for 30 minutes; and 2) immersion in 25^{o}C water for 120 minutes. The seeds were then sown under into trays lined with litter soil and organic fertilizer (1:1), after that kept in a germination chamber for 30 days (when the germination percentage was found to stabilize).

The germinated and emerged seedlings were counted at every three days to evaluate the germination percentage (%) and the germination rate index (GRI) (=Σni/ti where G1/N1+ G2/N2 + ... Gn/Nn , and n1, n2 ... nn are equal to the numbers of germinated seeds, and N1, N2... NN are the numbers of days) following Kader (2005). The outcomes were submitted to Matrix Anova Unbalanced and the significant variables were compared using the HSD test at a 5% probability level.

Results and Discussion

Only the gray seeds germinated. This variability of seed germinative potential according to seed color has been observed in various species. Scalon et al (2012) reported that numerous workers correlated the physical, morphological and physiological characteristics of seeds to their ripening.

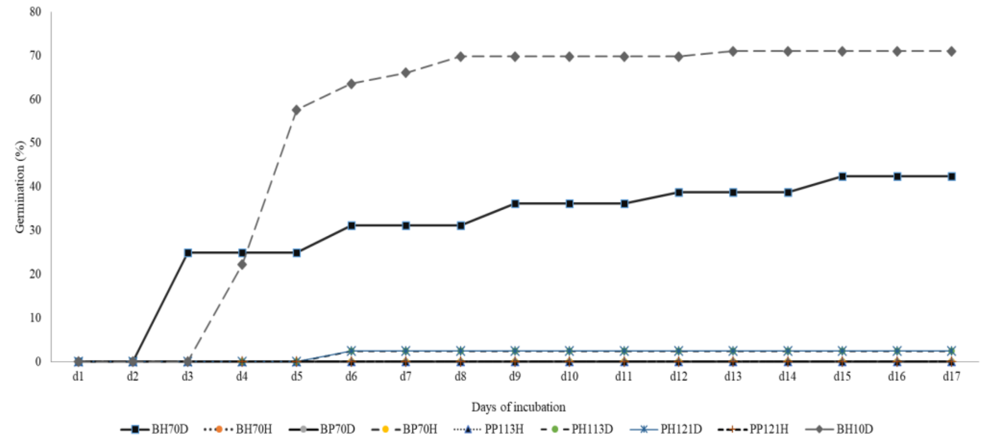

Figure 1. Percentage of *A. gangetica*, seeds germinated in each seed sources, colour, storage duration and pre-germinative treatment (water 25°C and 80°C)

Figure 1 shows that seeds began to germinate after 3 days. The number of germinated seeds increased until the 14th day and then stabilized until the end of the evaluation duration. Germination was only observed on the 17th day in the other treatments and remained constant until the end of the evaluation duration. Germination was observed at room temperature about 25-28°C. Similarly, Scalon et al. (2007) observed that, on the average, germination percentages of *Dimorphandra mollis* Benth. seeds were higher at 25°C and at 20/30°C.

Table 1. Average of total germination, germination on the first count and index of germination speed of *A. gangetica*

Treatments	n	Total germination (%)	FDG (day)	Germination on the 1st count	GRI
Seed source					
Bogor	1040	16.87[a]	3	33.38[a]	11.24[a]
Purwakarta	200	2.00[b]	6	0.00[b]	0.61[b]
Seed color					
Brown	720	24.57[a]	3	9.82[a]	15.22[a]
White	520	0.94[b]	6	0.00[b]	0.37[b]
Immersion temperature (°C)					
25	740	22.39[a]	3	18.09[a]	14.65[a]
80	500	0.33[b]	6	0.00[b]	0.07[b]
Storage duration (days)					
10	240	71.06[a]	4	22.30[b]	46.64[a]
70	800	8.75[b]	3	50.00[a]	5.93[b]
113	120	0.83[c]	6	00.00[c]	0.48[c]
120	80	3.75[c]	6	00.00[c]	2.28[c]

Abbreviation: FDG = first day cermination, GRI = germination rate index

Based on statistic analyses, all the evaluated characteristics demonstrated significant effect on total germination, number of the first geminated seed and germination rate index. GRI calculations merely show the percentage of germination per day, so the higher the percentage and the shorter the duration, the higher the GRI. Higher percentages of total germination and GRI were noted during the first count when the seeds were harvested in Bogor, had brown color and treated by immersion in water 25°C for 120 minutes.

There was a significant effect of storage duration on the *A. gangetica* germination that the longer storage duration was reduced total germination despite higher germination of 70 days storage on the first count (Figure 2). The effect of storage duration is specific on each species such as *Matricaria chamomile* could storage until 12 months (Banjaw and Wolde, 2017), *Croton urucurana* for 300 days (Scalon et al, 2012) or *Glycine max* until 180 days impeding possible chemical and physical changes that may come about during storage (Filho et al, 2016).

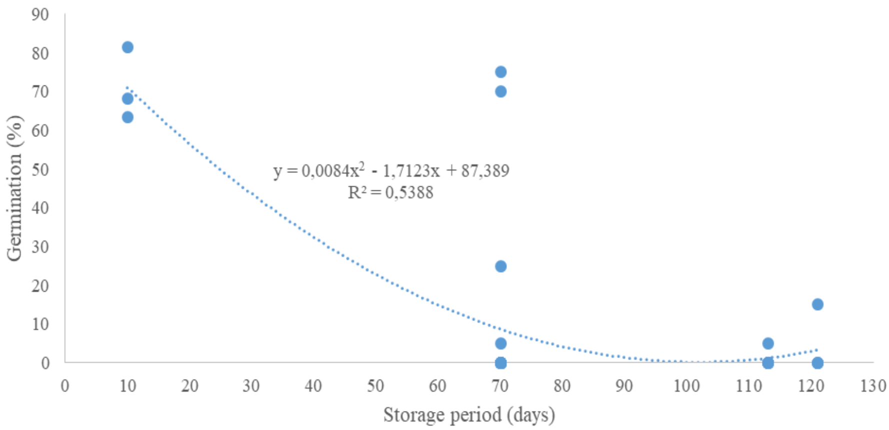

Figure 2. Germination percentage of *A. gangetica* after different storage periods

Conclusions

A. gangetica germination affected by seed source, color, pre-germinative treatments, and storage duration on germination.

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Selection of Irradiated 300 Gy Alfalfa (*Medicago sativa*) on Acid Stress through Tissue Culture

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Abstract

Alfalfa (*Medicago sativa* L) is a high nutrient leguminous that was just started being developed in Indonesia. Croplands adaptation problem results in alfalfa difficulties to produce well, especially in areas with high acidity. This study aims to investigate the possibility of irradiation response on Alfalfa calluses for selection to acid stress by gamma ray 300 Gy. This experiment carried out in a completely randomized factorial design with different replications. A Factor were four numbers of individual plants (G3E39, G3G50, G3E1 and G3C5) and the B factor were the acid treatments with the addition of $AlCl_3$ consists of P0: Control without AlCl3, pH 6.09), P1: with AlCl3 100 ppm, pH 5.46, P2: with AlCl3 200 ppm, pH 4.84, P3: with AlCl3 300 ppm, pH 4.51, P4: with AlCl3 400 ppm, pH 3.63, P5: with AlCl3 500 ppm = pH 3.33. The data was analize by variance analysis (ANOVA) and Duncan advanced test assisted with SPSS 16 applications. Parameters observed were plant height, leaf number, media shrinkage shrinkage and plant weight. The results showed that the individual plant and the acid treatment significantly affected ($P<0.05$) the observed parameters. The best plant productivity was G3G50 with acid tolerance at pH 3.63.

Keywords: alfalfa, irradiation, acid treatment, tissue culture

Introduction

Alfalfa (*Medicago sativa* L) can grow well in a good soil fertility and drainage with normal pH of 6.5 - 7.5 (Widyati 2012). Alfalfa can adapt to dry areas with rainfall of 200 mm/year or wet area of 2500 mm/year (Radovic *et al*. 2009). Alfalfa has high protein, mineral and vitamin content (Wahyuni and Kamaliyah 2009). Many regions in Indonesia have a soil pH below 6.5. According to Mulyani and Sarwani (2013) the potential of arid agricultural land of Indonesia is 108.8 million ha spread over Sumatra, Kalimantan and Papua. Alfalfa can be widely developed in Indonesia but needs to be improve geneticaly to acid soil tolerance. This genetic improvement can be done by gamma ray irradiation. The objective of this study was to select the alfalfa (*Medicago sativa* L.) response on irradiation of gamma rays 300 gy that resistant to acid stress using tissue culture plant.

Materials and Methods

This research was conducted in Forage Tissue Culture Laboratory, Division of Forage Technology and Pasture Science, Faculty of Animal Science, Bogor Agricultural University. This research was conducted from January - March 2018. Alfalfa plants which have been irradiated by gamma rays obtained from the collection of Forage Tissue Culture Laboratory, Division of Forage Technology and Pasture Science, Faculty of Animal Science, Bogor Agricultural University. Sterilization was done by 70% alcohol, laundry soap, clorox 10 - 20%. Growth regulators used was 2,4D (dichlorophenoxyacetic acid), basal MS (Murashige Skoog) media. Treatment for the media acidity was using different levels of aluminum from $AlCl_3$ were consist : P0: Control (pH 6.09), P1 (100 ppm $AlCl_3$, pH 5.46), P2 (200 ppm $AlCl_3$, pH 4.84), P3 (300 ppm $AlCl_3$, pH 4.51) , P4 (400 ppm $AlCl_3$, pH 3.63), P5 (500 ppm $AlCl_3$, pH 3.33). Observations were carried out within 4 weeks with 3 days of interval so that 10 observations were done along this experiment. The variables observed were plant height, leaf number, media shrinkage shrinkage and plant weight. The data analyzed by multi-ANOVA using SPSS software, then further by Duncan test (Matjik and Sumertajaya 2006).

Results and Disscusion

The result of variance analysis showed that interaction of plant number and acid treatment significantly ($P <0.05$) influenced the response of plant height (Table 1). The interaction showed that the G3G50 was able to adapt to the optimum pH level of 5.46 (100 ppm $AlCl_3$ addition). The higher $AlCl_3$ addition the lower plant's height response. The best effect of treatment was on the addition of $AlCl_3$ 0 ppm and 100 ppm. The higher of $AlCl_3$ addition causing aluminum poisoning of alfalfa plant. Wang *et al.* (2016) explained that aluminum causes a decrease in alfalfa plant growth by inhibiting meristematic zone extension, irregular cell structure, and defective cell shape.

The result of variance analysis showed that the number of plants did not significantly affect the number of alfalfa leaves while the addition of $AlCl_3$ significantly affected the number of alfalfa leaves ($P <0.05$) (Table 2). The decrease of leaf number occurred in the treatment with the addition of $AlCl_3$ 300-500 ppm. Decrease in the number of leaves is caused by aluminum activity that inhibits the absorption of water and nutrients. Karti and Setiadi (2011) explained that the increase in Al can inhibit leaf formation in sensitive plants. Köpp *et al*. (2011) added that the growth in an acid conditions as a mechanism of tolerance level by utilizing nutrient solutions in controlled environments, and as an evaluation of plants against aluminum poisoning. The result of variance analysis showed that the addition of $AlCl_3$ and plant number significantly ($P <0.05$) affected to media shrinkage. The highest media shrinkage was on G3G50 plant number (Table 3). The addition of $AlCl_3$ decrease the media shrinkage response. The tolerance level of media shrinkage was up to the addition of 200 ppm $AlCl_3$ (pH 4.84). Media shrinkage is the result of water absorption and nutrients for plant metabolism. Manpaki (2017) explained that in his research on *lamtoro* shrinkage of plant media has decreased related to growth's problems.

Table 1. Response of Alfalfa Height after Gamma Rays Irradiation of 300 Gy (30 HST)

plant number	$AlCl_3$ (ppm)						Average
	0	100	200	300	400	500	
			--------------------------------mm--------------------------------------				
G3E39	23.97±0.00def	35.89±21.46bc	11.76±4.03g	9.72±3.69g	11.52±2.54g	10.05±3.13g	17.15b
G3G50	49.36±9.21a	39.06±8.14ab	26.99±8.27cde	8.86±1.3g	9.21±3.77g	8.91±2.18g	23.73a
G3E1	27.71±5.29bcde	32.60±19.83bcd	25.57±6.20cde	11.04±3.39g	8.46±1.95g	8.75±2.31g	19.02ab
G3C5	36.62±14.46bc	29.80±9.00bcde	18.27±6.69efg	10.32±3.13g	9.98±2.63g	14.22±4.20g	19.86a
average	34.41a	34.33a	20.64b	9.98c	9.79c	10.48c	

Notes: 0 ppm (pH 6.09), 100 ppm (pH 5.46), 200 ppm (pH 4.84), 300 ppm (pH 4.51), 400 ppm (pH 3.63), and 500 ppm (pH 3.33). The small letters on the rows and columns show a significant difference at the level of 5% (P<0.05).

Table 2. Response of alfalfa leaf number after gamma ray irradiation 300 Gy (30 HST)

plant number	AlCl3 (ppm)						Average
	0	100	200	300	400	500	
			---------------------------------helai daun--------------------------------------				
G3E39	11.50±6.36	12.00±5.19	12.50±0.70	7.00±1.73	8.50±1.94	6.67±1.52	9.69
G3G50	21.00±4.35	15.60±3.64	18.20±6.18	9.00±6.48	6.00±2.96	6.80±2.86	12.76
G3E1	17.33±7.44	17.13±4.51	16.88±7.51	5.83±1.94	4.28±2.81	6.57±2.82	11.33
G3C5	18.60±7.66	12.50±5.25	12.40±5.68	11.00±6.37	7.40±2.19	8.00±2.82	11.65
Average	17.10a	14.30a	14.99a	8.20b	6.54b	7.00b	

Notes : 0 ppm (pH 6.09). 100 ppm (pH 5.46). 200 ppm (pH 4.84). 300 ppm (pH 4.51). 400 ppm (pH 3.63). and 500 ppm (pH 3.33). The small letters on the rows and columns show a significant difference at the level of 5% (P<0.05).

Table 3. Response on media shrinkage after gamma ray irradiation 300 Gy (30 HST)

plant number	AlCl3 (ppm)						Average
	0	100	200	300	400	500	
	------------------------------ bobot (gram) ------------------------------------						
G3E39	1.00±0.26	0.80±0.20	0.82±0.10	0.50±0.10	0.63±0.10	0.53±0.22	0.71b
G3G50	0.90± 0.22	0.94±0.21	1.00±0.26	0.68±0.15	0.65±0.12	0.75±0.10	0.81a
G3E1	0.87±0.05	0.76±0.11	0.70±0.10	0.64±0.23	0.64±0.25	0.46±0.11	0.67b
G3C5	0.70±0.00	0.70±0.00	0.50±0.08	0.53±0.15	0.53±0.15	0.60±0.08	0.59c
Average	0.86a	0.79a	0.75a	0.58b	0.61b	0.58b	

Notes : 0 ppm (pH 6.09). 100 ppm (pH 5.46). 200 ppm (pH 4.84). 300 ppm (pH 4.51). 400 ppm (pH 3.63). and 500 ppm (pH 3.33). The small letters on the rows and columns show a significant difference at the level of 5% (P<0.05).

Table 4. Response on final weight of alfalfa after gamma ray irradiation 300 Gy (30 HST)

plant number	AlCl3 (ppm)						Average
	0	100	200	300	400	500	
	------------------------------ bobot (gram) ------------------------------------						
G3E39	0.60±0,33	0.50±0.10	0.54±0.11	0.33±0.05	0.30±0.08	0.43±0.09	0.45ab
G3G50	0.64±0.13	0.70±0.10	0.56±0.15	0.76±0.97	0.50±0.14	0.20±0.08	0.56a
G3E1	0.58±0.14	0.33±0.19	0.46±0.15	0.38±0.17	0.32±0.19	0.32±0.08	0.39b
G3C5	0.40±0.00	0.50±0.00	0.28±0.15	0.30±0,20	0.47±0.11	0.43±0.09	0.39b
Average	0.55	0.50	0.45	0.44	0.39	0.34	

Notes : 0 ppm (pH 6.09). 100 ppm (pH 5.46). 200 ppm (pH 4.84). 300 ppm (pH 4.51). 400 ppm (pH 3.63). dan 500 ppm (pH 3.33). The small letters on the rows and columns show a significant difference at the level of 5% (P<0.05).

The result of variance analysis showed that the addition of $AlCl_3$ had no significant effect on final plant weight but was significantly ($P < 0.05$) influenced by plant number (Table 4). The best final plant weight is on the G3G50 plant number followed by G3G39, G3E1 and G5C5 plant numbers. The final weight of the plant is the main indicator of tolerance level on the addition of $AlCl_3$. The high acid stress was caused by the addition of $AlCl_3$ inhibits the meristematic zone of the plant but does not inhibit cell division activity until they reach certain acidity level in which the cell can no longer perform physiological activity so that causing the death of plant cells. Wang *et al*. (2016) explained that aluminum inhibits meristematic zone extension, but does not inhibit cell division therefore causing irregular cellular arrangement.

Conclusions

The G3G50 plant number gives the best response on acid tolerance of 400 ppm $AlCl_3$ (pH 3.63), followed by G3G39 plant number with acid tolerance to 300 ppm $AlCl_3$ (pH 4.51), and G3E1 and G5C5 plant numbers with acid tolerance up to 200 ppm $AlCl_3$ (pH 4.84).

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The *bmr* Sorghum Productivity Grown on Swamp-soil Applied Biochar and Harvested in Different Age

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Abstract

Nowadays forage production is starting to be done by utilising sub-optimal soils due to land competition. Sorghum is well known by their good ability to growi in marginal soils, such as swamp soil which has low soil acidity and high Al^{3+}. The biochar application has been commonly known for its function as a soil amendment agent to improve soil quality and forage crops productivity in sub-optimal areas. This research using a completely randomised factorial design; the factors were biochar application levels and forage harvesting age. The G.53 lines of *bmr* sorghum, a mutant lines resulted from irradiation in Indonesia National Nuclear Energy Agency (BATAN) and developed by SEAMEO Biotrop, have been grown on swamp soil with levels of application 0, 5, 10, and 15 ton ha^{-1} and harvested at age 65 and 75 day after sowing. The cultivation was held on greenhouse system using treated swamp soil in a 45 kg polybag. The research parameters were sorghum individual weight (IW), sorghum leaf ratio (LR), sorghum stem ^{o}brix point (BP), forage dry matter (DM) content, and forage crude protein (CP) content. Research result showed that harvesting age factor has dominantly effect on sorghum agronomical parameters with linear correlation; the higher harvesting age would increase IW, BP and decrease LR. Meanwhile, there was an interaction of research factors on forage DM and CP content which the highest is between 15.30 to 17.06 % and 11.46 to 12.46% respectively.

Keywords: *bmr*, sorghum, biochar, amendment, sub-optimal.

Introduction

Forage production is now started by optimizing marginal soil. Sorghum is well known by their good ability to grow in marginal soil that forage production unaffected by decreasing of potential soil. One of marginal soil is the swamp soil that characterized by low soil pH and high content of Al^{3+}. Biochar has been widely used as a soil amendment agent with the aim of improving soil fertility as well as the productivity of crops.

Biochar is an aromatized material with relatively large pore structures and surface area after pyrolysis under complete or incomplete anoxic conditions (Lehman, 2007). Biochar is expected to increase swamp soil utility and increase forage production. As an emerging soil amendment, biochar application into soil not only improves soil fertility, but also affects the transformation of N which provides nutrient and habitats for soil microorganisms and reduces N leaching (Lehmann et al., 2011; Gul et al., 2015)

Materials and Methods

The G.53 lines of bmr sorghum is a mutant lines that resulted from irradiation in Indonesia National Nuclear Energy Agency (BATAN) and developed by SEAMEO Biotrop. These sorghum have been grown on swamp soil with levels of biochar application were 0, 5, 10, and 15 ton ha^{-1} and harvested at age 65 and 75 days after sowing. The cultivation was held on greenhouse system using treated swamp soil in a 45 kg polybag. Fertilization using NPK dosage 270 kg ha^{-1} was applied on 15 and 30 days after sowing (DAS). To anticipate both insect and fungal disturbances, insecticides and fungicides applied in recommended dosage. This research using a completely randomized factorial design; the factors were biochar application levels and forage harvesting age. The research parameters were sorghum individual weight (IW), sorghum leaf ratio (LR), sorghum stem brix point (BP), forage dry matter (DM) content, and forage crude protein (CP) content. IW and LR were calculated on harvesting day, while BP was obtained by squeezing juice from the sorghum stem and using defining using refractometer. DM and CP were analyzed using proximate procedures (AOAC, 2005).

Results and Discussion

Result showed that harvesting age have dominantly effect on sorghum productivity and quality, but biochar application have no significant effect on IW, LR and BP parameters. There was no interaction ($P > 0.05$) between the factors and IW, LR, and BP parameters, but the parameters were significantly ($P < 0.05$) influenced by harvest age (Table 1). The higher of harvest age will obtain higher individual weight, and higher brix values with lower leaf percentages. This is a normal phenomenon in the vegetative phase of the plant, where the plant is still growing to achieve maximum conditions. Sorghum *bmr* is predicted to have higher forage quality if harvested earlier (Kurniawan, 2014). At the age of 75 days, sorghum plant can still grow as evidenced by the increasing production and the rise of brix value. The percentage of leaves ranging from 10% to 30% of the overall dry weight of the plant depends on the variety and increases with the maturity of the plant (Yosef et al. 2009).

While higher brix values in physiological maturity phase indicated the high accumulation of total sugar content in stem of sorghum plant. The brix value increases in the flowering phase until the physiological maturity phase is suspected to occur due to a decrease in the water content in the stem (Gadakh et al., 2013).

Table 1. Sorghum Individual Weight, Leaf Percentage, and ^{o}brix point

Harvest (DAS)	Biochar Level (ton^{-1} ha) 0	5	10	15	average
	------------------------------individual weight--------------------				
65	168.83±42.84	181.83±32.58	182.83±14.69	198.92±29.59	183.10±30.32^{b}
75	252.50±54.63	213.33±14.85	214.50±42.61	239.00±15.77	229.83±36.72^{a}
Average	210.67±63.76	197.58±28.86	198.67±34.02	218.96±30.67	
	---------------------------------% leaf--------------------------------				
65	57.70±4.47	56.85± 2.65	54.80±2.31	53.41±2.67	55.69±3.30^{a}
75	41.11±1.78	39.65± 5.44	38.73±3.21	41.93±6.19	40.36±4.23^{b}
Average	49.41±9.41	48.25±10.01	46.77±8.98	47.67±7.56	
	----------------------------------^{o}brix---------------------------------				
65	6.36±0.72	5.98±0.60	6.95±0.60	6.53±0.35	6.46±0.63^{b}
75	9.11±1.11	8.54±2.29	9.26±2.23	6.98±0.51	8.47±1.79^{a}
Average	9.02±2.77	9.19±3.78	7.81±2.31	8.48±1.57	

Different superscript in the same line means significantly different (P<0.05)

Meanwhile, there was a significant interaction (P <0.05) between biochar use factor and harvest age on DM content and CP content of sorghum (Table 2). Plants respond negatively to the use of 15 tons of ha^{-1} biochar in DM and CP. The most optimal results were obtained on the application of 10 tons ha^{-1}. The biochar and N fertilizer application significantly increased crop yield which might be associated with the improved soil nutrients such as soil CEC, NH^{4+}-N, TN, available P and K contents (Liu et al. 2018).

Tabel 2. Sorghum Dry Matter and Crude Protein Content

Harvest (DAS)	Biochar Level (ton^{-1} ha) 0	5	10	15	average
	----------------------------------DM---------------------------------				
65	13.28±0.74^{c}	13.38±1.16^{c}	15.30±1.03^{ab}	14.59±1.14^{bc}	14.14±1.27
75	16.10±1.22^{ab}	17.06±1.49^{a}	16.90±1.01^{a}	14.54±1.15^{bc}	16.15±1.46
average	14.69±1.78	15.22±2.32	16.10±1.27	14.57±1.04	
	----------------------------------CP----------------------------------				
65	11.46±0.56^{ab}	12.46±2.02^{a}	9.61±1.57^{bc}	9.16±1.90^{c}	10.67±2.01
75	6.59±1.31^{d}	5.93±0.92^{d}	6.02±1.16^{d}	7.80±0.92^{cd}	6.58±1.24
average	9.02±2.77	9.19±3.78	7.81±2.31	8.48±1.57	

Different superscript in the same line means significantly different (P<0.05)

The production capability that remains high in *bmr* sorghum despite being grown on marginal soil is due to the mutation effect of some genes due to gamma ray radiation. The existence of favored mutant strains that have high biomass productivity, it is suspected that gamma ray radiation treatment can improve on the stem of the sorghum plant (Sihono, 2013).

Conclusions

Harvesting age factor has dominantly effect on sorghum agronomical parameters with linear correlation; the higher harvesting age would increase individual weight, °brix point and decrease leaf ratio. Meanwhile, there was an interaction of research factors on forage dry matter and crude protein content which the highest is between 15.30 to 17.06 % and 11.46 to 12.46% respectively.

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The Influence of Palm Kelner Cake on Nutrient Intake and Performance of Growing Brahman Cross Cattle

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Abstract

Palm kernel cake (PKC) is one of the major by-products of the Malaysian palm oil industry. The use of PKC as animal feed in Malaysia is common, however the use of PKC in beef cattle as a single concentrate has not been observed. This objective of this study was to evaluate the use of PKC as a single or mixed with commercial concentrate as cattle feed. This study was conducted at the Cattle Breeding Center in Kota Belud, Sabah, Malaysia. Fifteen male Brahmann Cross (BX) cattle were used in this experiment. The cattle were divided into three groups with five replications. The experiment design was Randomized Block Design 3 x 5. The ration were R1 = 50% *Brahiaria decumben* (BD) + 50% commercial concentrate as a control, R3 = 50% BD + 25% commercial concentrate + 25% PKC and R2 = 50% BD + 50% PKC. The results showed that the use of PKC as concentrate did not affect on consumption of DM, CP, CL and TDN. However, use of PKC as single concentrate (R3) increased significantly ($p<0.05$) CF consumption and decreased NFE consumption. The DM and OM digestibility of the ration were not significant. The DM digestibility of R1, R2 and R3 were 66.96, 62.56 and 63.20% respectively. There was no significant effect on the average daily gain (AGD) between treatments. The ADG of R1, R2 and R3 were 0.82 ± 0.18, 0.97 ± 0.30 and 0.93 ± 0.08 kg day^{-1} respectively. But, there was tendency that the ADG of cattle fed R2 and R3 was more higher than R1 (control), therefore the feed efficiency and IOFC of R2 and R3 were significantly higher. It could be concluded that PKC could be used as single concentrate as substitute commercial concentrate for BX cattle.

Keywords: palm kelner cake, concentrate quality, average daily gain, brahmann cross

Introduction

Feeding on beef production is an important factor in supporting the production success Forage as the main feed with concentrate can complete of cattle feed for production. Concentrate feed gives enough influence to performance and efficiency of beef cattle. According to Priyanto and Widiawati (2010) the formulation of concentrates determine the quality of the feed. In addition, the raw material source used in preparing rations and the availability of available raw materials also influences.

Malaysia is the largest producer and exporter of palm oil products in the world. One of the by-products of the palm industry is the Palm Kernel Cake (PKC).

Malaysia produces the PKC more than 1.3 million tons per year. According to Devendra (1977), PKC is a feedstuff raw material that is potentially a source of protein with biological values ranging from 61 to 80%, and contains 14-20% crude protein (Zarei *et al.* 2008). The difference in protein content depends on the processing method (Boateng *et al.* 2013). The expeller processing contains crude protein between 13.3 - 15.0%, while with hydrothermal processing contains between 19.4-19.8%. PKC is generally given to dairy cattle and beef cattle as a source of protein. According to Osman and Hisamuddin (1999), more than 50% of Malaysian farmers use the PKC as concentrated feed for livestock.

This objective of this study was evaluate the use of PKC as a single or mixed with commercial concentrate as BX cattle feed on consumption, digestibility and feed efficiency at Cattle Breeding Center in Kota Belud, Sabah, Malaysia.

Material and Methods

This research was conducted in Cattle Breeding Center (CBC) Wario 1, Kota Beut Sabah. Fifteen male Cross Brahman (BX) cattle were used in this study. The initial average body weight of the cattle was 214±17.4 kg, and the age was around three years. The animal were randomly allocated into three groups, and each group included 5 animals. The preliminary period was conducted for 15 days, followed by experiment period for two months.

The animals were feed with three type of ration that containing concentrate, palm kernel emal (PKC) and combination of commercial concentrate and PKC. The comercial concentrate contained wheat grain, maize grain, wheat pollard, fish meal, palm kernel expeller and soya bean meal. The animals were kept in individual cages and fed two times a day. Chopped *Brahiaria decumben* (BD) was given in at 10.00 AM and concentrate at 14.00 PM, while drinking water was ofered *ad libitum.* The kinds of rations, i.e:

R1: 50% BD grass and 50% commercial concentrate (as control)
R2: 50% BD grass, 25% commercial concentrate and 25% PKC
R3: 50% BD grass and 50% PKC

The chemical composition of feeds is showed in Table 1.

Table 1. Chemical composition of experimental feeds

	DM	Ash	CP	CL	CF	NFE	TDN*
Brahiaria decumben	20.50	5.75	7.23	1.44	25.06	60.52	60.88
Palm Kernel Meal (PKC)	93.43	4.55	14.05	9.07	12.52	59.81	69.84
Commercial concentrate	90.82	4.87	11.63	7.87	4.77	70.86	81.39

* TDN was calculated using formula TDN = 70.6 + 0.259 CP + 1.01 EE – 0.76 CF +0.0991 NFE (Sutardi, 2001) and concentrate were calculated using formula TDN = 37.937 - 1.018 (CF) - 4.886 (CL) + 0.173 (NFE) + 1.042 (CP) + 0.015(CF)2 - 0.058 (CL)2 + 0.008 (CF)(NFE) + 0.119 (EE) (NFE) + 0.038 (CL) (CP) + 0.003 (EE)2 (CP) (Hartadi, 1990)

The parameter measured were consumption of dry matter (DM), organic matter (OM), crude protein (CP), crude lipid (CL), crude fiber (CF) and nitrogen free extract (NFE); feed digestibility; average daily gain (ADG), feed efficiency and Income Over Feed Cost (IOFC). The feed and water consumption were recorded every day. The digestibility was measured by total collection method during the last week of observation. The feed sample and collected feces were analyzed for their chemical composition using AOAC methods (2015). The animal body weight were recorded using digital animal balance before and after feeding trial.

The research used Randomized Block Design (RBD) with three treatments and five replications. The data were analysed with ANOVA, followed by Duncan multiple rank using SAS application software.

Results and Discussion

Feed Intake

Table 2 shows the treatments did not significant affect (p>0.05) on DM and nutrient consumption. This can be seen the average DM consumption of the rations were 4.31 - 4.92 kg head^{-1} day^{-1}. This DM consumption was only 1.61 - 1.91% of body weight. This consumption was relatively lower than previous studies, using BX steer with fully concentrate feeding, that the DM consumption were 10.06 to 10.38 kg head^{-1} day^{-1} (Wirogo *et al.* 2012). This difference was due to differences in the composition of the rations used, the nutrient content and body weight of the animal.

Table 2. Feed and nutrient consumption

Variables	Ration		
	R1	R2	R3
Feed Consumption:			
As feed (kg head^{-1} day^{-1})			
Forages	10.38±1.59	10.75±0.25	10.63±0.44
Concentrate	2.86±0.26	2.95±0.05	2.28±0.45
Total	13.24±1.85	13.70±0.23	12.91±0.87
Dry Matter (kg head^{-1} day^{-1})			
Forages	2.13±0.33	2.20±0.05	2.18±0.99
Concentrate	2.60±0.24	2.71±0.05	2.13±0.42
Total	4.72±0.56	4.92±0.06	4.31±0.50
Nutrient Consumption (kg head^{-1} day^{-1})			
Crude protein	0.46±0.05	0.51±0.01	0.46±0.06
Crude lipid	0.23±0.02	0.26±0.00	0.22±0.04
Crude fiber	0.66±0.09^{b}	0.79±0.01^{a}	0.81±0.07^{a}
NFE	3.13±0.36^{a}	3.11±0.04^{b}	2.59±0.30^{bc}
TDN	3.41±0.39	3.41±0.04	2.82±0.34

* R1 = 50% BD grass + 50% commercial concentrate, R2 = 50% BD grass + 50% commercial concentrate + 25% PKC, and R3 = 50% BD grass + 50% PKC.

DM consumption affected also nutrient and TDN consumption. The results showed that there was no significant difference in consumption of CP, CL and TDN. However, there were significant differences ($p < 0.05$) in CF and NFE intake. The use of PKC in ration R2 and R3 significantly increased CF and decreased NFE. The using of PKC has also tendency in decrease of TDN intake.

Feed Digestibility

Table 3 shows nutrient digestibility of the rations in male BX cattle during the study. There was no significantly different ($p > 0.05$) between rations on digestibility of dry matter (DDM), organic matter (DOM) and nutrients.

The digestibility of DM of the rations were R1 (67.01±6.40 %), R2 62.58±4.63 % and R3 (63.04±3.12 %, while OM digestibility were R1 (70.47±5.70%), R2 (66.12±3.68 %) and R3 (66.43 ± 2.70 %). The result shows that use of 50% and 100% of PKC as substitute commercial concentrate had relatively same digestibility. The results shows that PKC as a single concentrate had the same quality with commercial concentrates containing various feed ingredients.

Table 3. Digestibility of dry matter, organic matter and nutrient

Digestibility (%)	Ration		
	R1	R2	R3
Dry Matter	67.0±6.40	62.6±4.63	63.0±3.12
Organic Matter	70.5±5.70	66.1±3.68	66.4±2.70
Crude Fat	84.0±4.85	82.9±2.91	83.2±3.50
Crude Protein	59.1±7.38	58.7±4.73	56.8±4.30
Crude Fiber	48.4±11.85	47.7±4.80	50.6±4.14
NFE	69.5±5.51	64.9±4.57	64.1±3.26

* R1 = 50% BD grass + 50% commercial concentrate, R2 = 50% BD grass + 50% commercial concentrate + 25% PKC, and R3 = 50% BD grass + 50% PKC.

Average Daily Gain and Feed Efficiency

Table 4 shows that there was no significant difference ($p > 0.05$) in the average daily gain (ADG) of BX cattle fed on commercial and PKC rations. However, there was tendency that the ADG cattle fed with R2 (containing 50% PKC) and R3 (containing 100% PKC) was higher than R1 (100% commercial concentrate). The ADG were R1 (0.82 kg head^{-1} day^{-1}), R2 (0.93 kg head^{-1} day^{-1}), and R3 (0.97 kg head^{-1} day^{-1}) . This performance was relatively better than the local Indian Native dairy cattle and Sahiwal-Friesian crossbreed dairy cattle (Yusuff *et al.* 1987). This is also correspond with Zahari and Alimon (2005), that consumption of 30-50% PKC will improve cattle performance. However, the result differs from previous studies conducting by Ngadiyono (1995), that the ADG of Cattle BX fed with a high ammount concentrate in the feedlot system were 0.80 - 1.2 (kg of head^{-1} day^{-1}).

The research results showed that feed efficiency of rations was significantly difference ($p < 0.05$) between treatments. The highest feed efficiency was found in R3 (0.22%), while R1 (0.17%) and R2 (0.19%), this proves that the feeding in R3 had good feed quality so that the low consumption of dry matter 4.31 (kg head^{-1} day^{-1}) was able to produce body weight of 0.97 (kg of head^{-1} day^{-1}).

Table 4. Performance BX cattle during research

Variables	Ration		
	R1	R2	R3
Initial body weight (kg)	223±14.55	217±14.64	213±14.02
Final body weight (kg)	270±23.78	271±15.97	269±26.62
ADG (kg head^{-1} day^{-1})	0.82±0.18	0.93±0.08	0.97±0.30
Feed efficiency	0.17±0.02^{b}	0.19±0.02^{ab}	0.22±0.04^{a}

* Different superscript in the same column means significantly different (P<0.05). R1 = 50% BD grass + 50% commercial concentrate, R2 = 50% BD grass + 50% commercial concentrate + 25% PKC, and R3 = 50% BD grass + 50% PKC.

Income Over Feed Cost (IOFC)

Table 5 shows Income Over Feed Cost (IOFC) of ration. The result showed that the used of PKC as substitute commercial concentrate reduced feed costs. The feed cost of ration R1 (commercial concentrate) was 7.4 MYR head^{-1} day^{-1}, while R2 (25% PKC) and R3 (50% PKC) were 6.6 MYR head^{-1} day^{-1} and 5.0 MYR head^{-1} day^{-1} respectively.

This reduction in feed costs has led to an increase in IOFC. The R3 ration using PKC as the single had most significant in IOCF (2.8 MYR head^{-1} day^{-1}). Due to the high cost of commercial concentrate, the cattle that get R1 rations had negative IOFC, this means the feed cost of R1 was more expensive than the value of weight gain, thus causing loss.

Table 5. Income Over Feed Cost (IOFC)

Variables	Ration		
	R1	R2	R3
Cost (MYR head^{-1} day^{-1})			
Forages	3.10	3.20	3.20
Concentrate	2.90	2.90	1.80
Total (a)	7.40	6.60	5.00
Average Daily Gain	0.82	0.93	0.97
Income (MYR head^{-1} day^{-1}) (b)	6.60	7.50	7.80
IOFC (MYR head^{-1} day^{-1}) (b-a)	-1.20	0.90	2.80

* R1 = 50% BD grass + 50% commercial concentrate, R2 = 50% BD grass + 50% commercial concentrate + 25% PKC, and R3 = 50% BD grass + 50% PKC. 1 MYR = Rp 3.200,- (1 Februari 2017).

Conclusions

The use of PKC as a substitution of commercial concentrate in BX cattle had no negative effects on consumption, digestion and body weight gain, so that PKC can be used as concentrate in BX beef cattle and provided significant profit (IOFC).

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The Effect of Different Legume Leaves Supplementation on Feed Intake, Digestibility and Growth of Etawa Crossbreed Goat Given *Paspalum atratum* Grass as Basal Feed

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Abstract

The research was done to examine the effect of supplementation of different legume leaves on feed intake, digestibility and growth of Etawa crossbreed goats (initial liveweight (W) 11.11 kg) received *Paspalum atratum* as basal diet. The experiment applied 4 x 6 randomized block design, with 4 treatments and 6 replicates. The dietary treatments were (1) *Paspalum atratum* (P), (2) P + *Gliricidia sepium* (1% W dry matter (DM)/day (d)), (3) P + *Leucaena leucocephala* (1% W/d)) and (4) P + *Desmanthus virgatus* (1% W/d). The goats were placed in individual metabolic cage for the whole experiment which consisted of 2 weeks adaptation period and 6 weeks measurement periods. Variable measured were DM intake, DM digestibily and daily liveweight gain (DLG). The results showed that legume leaves supplementation significantly increased (P<0.05) the total DMI, DMD and DLG of Etawa crosbreed goat given *Paspalum atratum*. Goats without supplementation had lowest (P<0.05) total DM intake, DM digestibility and DLG. A significant increase in DM intake, digestibilty and DLG was recorded with Gliricidia supplementation. It was concluded that Leucaena and Desmanthus were the best legume leaves as feed supplement for Etawa crossbreed goat fed *Paspalum atratum*.

Keywords: Etawa crossbreed goat, digestiblity, feed intake and growth

Introduction

Goats have a very important role in Indonesian farming system or community as producers of meat (animal protein), customary needs, savings and family income sources. The number of goat populations in Indonesia has increased from year to year. Based on data from LAHS (2017), goat population in Indonesia was 18.50, 18.64 and 19.01 million heads in year 2013, 2014 and 2015, respectively. Similarly, national goat meat production also showed an increase trend. The production of goat meat in 2014 reached 65.100 tons increased to 67.800 ton in 2016.

Despite its potential in providing meat, under small holder farming system, goat productivity are often constrained by poor nutrition supply especially during the dry season. This is because the small holders farmers rely on native grass to fed their goats. In general native grass has low quality and often provide insufficent biomass to meet goat nutrient requirements. Marsetyo et al. (2012) reported that the crude protein (CP) content of native grass in Palu was 8.1% which is low to meet animal protein requirement.

One strategy to evercome this feed gap at farmer level is by introducing improved forages such as *Paspalum atratum*. This new improved grass have been adopted by farmers in Central Sulawesi for more than 4 years. Marsetyo (2014) reported that *Paspalum atratum* showed superiority in increasing daily liveweight gain of Kacang goats compared with native grass and *Brachiaria mulato* grass. *Paspalum atratum* produced leafly material and higher nutritive value compared these two grasses. However, in order to boost goat performance, it necessary to provide supplements that are rich in protein contents. Legumes leaves contain high protein and to some extent are avaliable at village level. This study was aimed to evaluate the effect of feeding different leguminous leaves on intake, digestibility and daily weight gain of growing Etawa crossbreed received *Paspalum atratum* grass as basal diets.

Materials and Methods

Experimental site

The experiments were conducted at the experimental farm located in Sibalaya village, Faculty of Animal Husbandry and Fishery Tadulako University, 40 km south of Palu, Central Sulawesi, Indonesia, from March to May 2018.

Animals, experimental design and diets

Twenty four male goats of Etawa crossbreed with average live weights of 11.11± 0.44 (SE) kg were used in this trial. The goats were ranked and blocked based on unfasted weight and allotted to four treatments, in randomised block design with four treatments and each replicated 6 times. The diets tested include (1) *Paspalum atratum* grass ad libitum (PA; 92 g CP, 626 g neutral detergent fibre (NDF), 15 g EE (ether extract)/kg DM), (2) PA + *Gliricidia sepium* (221 g CP, 322 g NDF, 25 g EE/kg DM; 1% weight (W) DM/day (d) (3) PA + *Leucaena leucocephala* (327 g CP, 305 g NDF, 33 g EE/kg DM, 1% W DM/d) and (4) PA + *Desmanthus virgatus* (232 g CP, 314 g NDF , 34 g EE/kg DM, 1% W DM/d). The amount of basal diet offered each day was set 20% more than that consumed by the goat on the previous day. The legume allocation was adjusted according to new liveweigh every week.

Paspalum atratum grass as a basal diet that was cutted at similar age, harvested daily in the morning and chopped to a length of 10-20 cm. *Gliricidia sepium*, *Leucaena leucocephala* and *Desmanthus virgatus* plantation were available at farm. The legum foliage was harvested in the late afternoon.

The grass was offered twice a day at 09.00 h and 14:00 h with half of the daily ration at each occasion, while the legume foliages were offered once per day in the morning at 07.00 h. The feeds were weighed every day for individual feeding adjusted to actual DM content of the feeds. The goats were housed in individuall metabolic cage (1.5×2 m) for the whole experiment. Before commencement of the experiment all animals were injected with Ivomec (1 mL/50 kg live weight) against internal and external parasites. The experiment lasted for 8 weeks consiting of 2 weeks adaptation period and 6 weeks measurement period. Drinking water was on offer at all times.

Measurement and Calculation

Variables measured in this experiment include total DM intake, DM digestibility and daily liveweight gain. Feed intake was measured for six weeks and calculated as the difference between the amount of feed offered and the amount of feed refused. Digestibility was measured for 7 consecutive days on week 6. During the collection period in the digestibility trial, the refused feed and faeces were collected from each animal. Refusals were collected every day for the one week then taken sub samples for each animal for chemical analysis. Each morning during digestibility measurement, total collection of faeces for each animal was weighed, mixed homogeneously and and sub sampled about 20% and kept in a deep freezer (-20^{o}C). At the end of digestibily measurement, subsamples of faeces were thawed and pooled for each animal and dried at 60 °C for 72 h to determine the DM content. The experimental goats were weighed every week in the morning at 06:00 h before morning feeding.

Chemical analysis

Prior to chemical anlysis, reperesentative samples of feed and faces were ground (1 mm screen) and then dried at oven at 60 °C to determine their dry matter (DM) content (AOAC, 1990). Samples of feed offer were also analyzed for organic matter (OM), nitrogen and EE (AOAC, 1990) and also NDF contents using method of Van Soest et al. (1991).

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Statistical Analysis

Data collected from the experiment were statistically analysed by ANOVA with Minitab statisstical package sofware version 12. A least significant differences test by Steel and Torrie (1980) were used to compare the differences in mean values among dietary treatments.

Results and Discussion

Table 1 shows the data of DM intake, DM digestibility and daily liveweight of Etawa crossbreed goat received *Paspalum atratum* grass added with three different legume leaves. Although the legume leaves did not completely eaten, but the DM intakes of legume approached their total allowances. The DM intake of *Gliricidia, Leucaena* and *Desmanthus* were 89, 97 and 98%, respectively from their total allocation. A small differences in intake of the legume DM intake could probably associate with physical properties and palatability among the legumes that have been suggested by previous studies (Poppi et al, 1994; Ellis et al., 2000).

This study showed that addition of legume leaves to Etawa crossbreed goat given *Paspalum atratum* grass significantly ($P<0.05$) increased total DM intake with no significant differences ($P>0.05$) among the legume type (Table 1). Although supplementation of legumes resulted in the increase of total DM intake, but legume supplementation depressed basal feed intake that called a substitution. The rates of substitution due to supplemenation of *Gliricidia sepium, Leucaena leucocephala and*

Desmanthus virgatus to the basal diet in this study were 19%, 11% and 19%, respectively. Ideally addition of protein rich supplement such as legume could result in the stimulation of basal diet intake. Rumen microbes are the main fibre digester in the rumen therefore when they are provided with substrate such as ammonia, the intake of grass component could be increased but it was not happened in this study. However, other factors such as physical properties of feeds may also affect to the substitution effect (Poppi et al, 1994; Ellis et al., 2000). Previous studies (Marsetyo et al., 2012; 2016; and 2017) also reported the effect of legume supplemention on the reduction of basal feed intake. The rate of substitution in the current studies is smaller than previous studies. The legumes used in the current study were naturally bulky that could resulted in the lowering capacity of reticulorumen to accomodate more the basal diet. This phenomenon has been proved by Marsetyo et al. (2016) who found that the substitution rate of *Gliricidia* was about double than rice bran.

Table 1. Average dry matter intake, dry matter digestibility and daily liveweight gain of Etawa crossbreed goat received *Paspalum atratum* grass supplemented with three different legume leaves

Parameter	PA	*PAG*	*PAL*	*PAD*
DM intake of legume (% W/d)	0.00±0.00	0.89±0.01	0.97±0.01	0.98±0.01
DMI intake of Paspalum grass (% W/d)	2.48±0.09	2.00±0.09	2.21±0.11	2.02±0.16
Total DM intake (%W/d)	2.48±0.09[a]	2.89±0.09[b]	3.18±0.11[b]	3.01±0.16[b]
Total crude protein intake (g/d)	30.36±0.42[a]	56.7±0.53[b]	57.49±0.62[b]	55.78±0.60[b]
DM digestibility (%)	51.93±0.72[a]	55.58±0.57[b]	61.04±0.71[c]	60.98±0.68[c]
Daily Liveweight gain (g)	25.40±2.10[a]	40.09±2.71[b]	50.79±2.10[c]	46.83±4.29[c]

PA = *Paspalum atratum* grass *ad libitum*, PAG = PA + *Gliricidia sepium, PAL = PA +Leucaena leucocephala* and PAD = PA + *Desmanthus virgatus;* Means with different superscripts in same row are significantly different (*P*<0.05).

In the digestibility trial, inclusion of different legume leaves in the ration increased significantly (P<0.01) DM digestibily of Etawa crossbreed goat given *Paspalum atratum* grass (Table 1). Diet containing *Gliricidia* had higher (P<0.05) DM digestibility than control diet (*Paspalum atratum* only), however the highest DM digestibility was achieved by diets supplemented with *Leucaena* and *Desmanthus*, but no significant differences (*P* > 0.05) between these two treatments (Table 1). Addition of *Gliricidia, Leucaena* and *Desmanthus* to *Paspalum atratum* (with DM digestibilty 51.93%) increased DM digestibility by 3.65%; 9.11% and 9.05%, respectively. Increasing of DM digestibily in the current study was associated with increased crude protein intake (Table 1) delivered from legumes. This situation could enhanced the microbial growth and activity in the rumen. Previous study (Ellis et al., 2000) reported that supplementation of ruminants with high protein feed can result in the increase in DM digestibility of the ration. Moreover, legume supplemented goats relatively had higher digestible proportion digesta from the supplement compared with goat without legume supplementation. This results is in agreement with previous study of Van Eys et al. (1986) who also reported an increase in feed DM digestibilty due to addition tree legumes (*Gliricidia, Leucaena and Sesbania*) on goat fed Napier grass.

Addition of legume in the ration increased significantly ($P<0.05$) daily liveweight gain Etawa crossbreed goat in the current study (Table 1). The highest ($P<0.05$) daily liveweight gain were achieved by addition of *Leucaena* and *Desmanthus* and no significant difference ($P>0.05$) between these two treatment. This increase in daily liveweight gain was associated with increased total DM intake and DM digestibility of supplemented goats. More nutrients both protein and metabolisable energy were available for supplemented animal therefore legume supplemented goats gained more weight than unsupplemented ones. Inclusion of *Gliricidia, Leuacena and Desmanthus* to Etawa crossbreed goat received *Paspalum atratum* resulted in the increase of daily liveweight gain up to 58, 99 and 84% of unsupplemented goat, respectively. The range daily liveweight gain of crossbreed Etawa goat in the current study (26-51 g/d) was higher than in the study of Suparman et al. (2016). These authors noted that avearge daily liveweight gain of Etawa crossbreed ranged 22-27 g/d.

Conclusions

Growth performance of Etawa crossbreed goat given new introduced grass *Paspalum atratum* grass was low and can be enhanced by addition of legume leaves. *Leucaena leucocephala* and *Desmanthus virgantus* leaves were the best as feed supplement to increase growth of Etawa crossbreed goat fed *Paspalum atratum* grass.

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The Effects of Leubiem Fish Waste (*Chanthidermis Maculatus*) As Protein Source in Rations on The Performance of Male Alabio Ducks

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Abstract

The aim of this study is to determine the effect of leubiem fish waste (Chanthidermis Maculatus) as a source of protein in rations on the performance of male Alabio duck. The study used 96 male Alabio ducks 8-14 weeks old grower phase. The duckss were allocated into 4 treatments and 4 replications (6 ducks/pen). The male Alabio ducks was fed ration contained 17-18 % crude protein and 2700 kkal/kg metabolizable energy. The experiment used completely randomized design with 4 treatment rations: R0 (control / 0% leubiem fish waste), R1 (basal diet containing 10% leubiem fish skin flour), R2 (basal diet containing 10% leubiem fish head flour) and R3 (basal diet containing 10% leubiem fish bone flour). The observed variables were: feed consumption, body weight gain, final body weight, feed conversion, and mortality of male Alabio duck. Data was analiyzed by Anova and Duncan test. The results showed that the use of leubiem fish waste gave a positive response to the performance of male Alabio duck. The use of leubiem fish waste (skin flour, head and bone) in ration significantly affect (P<0,05) feed consumption, body weight gain, and final body weight, but no significant affect on ration conversion and mortality male Alabio duck grower phase. It was concluded that the use of leubiem fish waste (skin flour 10%) could serve as a source of protein in duck ration and able to increase body weight gain, and final body weight of male Alabio duck.

Keywords: Leubiem Fish Waste, Alabio Ducks, Rations, Performances

Introduction

Leubiem fish (*Chanthidermis maculatus*) is one of the jebong or goat fish family which is one of the fish species found in the Indo-Pacific or Red Sea and Africa region to Southeast Asia, north of Japan and south to north of Australia and east west Atlantic. *Chanthidermis maculatus* or better known to people of Aceh as *leubiem fish.* It was commonly found on the coast of Thailand, Indonesia, Philippines and Japan (Zarry *et al*. 2017). Protein content of leubiem fish waste was high, ranging from 46.08 to 66.2%, it was higher than fish meal generally contained 53.7% (Nikijuluw, 2010). Utilization of the fish processing waste will give many advantages such as a source of protein in, animal ration reduces environmental pollution, and sources of minerals in animal ration such as, phosphorus, calcium and vitamins.

One of the fish waste which have high protein, mineral, phosphor and calcium source is Leubiem fish waste (*Chanthidermis maculatus*) which can be utilized as duck feed ingredients. Utilization of fish waste is one alternative to reduce the cost of ration in the of ducks business (Gombo *et al.* 2015). Fish waste which consisting of head, the contents, of gastro-intestinal tract, meat, and bone, if it is fed freshly, it may harmful to the livestock. It needs to be processed prior to feeding (Nunung 2012). Processing fish waste does not only have high nutritional value but also provide a distinctive taste and aroma, have high digestibility and available amino acid (Abun *et al.* 2004). One of processing technique that can be applied is fish meal making (Widyasari *et al.* 2013). Baye *et al.* (2015) reported that utilization of fish waste flour in poultry ration increased feed consumption and body weight gain. The purpose of this study to determine the effect of leubiem fish waste as a source of protein in rations on the performance of male Alabio duck.

Materials and Methods

The research used 96 male Alabio ducks at grower phase. Ration used in this experiment consisted of leubiem fish waste (skin, head, and bone) corn, rice bran, coconut meal, soybean meal, sago, coconut oil, premix, NaCl, and DCP.

Treatment Rations

Treatment rations used were basal rations containing leubiem fish waste (skin, head and bone) formulated according to the grower phase duck requirements: It contained 17-18 % crude protein and 2700 kkal/kg metabolizable energy (Table 1).

Experimental Procedure

This study used 96 male Alabio ducks of 8 weeks of old and reared until 14 weeks of old in the litter cages system. The experiment lasted 6 weeks and during that time, feed and water were offered ad-libitum. Feed consumption and body weight gain were determined weekly. Final body weight, feed conversion, and mortality of male Alabio duck were determined at the end of feeding trial.

Statistical Analysis

The study was conducted for 6 weeks (age 9 - 14 weeks). The design used was completely randomized design with 4 treatment rations and 4 replications: R0 (control / 0% leubiem fish waste), R1 (basal diet containing 10% fish skin flour leubiem), R2 (basal diet containing 10% fish head flour leubiem) and R3 (basal diet containing 10% fish bone flour leubiem). The observed variables were: feed consumption, body weight gain, final body weight, feed conversion, and mortality of male Alabio duck. Data was analiyzed by Anova and Duncan test (Steel and Torrie 1993).

Table 1. Composition and nutrients content of the treatment ration

Feed Ingredients	R0	R1	R2	R3
Corn	38.5	40	37	37
Rice bran	17	18	18	18
Coconut meal	10	13.5	13	13
Soybean meal	24.3	7.5	12	10
Sago	7.2	8	7	9
Fish skin flour leubiem	0	10	0	0
Fish head flour leubiem	0	0	10	0
Fish bone flour leubiem	0	0	0	10
Coconut oil	1.5	1.5	1.5	1.5
Premix	0.5	0.5	0.5	0.5
NaCl	0.5	0.5	0.5	0.5
DCP	0.5	0.5	0.5	0.5
Total	100	100	100	100
Calculated nutrients content:				
Metabolizable energy (Kcal/kg)	2702	2767	2706	2719
Crude protein (%)	18.02	18.12	18.08	18.15
Crude fiber (%)	5.92	6.66	6.55	6.95
Crude fat (%)	4.57	4.99	5.1	4.77
Ca (%)	0.28	1.09	1.36	1.07
P (%)	0.58	0.95	1.09	0.91

Results and Discussion

Rations Consumption

The average consumption of male alabio ducks ration during the study were 142.66 - 152.18 grams per head per day (Table 2). The lowest feed intake was obtained from treatment R0 (control/ 0% leubiem fish waste) and the highest feed intake was found in treatment R3 (basal diet containing 10% fish bone flour leubiem). The data of male Alabio ducks performance obtained in this study are presented in Table 2.

The results showed that the use of leubiem fish waste (skin, head and bone) in ration formulation significantly affect (P<0.05) ration consumption of male alabio duck. An improvement of ration consumption was found in the male Alabio ducks fed 10% leubiem fish bone flour (R3), it was significantly higher (P<0.05) in compare to control ration (R0). Ration consumption in livestock can be influenced by various factors, one of the main factors according to Hernandez *et al.* (2004) was the quality of feed including the nutrient content contained in the feed. Daud *et al.* (2013) found that ration consumption was also strongly influenced by the palatability of the rations, types, and composition of feed ingredients used in duck ration formulation. In addition, the palatability of the ration is also influenced by the of the ration itself (Alaily *et al*. 2011). This is caused by rations formulated with leubiem fish waste flour gave a fresh smell and increased palatability of the rations. In addition, the high consumption of rations was also influenced by the taste, shape and content of these dietary proteins. High consumption of rations followed by increasing of protein consumption to meet the needs of amino acids for these animals, and protein efficiency was influenced by protein consumption (Liu *et al.* 2015; Varianti *et al*. 2017). Feed consumption influenced by various factors, including the nutrient content in the feed and the level of energy content in the ration (Fan *et al*. 2008).

Table 2. The performances of male Alabio ducks (9 - 14 weeks)

Parameters	Treatment			
	R0	R1	R2	R3
Ration consumption (g/h/day)	142.66±12.8^{a}	150.31±4.40^{ab}	148.32±7.16^{ab}	152.18±8.75^{b}
Body weight gain (g/h/day)	10,87±0,28^{a}	11,98±0,38^{b}	11,67±1,06^{b}	11,37±1,12^{b}
Final body weight (g)	1329,1±12,72^{a}	1389,1±17,34^{b}	1378,2±48,11^{b}	1372,3±50,69^{b}
Feed conversion ratio	4,4±0,37	4,6±0,15	4,5±0,05	4,7±0,25
Mortality (%)	0	0	0	0

Note: Different superscript in the same line means significantly different (P<0.05); R0 = 0% leubiem fish waste (control); R1= basal diet containing 10% leubiem fish skin flour; R2= basal diet containing 10% leubiem fish head flour; R3= basal diet containing 10% leubiem fish bone flour

Increasing consumption of ration containing leubiem fish waste (skin, head and bone) was also thought to be caused by the effect of the ration color. The basic color of fish skin (R1), head flour (R2) and bone flour (R3) is rather yellowish and bright. This is in line with Prayitno and Sugiharto (2015) statements which said that bright color of ration increased consumption of the rations.

Body Weight Gain

The weight gain of Alabio male ducks (8-14 weeks) during the study ranged from 10.87-11.99 g/head/day (Table 2). The results of statistical analysis showed that the use of leubiem fish waste (skin, head and bone) in Alabio male duck ration formulation gave significant affect (P<0,05) on weight gain. This result suggested that the use of leubiem fish waste in the dietary formulation as a protein source increased the weight of male Alabio duck. The increasinge of livestock weight was strongly influenced by the consumption of rations (Daud *et al*. 2017). Level of protein consumption was determined by the level of ration consumption, the more rations consumed, the more protein consumed. It may resulting in excess of protein in the body (Alyandari *et al*. 2014).

Final Body Weight

The results showed that the final body weight of male Alabio ducks ranged from 1329 - 1389 g/head (Table 2). Rations containing leubiem fish waste had a significant effect (P<0.05) on final body weight of male Alabio ducks at 8-14 weeks. The highest final weight was found in R1 treatment 1389,1 g/head and the lowest final weight was found in treatment R0 1329,1 g/head. It can be seen that the use of 10% leubiem leather skin flour increased duck's body weight relatively higher than other treatments, (P <0.05). Duck growth rate will be optimal if the genetic potential supported by feed proteins and energy contents that suits their needs (Dewanti *et al.* 2013).

Feed Conversion Ratio (FCR)

One of the variables used to see the ability of livestock to convert feed into meat- especially products is to look at the value of FCR. The lower the value of the FCR, the lower amount of feed needed to increase a unit of body weight (Apriliana Devi Anggraini *et al.*
2017). FCR results showed that the use of leubiem fish waste in Alabio duck feed formation for male grower stage during 9-14 weeks had no significant effect on ration conversion (Table 2).

This finding suggested that the use of leubiem fish waste in the grower Alabio duck ration produced a similar FCR to the control feed. This finding suggested that the formulated local diet containing leubiem fish waste is able to provide the level of palatability, quantity and balance of nutrients and it is effective in promote growth of the ducks and improves feed to body weight conversion of the rations. The smaller the feed conversion rate, the more efficient the use of ration by livestock (Arifah *et al.* 2013). The value of feed conversion depends on the quality of feeds given to the animal. The higher the nutrient conceived the better the conversion of the resulting feed. This happens because with a good feed the livestock consumed less feed to produce the same body weight in compare to less good one. High growth reflecteds the efficiency of ration consumption and it can be seen from decreasing ration conversion rate (Nurhayati *et al.* 2016).

Mortality

The results showed that the use of leubiem fish waste in feed formulation did not affect mortality of Alabio male duck grower phase. This suggests that the use of leubiem fish waste may be one of the most reliable sources of feed ingredients as a protein source in Alabio duck ration formulation as well as good and regular maintenance management. Provision of ration and regular water supply greatly affects the immune system of ducks. Cage hygiene also greatly affects the mortality of ducks, where dirty cages easily led to disease infection that caused death of the ducks. Good maintenance management can control and prevent disease on ducks and inhibit the occurrence of infection so mortality rate in ducks were minimized (Shandu 2014).

Conclusions

It was concluded that the use of leubiem fish waste (skin flour 10%) can serve as a source of protein in duck ration and able to increase body weight gain, and final body weight of male Alabio duck.

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Dietary Supplementation of Fulvic Acid and Ground *Moringa oleifera* on Performance and Hematological Profile of the Javaness Quail *(Coturnix coturnix japonica)*

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Abstract

This research was conducted to study the effect of powder *Moringa oleifera* leaves and fulvic acid supplementation in the diet on the performance and hematological parameter of the experimental quails (*Coturmix coturmix japonica*). As many as 180 quails aged 30 days old with initial BW of 98.6 + 8.4 g were used and reared for 9 weeks. Blood samples for laboratory assay were taken through veni functure from 18 quails at the end of the rearing period (age of 13 weeks). Hematological parameters analyzed were erythrocyte, leucocyte counts and hemoglobin as well as erythrocyte indices e.g. Mean Corpuscular Volume (MCV) and Mean Corpuscular Hemoglobin Concentration (MCHC). The treatments consist of six diet differentiations with inclusion of various levels of fulvic acid (0% and 0.5%) and three levels of Ground *Moringa oleifera* leaves (0%, 5%, and 10%). The experimental design used completely randomized factorial with two factors (2x3) and three replications. The results showed that supplementation of fulvic acid and *Moringa oleifera* flour in the diets did not significantly affect (P> 0.05) the egg production (quail day), the FCR (feed conversion ratio) and the hematological profile of the experimental quails. From this research, it can be concluded that the diets containing *moringa oleifera* leaves and fulvic acid do not disrupt the chemical composition of the quails' blood and hematological analyses showed that the hematological parameters measured were still within normal range.

Keywords: fulvic acid, haematology, ground Moringa oleifera leaves, quail day egg production, laying quails

Introduction

The quails have recently emerged to be the right choice to diversify poultry farms and explore the quality of eggs and meat. Quail has excellent disease resistance compared to chickens. The quails belong to the order Galliformess, family hephasinidae, genus Coturnix and species coturnix. Quail birds as poultry birds are a much better commercial choice because of their low volume and weight, early maturity and growth, high egg laying rates, low feed and space requirements.

High-quality protein with an adequate balance of amino acids is one of the most important nutrients for quails. *Moringa oleifera* is one of local feed containing excellent nutrients composition and active substances as nutricines like antioxidant which has function to support body protection system. Antioxidant phytochemicals such as phenolic and carotenoids can help protect the cellular system from oxidative damage and reduce the risk of chronic diseases (Sreelatha and Padma, 2009). Moringa leaves are known to have essential amino acids and contain high crude protein. Mineral content in the ground moringa leaves can also be expected to maximally help the development of egg shell.

The use of plant proteins in feed intake combined with organic acid, such as fulvic acid, may be able to improve the quail's immune system. Fulvic acid is found in nature as a product of microbial metabolism processes, which means it is produced when organic plant material decomposes and millions of beneficial healthy bacteria are released. Fulvic acid contains large amounts of nutrients that improve bowel health, including trace minerals, electrolytes, fatty acids, silica, which increases the synthesis of collagen, prebiotics and probiotics. This helps nourish the digestive tract and also enhance the ability of "good bacteria" to repopulate and form a healthy 'micro-biome' environment. A strong digestive system will improve the immunity, help control of hormone production and reduce stress response. Supplementation of fulvic acid in laying quail feed intake was reported to have reduced the disease occurrence and improved the feed digestion and the quality of eggs and eggshells (Supriyati, 2007).

The objective of this research was to study the effect of fulvic acid with ground *Moringa oleifera* leaves in the diet on the performance of feed intake, egg production and feed conversion ratio of laying quails. Hematological parameter analysis was performed to evaluate healthy status of the quails.

Materials and Methods

Experimental birds and housing

The experimental bird observed were as many as 180 quails aged 30 days old with initial BW of 98.6 $\pm$ 8.4 g, procured from a local farm around Bogor, West Java. The experiments were conducted in 18 battery cages with 10 quails in each cage and allowed for 10 days of acclimation. The study was conducted for 13 weeks. The cages were placed in vents (naturally and mechanically) and illuminated (artificially and naturally through windows) on cement-flooring. The quails were weighed at the beginning and at the end of the experiment (13 weeks of age) to determine the body weight changes.

Experimental feed

The birds were fed with its own feed mixture, containing fulvic acid and ground moringa leaves, in mesh form. Diet is formulated according to Lesson and Summers (2005) with protein and metabolic energy 18% and 2,900 kcal/kg respectively. The leaves and stems of *Moringa oleifera* used are harvested and dried in an artificial dryer (dehydrator) at 60^0C for 6 hours. Dried leave and stems are then ground by semi hammermill with 3 mm screen size. Various levels of fulvic acid were incorporated into various levels of ground moringa leaves. The combination of fulvic acid and moringa was then mixed in a diet with the ingredients consisting of yellow corn, rice bran, soybean meal, corn gluten meal, premix for poultry, $CaCO_3$, DCP, NaCl, DL-Methionin, crude palm oil, *Moringa* and fulvic acid. The diets were given to the quails twice a day (in the morning and afternoon) and water was supplied ad libitum. The temperatures and the humidity during experiment were recorded 3 times a day. The experimental diets and the nutritional composition of the diets based on the laboratory analysis is presented in Table 1 and 2.

Experimental design

The experimental design used compeletely randomized factorial designed with two factors (2x3) and three replications. The treatments consisted of two different levels of fulvic acid (0% and 0.5%) for the first factor and three different levels of Ground *Moringa leaves* (0%, 5%, and 10%) for the second factor. Experimental treatments were randomly assigned to a total 18 battery cages in a completely randomized plan with 3 replications.

Egg production and blood collection

Egg production was recorded on a daily basis and feed consumption and feed conversion ratio were calculated for 5 weeks during the experimental period. All eggs produced during the period were counted and weighted. While blood samples for laboratory assay were collected through veni puncture between 8 and 10 am at the end of rearing period (13 weeks of age). The samples were then transferred into a bijou bottle containing EDTA, an anticoagulant agent for the hematological assay. Preparation of blood stains with Giemsa Staining was done to calculate the number of leukocytes. Total white blood cells and total red blood cells were calculated by using Neubauer hemocytometer, with a modified diluent solution of Rees & Ecker. Measurement method utilized to check total cholesterol and HDL levels was CHOD-PAP enzymatic calorimetric test, while measurement method utilized to check triglyceride levels was GPO-PAP enzymatic calorimetric test.

Hematological test and statistical analysis

The hematological parameters measured were erythrocytes counts, hemoglobin concentration, hematocrit percentage, leukocyte counts and leukocyte differentiation (Jalees *et al*., 2011). All data were analyzed by using the analysis of variance and Duncan multiple range test. Data were tested by using analysis of variance (ANOVA) and the differences among the treatments were examined by utilizing Duncan multiple range test (Steel and Torrie, 1993).

Results

Production Performances of the Experimental Quails

Feed intake during the experiment ranged from 114.73 – 123.27 g/bird/week (Table 3). These results indicate that supplementation of fulvic acid and ground *moringa leaves* in the treatments significantly affected the average feed consumtion. The feed given in the current study is in accordance with the needs of quails published in SNI (1995) i.e. 2900 kcal/kg of metabolizable energy. Percentage of hen day egg production and Feed Conversion Ratio (FCR) of the experimental quail was found to be insignificant (P>0.05) with the range of 36.5% – 48.3% and 2.03 – 2.62

respectively, however the daily feed intake was affected significantly ($P<0.05$). The result of egg production (Hen day), feed intake and FCR are presented in Table 3.

Hematological Parameters

The mean on hematological analysis of experimental quails (*Coturmix coturmix japonica*) at the age of 13 weeks (adult quail) was recorded to have shown insignificant differences as shown in Table 4. It was observed that the variables measured such as the amount of erythrocytes, hematocrit (packed cell volume), hemoglobin level, erythrocytic index, i.e. Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin Concentration (MCHC) were found to be insignificant ($P>0.05$) at different treatments and interaction levels. In this experiment, the quail's hematological profile was still within the normal range (Table 4). The measurement of leukocyte counts from experimental quail ranged from 24.75 to 26.43 $10^3/mm^3$ (Table 5). This results were in the range of the work of Sturkie and Griminger (1976) namely 20-40 $10^3/mm^3$.

Blood Lipids of Quail

Lipid profiles of quail blood include total cholesterol, triglycerides, low density lipoproteins (LDL) and high density lipoproteins (HDL). Lipid profiles are presented in Table 6. The analysis showed that the lipid blood profile of experimental quails is not significantly affected by the treatments and the interaction ($P>0.05$). The result showed that the lipid profiles were still in the range of normal condition.

Discussion

Feed consumption in this experiment was similar to that of quails at the same age reported by Anggraeni *et al*. (2016), which was 79.19 – 154.70 g/bird/week. There are limiting factors of feed intake namely the capacity of gizzards and energy needs (North and Bell, 1990). The limiting factors of the quails is stop eating when energy needs are met (Anggraeni *et al*., 2016). These experiments resulted in lower egg production than the experiment reported by Arumugam *et al*. (2015) using Japanese quails reared in the cage i.e. 67% of hen day egg production. The egg production (Hen day), feed intake and FCR are presented in Table 3.

Red blood cells or erythrocytes are the most abundant cells in the bloodstream and contain hemoglobin, a compound that carries oxygen through the body. Erythrocyte counts in experimental quail blood ranged from 2.67 to 5.43 $10^6/mm^3$. The amount of erythrocyte was similar to that of the experiment done by Uchendu *et al*. (2010) reporting that the amount of female quail erythrocyte was 3.89-5.87 $10^6/mm^3$. While Hermana *et al*. (2013) reported that erythrocyte counts of quails fed with diet containing ground leaves of Katuk and mulberry were 3.35-3.73 $10^6/mm^3$. The red blood cell counts increased along with the age where the lowest count was found in chicks and the highest in adults (Kececi and Col, 2011). The Erythrocyte counts in this study indicated that supplementation of the fulvic acid and the ground *Moringa leaves* did not affect erythrocyte counts in quails' blood or still within the normal range. The normal erythrocyte count is 2.30 - 3.86 x $10^6/mm^3$ (Sturkie and Griminger, 1976).

The hematocrit value in this experiment was 30.67% - 40.67%. The hematocrit range in this study was still normal. According to Campbell and Ellis (2012), the normal hematocrit value in laying quails is 30.0% -45.1%. Guyton and Hall (2010) reported that normal hematocrit depends on the adequacy and number of proper erythrocytes. Hematocrit or PCV (packed cell volume) is influenced by the number and size of red blood cells (Sturkie and Griminger, 1976). Hematocrit value can be affected by some other factors including the level of stress, nutrients and temperature as well as dehydration and parasite existence in the blood.

The percentage of hemoglobin from the experimental laying quails was found to be 7.0% -10.6%. According to Strakova *et al*. (2010) normal hemoglobin levels in laying quails ranges from 7.0 to 13.0 %. Normal concentration indicates the adequacy of oxygen distributed throughout the body tissues. Fulvic acid and *Moringa oleifera* leaves contain high content of Iron, in the form of heme compounds, 44.85 ppm and 21.37 ppm respectively. Iron (Fe) is a very important mineral in the formation of hemoglobin, cytochrome and myoglobin in the transportation, storage and utilization of oxygen (Guyton and Hall, 2010). Japanese quails showed that hemoglobin levels remained stable until the age of 7 weeks (Ali *et al.,* 2012) and increased along with the age. Packed Cell Volume and Mean Corpuscular Volume Value increase depending on environmental temperature and storage duration of samples (Hadzimusic *et al*., 2010). MCH (Mean Corpuscular Hemoglobin) and MCHC (Mean Corpuscular Hemoglobin Concentration) were calculated on the basis of PCV, hemoglobin and Erythrocyte counts (Campbell and Ellis, 2012). MCV determined the average volume of red blood cells in femtoliter (fl) or cubic micron (μm3), which was found to be insignificant for all treatments with the range of 66.70 fl.-154.39 fl. The results were consistent with the findings of Sturkie and Griminger (1976), the normal range of MCV of female quail was 78.43 - 117.16 fl, However the treatment with the inclusion of 0.5% fulvic acid, MCV tended to be low. According to Fitrohdin *et al.* (2014), low MCV values are due to stress levels that are affected by heat pressure during rearing period. That result is consistent with the fact that temperature and humidity during the experiments were relatively high. This condition resulted in increased oxygen demand for the experimental quail but the formation of hemoglobin was not optimal. The calculated index reflects a higher or lower value due to low levels of hemoglobin in the blood. In this study, MCHC concentrations were not significantly different for all the treatments. MCHC and KIA reflect hemoglobin levels of RBC or Erythrocytes. This measure can be used to diagnose types of anemia (Pandian *et al.,* 2012). The Average MCHC value of the experimental quail was in the range of 21.54% -31.64%. The normal range of MCHC in the quails is 27.20% - 40.63% (Sturkie and Griminger, 1976). MCHC values of quail fed with diets without fulvic acid tended to be below normal levels due to changes in the ratio of hemoglobin and hematocrit. The higher the hematocrit value is, the lower the MCHC value will be. High hematocrit values are predicted as a result of dehydration effect (Fitrohdin *et al.*, 2014).

The measurement of leukocyte counts from experimental quail ranged from 24.75–26.43 10^3/mm^3 (Table 5). This result is in the range of works by Sturkie and Griminger (1976), which is 20-40 10^3/mm^3. The low counts of Leucocyte in the blood indicates that the animal's immune system is low. This condition results in low antibody formation due to low antigens found in the blood (Wardiny *et al*., 2012). The number of leukocytes in this study was still in a normal range.

Leukocytes Differentiation

Leucocytes can be classified into major groups of granular and non-granular leucocytes. The former consists of neutrophils, eosinophils and basophils while the later consists of lymphocytes and monocytes (Anggraeni *et al*., 2016). Their main function is to act as scavengers that help fight infection. Granulocytes and monocytes are phagocytic, swallowing or ingesting foreign particles which they come in contact with (Piliang *et al*., 2009). In the case of hemoglobin, it is good for overall disease resistance. Adequate numbers of lymphocytes and monocytes show direct fights with antigens in the body. According to Uchendu *et al*. (2010) the percentage of normal range of lymphocytes in laying quails is 61% -73%. The current experimental results presented in Table 5 are also within the normal range. Lymphocyte percentage of quails fed with the diets of *Moringa oleifera leaves flour* 10% with the addition of 0.5% fulvic acid tended to be higher. This condition may be due to the chelate nature of fulvic acid that allows increased availability of proteins from *Moringa oleifera* leaves (Supriyati, 2007).

Heterophils are the most abundant granulocyte in most avian species and occur alongside lymphocyte, monocyte, eosinophil and basophil in avian blood. According to Sturkie and Griminger (1976) the normal percentage of heterophils in laying quails ranges from 20% to 30%. The experimental results showed the percentage of heterophile was in the normal range. These results indicated that the inclusion of fulvic acid and moringa leaves in the diet did not disrupt the heterophil value. When animals were stressed out, heterophils would increase, accompanied by the low forming lymphocytes resulting in disruption of internal and external physiological processes in the body (causes of stress).

Monocytes are important component of innate immunity. The experimental results showed that the treatment of fulvic acid and moringa leave inclusion in the quail diets ranged from 1.10% to 1.83%. This result is in accordance with the work of Campbell and Ellis (2012) ranging from 0% - 4%. This indicated that there was no acute infection under the treatments and the health status of the experimental quails were good.

The main function of eosinophils is to enter the body through the lung or gastrointestinal ways which then detoxify foreign proteins and toxins produced by bacteria and parasites (Frandson *et al*., 2009). The average percentage of eosinophils in this experiment was 1.46% - 2.30%. According to Sturkie and Griminger (1976) the normal average of eosinophil in quails ranges from 0% to 3%, therefore this experiment indicated that eosinophils were in a normal range. These results showed that there were no foreign proteins or bacteria and parasites that interfered with eosinophils.

The function of the basophile is to secrete heparin to avoid blood clotting and to play a role in the allergic response. The basophil percentage in this study was 0.81% - 1.25%. This result is higher compared to that of Anggraeni *et al*. (2016) i.e. 0.33% in quails fed with diets containing pupa silkworms extract. According to Sturkie and Griminger (1976), the normal range of basophils in quails is 0% - 2%.

Therefore the result was still within normal range. Basophils at lower levels may indicate healthy conditions and at higher levels may indicate severe stress (Maxwell *et al.*, 1992).

According to Campbell and Ellis (2012), the normal range of Heterofile and Limphocytes (H/L) ratio of the laying quails is 0.3-0.5. The H/L ratio in this study was within normal range, indicating that there was no environmental stress experienced by experimental quails. The lower the H/L ratio is, the looser the stress the animal experiences.

Blood Lipids of Quail

The analysis showed the average lipid profile of experimental quails was not affected by this treatments (P>0.05). This means a diet containing fulvic acid and *Moringa oleifera* did not affect the lipid profile, still in normal levels. In other word, the treatments did not disrupt metabolic process of lipid in the blood.

The cholesterol level of experimental quails was still within normal levels and in accordance with Thrall *et al*. (2012), blood cholesterol of bird species including quail ranges from 100-250 mg/dL. Normal cholesterol levels indicates the ability of the body in maintaining homeostasis condition to meet the cholesterol needs in the blood in time of insufficient cholesterol intake from the feed (Hasanuddin *et al*., 2013).

Laying quails need large amount of cholesterol to form steroid hormone. Steroid hormone is some kind of estrogen that serves the development of the follicle to form the egg yolks during egg production. Normal cholesterol levels in the quails' blood indicate that the inclusion of fulvic acid and *Moringa oleifera* in the diet can maintain cholesterol levels in the blood and ovulation process in egg production.

According to Fenita and Suteky (2006), normal level of quail's triglycerides is about 155.52 mg/dL Besides being used as an energy source, triglycerides can be converted into cholesterol, phospholipids and other lipids (Razali *et al.*, 2013).

HDL carries cholesterol into the membrane cells to the liver and is used for the synthesis of bile acids in the body. HDL level of experimental quails ranged from 38.61 to 67.35 mg/dL or at normal levels. This result is in accordance with that of research done by Hilmi (2015), which was 38.23 - 62.18 mg/dL. The results of LDL level of experimental quails (Table 6) ranged from 57.64 to 94.48 mg/dL. These results are still normal and in accordance with that of the research done by Fenita and Setucky (2006), LDL cholesterol levels were around 54.50-92.78 mg/dL. According to Iriyanti *et al*. (2005), crude fiber in the diet can help lower the cholesterol levels in the blood. About 80% of total body cholesterol is in the form of LDL and 90% in HDL form. Crude fiber content in the experimental diets was 3%-4% and did not significantly affect LDL cholesterol levels.

Conclusion

The laying quail fed with the diet containing fulvic acid and ground *moringa oleifera* leaves did not disturb the production performances of laying quails and showed that the measured hematological parameters were still within the normal range. Supplementation of fulvic acid and moringa leaves in the diet of Japanese quails (*Coturnix coturnix japonica*) can maintain the health and the hematological parameters such as hemoglobin, Erythrocytes, MCV and MCHC, Leukocytes and leukocytes differentiation, and cholesterol as well as triglycerides at the normal level.

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Table 1. Feed composition and nutrients content of experimental diet of laying quail

Feed ingredients	A1B1	A1B2	A1B3	A2B1	A2B2	A2B3
Corn	51.00	49.03	47.20	51.38	49.36	47.20
Corn gluten meal	10.50	10.50	10.50	10.50	10.50	10.50
Rice bran	10.50	10.50	10.00	10.50	10.50	10.00
Soy bean meal	15.38	12.35	9.70	14.50	11.52	9.20
Crude palm oil	4.00	4.00	4.00	4.00	4.00	4.0
Ground Moringa leaves	0.00	5.00	10.00	0.00	5.00	10.0
Fulvic acid	0.00	0.00	0.00	0.50	0.50	0.5
DCP	1.00	1.00	1.00	1.00	1.00	1.0
CaCO3	7.00	7.00	7.00	7.00	7.00	7.0
Premix	0.30	0.30	0.30	0.30	0.30	0.3
Salt	0.20	0.20	0.20	0.20	0.20	0.2
DL-Methionin	0.12	0.12	0.12	0.12	0.12	0.1
Total	100	100	100	100	100	100

Note : A1B1 (rations control of), A1B2 (A1B1 + 5% *Moringa oleifera* leaf meal), A1B3 (A1B1 + 10% *Moringa oleifera* leaf meal), A2B1 (A1B1 + 0.5% fulvic acid), A2B2 (A1B1 + 0.5% fulvic acid + 5% *Moringa oleifera* leaf meal), A2B3 (A1B1 + 0.5% fulvic acid + 10 % *Moringa oleifera* leaf meal). *) Based on calculation using the formula of Leeson & Summers (2005).

Table 2. Nutrients Composition of the Experimental Diets based on the Laboratory Analyses

Nutrient Content	A1B1	A1B2	A1B3	A2B1	A2B2	A2B3
Dry Matter (%)	88.05	88.18	88.32	87.61	87.74	87.86
Moisture Content (%)	11.95	11.82	11.68	12.39	12.26	12.14
Ash (%)	9.45	9.39	9.34	9.40	9.35	9.29
Crude protein (%)	17.15	16.84	16.71	16.81	16.52	16.50
Crude fiber (%)	3.30	3.99	4.64	3.28	3.97	4.62
Crude fat (%)	4.52	4.65	4.76	4.53	4.65	4.76
NFE (%)	53.63	53.31	52.87	53.59	53.25	52.69
Gross Energy (kkal kg^{-1})	3627.00	3613.09	3605.06	3614.90	3600.53	3589.48

Table 3. Egg production and feed conversion ratio (FCR) of laying quail fed diet containing fulvic acid and ground moringa leaves

Parameters	Fulvic Acid	*Ground Moringa Leaves*			Average
		0%	5%	10%	
Egg Production (hen day,%)	0%	43.49± 2.83	43.14±2.27	36.54±2.80	41.06±2.63
	0.5%	42.48±6.72	44.71±5.68	48.26±6.15	45.15±6.18
	Average	42.99±4.77	43.93±3.97	42.40±4.48	
Feed Intake (g head/day)	0%	17.11±1.84	16.43±2.03	16.39±2.37	16.64 ± 2.08^{b}
	0.5%	17.19±1.89	17.61±2.07	17.39±1.73	17.40 ± 1.90^{a}
	Average	2.28±0.11	2.12±0.09	2.32±0.42	
FCR	0%	2.20±0.08	2.05±0.14	2.62±0.20	2.29±0.29
	0.5%	2.35±0.48	2.19±0.32	2.03±0.21	2.19±0.16
	Average	2.28±0.11	2.12±0.09	2.32±0.42	

Table 4. Haematotological profile of laying quail fed diet containing fulvic acid and ground *moringa oleifera* leaves

Parameters	Fulvic Acid	*Ground Moringa Leaves* 0%	5%	10%	Average	Standard
Erythrocyte number ($10^6/mm^3$)	0%	2.67±1.27	3.44±0.92	2.77±0.66	2.96±0.42	3.89-5.87[1]
	0.5%	5.43±1.43	3.14±0.80	3.07±1.18	3.88±1.34	
	Average	4.05±1.95	3.29±0.21	2.92±0.21		
Hematocrit value (%)	0%	30.67±8.80	38.83±4.25	40.67±2.75	36.72±5.32	30.0-45.1[2]
	0.5%	30.75±11.67	36.17±4.86	36.00±6.54	34.31±3.08	
	Average	30.71±0.06	37.50±1.89	38.33±3.30		
Haemoglobin level (g%)	0%	7.00±1.04	8.93±2.21	8.67±1.53	8.20±1.05	7.0-13.0[3]
	0.5%	7.40±2.16	8.67±2.73	10.60±2.00	8.89±1.61	
	Average	7.20±0.28	8.80±0.19	9.63±1.37		
MCV (fl)*	0%	145.85±108.02	104.26±16.87	154.39±48.21	134.83±26.62	78.43-117.16[4]
	0.5%	66.70±33.95	118.50±24.74	124.12±32.00	103.10±31.65	
	Average	106.27±55.97	111.38±10.06	139.25±21.40		
MCHC (%)	0%	23.24±2.38	23.52±8.15	21.54±5.15	22.77±1.07	27.20-40.63[4]
	0.5%	31.64±13.21	23.76±5.37	29.49±2.05	28.30±4.07	
	Average	27.44±5.94	23.64±0.17	25.52±5.62		
Leukocyte number ($10^3/mm^3$)	0%	24.75±1.98	24.82±3.86	24.80±2.84	24.61±0.28	20-40[4]
	0.5%	25.82±2.98	26.43±3.61	26.33±6.10	26.19±0.33	
	Average	25.28±0.75	25.36±1.52	25.57±1.08		

Note : *) fl (flemtoliter, x 10^{-6}), [1]Uchendu *et al.* (2010), [2]Campbell dan Ellis (2012), [3]Strakova *et al.* (2010), [4]Sturkie dan Griminger (1976).

Table 5. Percentage of leukocytes differentiation of laying quail fed diet containing fulvic acid and ground *moringa leifera* leaves

Parameters	Fulvic Acid	*Groun Moringa Leaves*			Average	Standard
		0%	5%	10%		
Lymphocytes (%)	0%	78.60±3.97	76.56±5.68	82.88±3.57	79.35±3.22	61-73[1]
	0.5%	78.75±6.78	78.30±2.29	73.95±1.56	77.00±2.65	
	Average	78.68±3.22	77.43±3.16	78.41±2.50		
Heterophiles (%)	0%	17.57±3.55	18.83±6.63	13.19±3.23	16.53±2.96	20-30[4]
	0.5%	17.17±5.87	17.08±2.74	22.63±1.14	18.96±3.18	
	Average	17.37±0.28	17.95±1.24	17.91±6.68		
Monocytes (%)	0%	1.47±0.49	1.44±0.51	1.22±0.63	1.38±0.13	0-4[2]
	0.5%	1.63±0.08	1.83±0.85	1.10±0.32	1.52±0.38	
	Average	1.55±0.11	1.63±0.27	1.16±0.09		
Eosinophiles (%)	0%	1.47±0.49	2.30±0.52	1.81±1.01	1.86±0.42	0-3[4]
	0.5%	1.64±0.86	1.55±0.59	1.46±0.63	1.55±0.09	
	Average	1.55±0.12	1.93±0.53	1.64±0.25		
Basophiles (%)	0%	0.89±0.05	0.86±0.04	0.90±0.09	0.88±0.02	0-2[4]
	0.5%	0.81±0.04	1.25±0.60	0.85±0.11	0.97±0.24	
	Average	0.85±0.05	1.05±0.27	0.88±0.03		
H/L	0%	0.23±0.06	0.25±0.10	0.16±0.05	0.21±0.05	0.3-0.5[2]
	0.5%	0.22±0.10	0.22±0.04	0.31±0.02	0.25±0.05	
	Average	0.22±0.0013	0.23±0.02	0.23±0.10		

Note : [1]Uchendu *et al.* (2010), [2]Campbell dan Ellis (2012), [4]Sturkie dan Griminger (1976).

Table 6. Average blood lipids profile of laying quail fed diet containing fulvic acid and ground *moringa leifera* leaves

Parameters	Fulvic Acid	Ground *Moringa oleifera* leaves			Average	Standard
		0%	5%	10%		
Total Cholesterol (mg/dL)	0%	180.15±44.67	163.97±47.94	181.55±30.66	175.22±9.77	100-250[5]
	0.5%	155.12±26.60	181.45±38.67	173.46±41.98	170.01±13.50	
	Average	167.64±17.70	172.71±12.36	177.51±5.72		
Triglycerides (mg/dL)	0%	150.58±79.62	250.99±144.95	282.52±107.60	228.03±68.90	155.52[6]
	0.5%	196.50±59.83	218.89±100.09	175.29±43.79	196.89±21.80	
	Average	173.54±32.47	234.94±22.70	228.90±75.82		
Cholestrol HDL (mg/dL)	0%	55.56±21.43	41.98±7.18	62.89±25.12	53.48±10.61	34.30-49.54[6]
	0.5%	38.61±8.83	67.35±39.01	51.30±15.14	52.42±14.40	
	Average	47.09±11.98	54.66±17.94	57.10±8.20		
Cholestrol LDL (mg/dL)	0%	94.48±41.01	57.64±24.58	85.82±6.96	79.31±19.27	54.50-92.78[6]
	0.5%	77.21±22.21	70.32±31.01	87.10±19.09	78.21±8.44	
	Average	85.84±12.21	63.98±8.97	86.46±19.09		

Note : [5]Thrall *et al*. (2012), [6]Fenita dan Suteky (2006)

Growth Performance of Quail (Coturnix coturnix japonica) Fed on Diet Using *Salvinia molesta* Meal

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Abstract

An study was carried out to evaluate the effect of feeding *Salvinia molesta* meal in diet on growth performance of quail. *Salvinia molesta* is an aquatic weed plant that can be found in swamps, lakes, and paddy fields with abundant production and have nutrient can be used to ingredient for poultry. This study used 240 day-old female quail and were reared for 6 weeks. The study used 2 kind of diets that were starting diets (0-3 week) and growing diet (3-6 weeks) contained 28% and 17 % crude protein with 2900 kcal/kg metabolizable energy. The study tested control diet (without *Salvinia molesta* meal), and 3 treatment diets contained 2%, 4% and 6% of *Salvinia molesta* meal in diet. Completely Randomized Design with 4 treatments and 5 replications was used this study. The Quail growth performance parameters including body weight gain, feed intake, feed conversion and final body weight. The results showed significantly ($P < 0.01$) decreased in body weight gain and feed intake ($P<0.05$) but did not significantly difference in feed conversion on using of *Salvinia molesta* meal 4 % and 6 % level in diet. It can be concluded 2% *Salvinia molesta* meal can be used in growing diet of quail (Coturnix coturnix japonica).

Keywords: quail, growth, *Salvinia molesta,* performance

Introduction

Salvinia molesta (kayambang) is an aquatic weed plant that can be found in swamps, lakes, and rice fields. Rates of growth and reproductive are formidably high in Salvinia molesta (Mc Farland *et al*., 2004). The study of nutrient content of *Salvinia molesta* is sufficient enough to meet the needs of poultry feed. The nutritional content of kayambang varies is affected by the growing media (Anderson *et al*., 2011; Mukherjee *et al*, 2010; Kurniawan *et al.*, 2010). The maximum level of use of *Salvinia molesta* meal varies on poultry diet (Setiawati *et al*., 2014; Santoso and Setiadi, 2016; Rahmawati *et al*., 2016; Santoso *et al*., 2017; Gena *et al*, 2014; Dwiloka *et al*., 2015).

Materials and methods

A total of two hundred and forty, day old female quail were studied over a period six weeks with mean initial body weight 6.66 ± 0.19 g/bird. The study used 2 kind of diets that were starting diets (0-3 week) (table 1) and growing diet (3-6 weeks) (table 2) contained 28% and 17 % crude protein with 2900 kcal/kg metabolizable energy. *Salvinia molesta* leaves were obtained from the lake, cleaned, dried and then finely ground. Quails were randomly alloted to 4 dietary treatments and each treatment was replicated five. Four experimental diets were formulated to contain percentage inclusion levels 0, 2%, 4%, and 6% of *Salvinia molesta*. Quails were served feed and water drinking ad libitum. Body weight and feed intake recorded weekly. Data obtained was subjected to analysis of variance (ANOVA) for the completely randomized design. Where significant differences were observed, means were separated using Duncan's Multiple Range Test.

Table 1. Composition of treatment diets with *Salvinia molesta* for 0-3 week period Coturnix-coturnix japonica

Ingredients	Inclusion levels of *Salvinia molesta* meal (%)			
	0	2%	4%	6%
Maize	42.5	38	36.5	35
Soybean meal	25	24.5	24	23.5
Coconut meal	6.5	6.5	6.5	6.5
Corn gluten meal	15	15	15	15
Fish meal	8	8	8	8
Kayambang (*Salvinia molesta*) Meal	0	2	4	6
Lemuru oil	0	3	3	3
CaCO3	1.5	1.5	1.5	1.5
Dicalcium Phosphat	1	1	1	1
Premix*	0.5	0.5	0.5	0.5
Total	100	100	100	100
Analysed nutrients:				
Crude protein (%)	27.66	29.95	27.64	29.97
Crude fat (%)	3.00	6.16	6.50	6.61
Crude fiber (%)	3.79	4.68	5.64	6.03
Ash (%)	14.20	16.64	13.62	14.74

Table 2. Composition of treatment diets with *Salvinia molesta* for 3-6 week period Coturnix-coturnix japonica

Ingredients	Inclusion levels of *Salvinia molesta* meal (%)			
	0	2%	4%	6%
Maize	53	50	50	50
Rice bran	13	12	11	10
Soybean meal	15	14	13	12
Coconut meal	6.45	6.45	6.45	6.45
Corn gluten meal	6	6	6	6
Fish meal	3	3	3	3
Kayambang (*Salvinia molesta*) meal	0	2	4	6
Lemuru oil	0	3	3	3
CaCO3	1.5	1.5	1.5	1.5
Dicalcium Phosphat	1.3	1.3	1.3	1.3
Premix*	0.5	0.5	0.5	0.5
L-Lysine	0.1	0.1	0.1	0.1
DL-Methionine	0.15	0.15	0.15	0.15
Total	100	100	100	100
Analysed nutrients:				
Crude protein (%)	20.05	21.40	19.24	19.49
Ether extract (%)	1.91	3.78	5.16	6.08
Crude fiber (%)	5.62	6.50	6.64	6.94
Ash (%)	8.04	7.48	7.19	7.21

Results and discussion

The effect of graded levels of using *Salvinia molesta* meal in diet on the performance of japanese quail is presented in table 2. Quail fed 2 % kayambang meal consumed significantly (P<0.05) lower feed and weight gain (P<0.01) than quail fed 4% and 6%. Quail fed 2% *Salvinia molesta* diet were best converter of feed to meat. Decreasing of feed intake and weight gain with increasing more 2% *Salvinia molesta* meal in the diet probably because of the lower digestibility of nutrien. Digestibility of nutrient were effected of various factor among other crude fiber, and antinutrient. In this study, it was noted that metabolizable energy decreased with increasing levels of *Salvinia molesta* meal. This could be attributed to high inclusion levels of *Salvinia molesta* meal in the diet as *Salvinia molesta* is a rich source of tannins (Muztar *et al*., 1978) or Tannins interfere with efficiency of feed utilization thereby resulting in poor weight gain and feed conversion ratio (Abang *et al.*, 2015). The presence of anti nutrient factor of *Salmonela molesta* with high fiber content of diet (Gena *et al*., 2014). Muztar *et al*. (1978) statement that aquatic plants do contain high fiber and tannin. The influence of lower the body weight causes the first time to laying of all levels of *Salvinia molesta* meal longer reached (table 3).

Table 3. Summarized table of performance characteristics of 0-6 week period Coturnix-coturnix japonica

Level inclusion of *Salvinia molesta* meal (%)	Feed intake cumulative (g/bird)	Weight gain cumulative (g/bird)	Feed conversion
0	458.22 ± 33.92[a]	118.67 ± 6.77[A]	3.87 ± 0.37
2	459.14 ± 13.86[a]	122.57 ± 5.02[A]	3.75 ± 0.10
4	423.52 ± 10.69[b]	108.88 ± 4.54[B]	3.90 ± 0.19
6	426.69 ± 9.78[b]	108.26 ± 3.71[B]	3.94 ± 0.10
Mean	441.89 ± 17.06	114.59 ± 5.01	3.86 ± 0.19

Different superscript in the feed intake column significant different at P <0.05 and weight gain colomn significant different at P< 0.05.

Table 4. Mean final body weight (6 week old) and the first time of laying Coturnix coturnix japonica

Level inclusion of *Salvinia molesta* meal (%)	Final body weight (g/bird)	The first time of laying (day)
0	125.16 ± 6.70[A]	48.4 ± 5.13
2	129.29 ± 4.86[A]	49.4 ± 3.21
4	115.57 ± 4.44[B]	51.6 ± 4.77
6	114.98 ± 3.85[B]	52.8 ± 3.90
Mean	121.25 ± 4.96	50.55 ± 4.25

Different superscript in final body weight column significant different at P <0.01

Conclusion

The performance evaluation recommended 2% level of inclusion *Salvinia molesta* meal in growth period diet quail result best performance.

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Functional Duck Egg Production High of Antioxidant and Omega 3 Fatty Acid Fed Diets Containing *Indigofera zollingeriana* Leaf Meal, Cassava Leaf meal and Lemuru fish Oil

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Abstract

The aim of this study was to evaluate the effectiveness of the use of *Indigofera zollingeriana* leaf meal, cassava leaf meal and lemuru fish oil to produce functional duck egg high in antioxidant and omega 3 fatty acid as well as the ducks performances. One hundred and fifty laying ducks were randomly divided into 3 experimental units with 5 replications using a completely randomized design. The treatments were: P0) farmer's diet as the control, P1) Diet contained 2% of lemuru fish oil and 11% of *Indigofera zollingeriana* leaf meal, P2) Diet contained 2% of lemuru fish oil and 11% of cassava leaf meal. The data were analyzed using Analyses of Variance (ANOVA). The variables measured were egg quality, feed consumption, egg weight, feed conversion ratio, and duck's day egg production. The results showed that the P2 treatment increased vitamin A content of the yolk and significantly (P <0.05) reduced yolk cholesterol and MDA content of the yolk compared to P1. P2 treatment improved the ratio of omega 3 to omega 6 fatty acids with great balance (5.31). P2 treatment increased feed efficiency compared to P0 and P1. P2 treatment significantly (P <0.05) increased egg production compared to P1. It was concluded that the use of 2% of lemuru fish oil and11 % cassava leaf meal yielded the highest quality of the egg and feed efficiency.

Keywords: duck egg, fatty acid, cassava leaf, *indigofera zollingeriana* leaf meal, lemuru oil.

Introduction

Recently, functional egg has become important due to the increasing degenerative diseases in the world including Indonesia. However, consumption of functional food in Indonesia is still lacking. Therefore, design of functional duck eggs with high antioxidant, omega 3 fatty acids and low cholesterol is expected to overcome this problem. Improvement of laying duck performance and functional duck egg production can be conducted through utilization of cassava leaf meal , *Indigofera* zollingeriana leaf meal and lemuru fish oil in the diet.

Indigofera zollingeriana leaf meal contains high β-carotene up to 507.6 mg /g (Palupi *et al* .2014). According to Akbarillah *et al.* (2008) *Indigofera zollingeriana* also contains 27.89% crude protein, 3.70% crude fat and 14.96% crude fiber. Cassava leaf meal can be used as source of antioxidant and protein. Natural antioxidants from leaf meal also protect unsaturated fatty acids in egg including omega 3 and omega 6 from oxidation. Cassava leaf meal contains 300 µg RE vitamin A (carotenoid) per 100 gram (Meiliana *et al* 2014). The use of carotenoids in rations increase egg yolk score and antioxidant content. In addition, according to Askar (1996) cassava leaf meal contains 28.66% crude protein, 9.4% crude fat , and 19.96 % crude fiber. Lemuru fish oil is by-product of Lemuru fish (*Sardinellalongiceps*) that contains high omega 3 fatty acids (EPA and DHA). Several studies indicated that lemuru oil can reduce the cholesterol content of eggs and significantly increase omega-3 fatty acid. In the body, omega-3 will transformed to be *eicosapentaenoic* acid (EPA) as precursor of prostaglandins that has important role for reproduction (Darmawan *et al.* 2013).

Materials and methods

One hundred and fifty laying ducks were randomly divided into 3 experimental units with 5 replications using a completely randomized design. The diets were arranged base on Leeson and Summers (2005) recommendation for laying duck with 2850 kcal / kg metabolizable energy and 16% crude protein (Table 1). The treatments were: P0) farmer's diet as control, P1) Diet contained 2% of lemuru fish oil and 11% of *Indigofera zollingeriana* . leaf meal, P2) Diet contained 2% of lemuru fish oil and 11% of cassava leaf meal.

The parameters observed were egg quality including cholesterol content of the yolk, ratio omega 6:omega 3, malondialdehyde (MDA) and Vitamin A content of the yolk, feed consumption, egg weight, feed conversion ratio and duck's day egg production.

Data were statistically analyzed using Analysis of Variance (ANOVA) by SPSS application (SPSS version 21.0) (Steel and Torrie, 1995), except the feed conversion ratio and vitamin A were analyzed descriptively.

Results and discussion

Egg Quality

The effect of treatments on egg quality are presented in Table 2. P2 significantly decreased ($P < 0.05$) yolk cholesterol (22.87 mg / g) compared to P0 and P1. The decrease of cholesterol content in P2 can be due to omega 3 fatty acid content in lemuru oil. β-carotene from cassava leaf meal effectively protects fatty acids (omega 3 and omega 6) from oxidation process. Omega 3 fatty acids can reduce triglyceride concentrations by inhibiting low-density lipoprotein (LDL) secretion in the liver and regulating gene expression in the liver (Yoriko and Darshan, 2009; Jump *et al* ., 2013).

P1 and P2 resulted the eggs in good ratio of omega 6:omega 3 (5.45 and 5.31) and the best ratio of omega 6 and omega 3 ratio in food are 4-5 (Simopoulos, 2002; Leeson and Atteh, 1995). Its mean that omega 3 content of the yolk was increased due to the treatments. This is due to the use of 2 % lemuru oil in diet as source of omega 3 fatty acids. According to Darmawan *et al* . (2013), the addition of 5% lemuru oil combined with 200 ppm Organic Zn increased omega 3 content of the yolk.

Table 1. Ingredients and nutrient content of treatment diet (*as fed*)

Ingredients	P0	P1	P2
	---------------------(%)------------------------		
Maize		42.2	42.2
Rice bran	25	19.1	19.1
Golden snail	50		
Noodle waste	25		
Cake meal		10	10
Indigofera sp leaf meal		11	0
Cassava leaf meal		0	11
Fish meal		6	6
Palm oil		2	2
Fish oil		2	2
CaCo3		6.9	6.9
NaCl		0.2	0.2
Premix		0.5	0.5
Dl- methionine		0.1	0.1
Total	100	100	100
Nutrient content:*			
Dry matter (%)	89.36	86.74	86.26
Ash (%)	9.85	12.78	12.22
Crude protein (%)	19.34	18.41	15.79
Crude fiber (%)	8.74	13.45	12.9
Crude fat (%)	4.3	4.77	5.9
Calcium (%)	4.28	4.72	4.27
Phosphor (%)	0.32	0.24	0.41
Gross energy (kcal/kg)	4051	3777	3992
β- carotene (mg / kg)	1.77	1.77	1.49

The use of 11% cassava leaf meal reduced MDA (5.20 µmol / g) compared to the use of *Indigofera zollingeriana*. Vitamin A of yolk in P2 (11% cassava leaf meal) was 27.6% greater compared to P0. Tee (1992) stated that β-carotene has 100% of activity as provitamin A in the body. According to Dueker (2007) the β-carotene provides up to 2 moles of retinal per mole of β-carotene. Increased content of β-carotene and vitamin A in eggs can produce functional eggs containing antioxidants, because β-carotene and vitamin A are antioxidant forming compounds (Palupi *et al* .2014). Surai (2003) stated that dietary containing carotenoids have vitamin A-forming activity that has a function as an antioxidant . Jiang *et al* . (2009) stated that the vitamin A egg content increased by 19.83% with the addition of 200 mg β-carotene / kg ration.

Table 2. Duck egg quality

Variables	Treatments		
	P0	P1	P2
Cholesterol (mg / g)	27.38 ± 0.83b	27.28 ± 39.2b	22.87 ± 2.29a
Ratio of omega-6: omega 3	19.97	5.45	5.31
MDA (µmol / g)	3.14 ± 1.61a	11.52 ± 2.70b	5.20 ± 2.56a
Vitamin A (IU / 100g)	72	60	99.5

Performance of Laying Ducks

The control treatment has the largest feed consumption (239.62 g / head / day). This was caused by the use of frees golden snails as much as 50% that could improve the palatability. P1 and P2 resulted smaller feed consumption than that of P0 up to 157.28 and 155.93 g of bird $^{-1}$ days $^{-1}$, respectively . The results obtained were in line with the findings of Darmawan *et al* (2013) that the average consumption of laying ducks aged 21-32 weeks was 155.27 g $^{-1-}$ day bird $^{-1}$.

The egg weight resulted in this experiment was greater than the finding of Darmawan *et al* (2013) who reported that egg weight was 57.84 g / egg. According to Leeson and Summers (2005) proteins and amino acids (especially methionine) are the most important nutrient in controlling egg size.

Utilization of cassava leaf meal resulted the lowest feed conversion ratio up to 5.69. This showed that addition cassava leaf meal in the diet was able to increase feed efficiency compared to *Indigofera zollingeriana* leaf meal.

Feeding cassava leaf meal resulted in higher egg production ($p < 0.05$) compared to the usage of *Indigofera zollingeriana*. ß-carotene from cassava leaf meal can increase the formation of vitamin A in the digestive tract. According to Palupi *et al*. (2014) that ß-carotene will be converted to vitamin A in chicken body then vitamin A is needed in the synthesis process of steroid hormones for the development of ootid cells into follicle.

Table 3. Performance of laying ducks aged 21-32 weeks

Variables	Treatment		
	P0	P1	P2
Feed Consumption (g bird $^{-1}$ day $^{-1)}$	239.62 ± 10.57^{a}	157.28 ± 9.70^{b}	155.93 ± 9.31^{b}
Egg weight (g egg^{-1})	66.01 ± 2.27	65.79 ± 3.00	62.84 ± 5.59
Feed Conversion ratio	6.62 ± 0.89	9.40 ± 1.38	5.69 ± 0.83
Egg Production (%)	55.21 ± 14.41^{a}	25.93 ± 4.96^{b}	45.14 ± 17.90^{a}

Conclusion

Feeding 11% cassava leaf meal with 2% fish oil yielded the best quality of ducks egg and highest feed efficiency.

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Crude Nutrient and Mineral Composition of *Asystasia Gangetica (L)* Derived from Different Growing Areas

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Abstract

Asystasia gangetica as a predominant plant species for feeding goat grows widely in various lands in Payakumbuh region. The present study was aimed to determine crude nutrient and mineral composition of the wild plant derived from five different growing areas, i.e. banana and cacao plantations, road sides, idle lands and river banks. The sampling sites were distributed in 3 different subdistricts. Fresh samples which were collected by using a plate meter of 0.5 x 0.5 m^2 were weiighed, chopped, dried and then ground in meal form prior to analysis for dry matter (DM), crude ash, crude protein (CP), crude fiber (CF), acid detergent fiber (ADF), cellulose, and minerals of Ca, P, Mg, Cu, Zn, Mn. Data were subjected to analysis of variance (ANOVA) in completely randomixed design of 5x3 consisting of 5 growing areas and 3 subdistricts as replications. Results showed that *A. gangetica* contained relatively low DM of 9.3-11.9%. Crude ash ranged 16.8-20.9%, CP: 15.5-25.0%, CF: 23.2-28.6 %, ADF: 42.5-46.4%, and cellulose :26.5-29.7%. Macro mineral Ca ranged 18.8-20.5 g, P:11.2-17.4, Mg: 7.5-8.5 g/kg DM. Trace element of Cu ranged 22.0-29.4 mg, Zn:17.4-22.6 mg, Mn: 36.2-41.4 mg/kg DM. *A. gangetica* grown in the banana plantation areas showed the highest crude protein content, while the highest fiber content was found by *A. gangetica* collected from the cocoa plantation. *A. gangetica* grown in river banks tended to have the higher mineral content of Ca, P, Mg, and Cu.

*Keywords***:** *Asystasia gangetica* L, predominant species, crude nutrient, mineral composition

Introduction

A. gangetica (Linn) T. Anderson belongs to the family of Acanthaceae and is commonly known as the Chinese violet. It has green and oval-shaped leaves with rounded base occurring in opposite pairs. This herb grows well and spreads widely in crop plantations, such as rubber, coffee, and palm oil plantations in particular (Ong *et al*., 2008). Although this plant is considered a serious environmental and agricultural weed (Asbur *et al*., 2015), *A. gangetica* is known have high nutritional value for feed, because this plant was not only rich in protein and soft fiber, but also contained favorable amount of minerals (Khalil, 2016; Sobayo *et al*., 2012; Adigun *et al*., 2014).

Goat farming in Payakumbuh region which cover Payakumbuh city and 50 Kota district is distributed mainly in the six sub-districts of Lareh Sago Halaban, Harau, Mungka, Luhak, Payakumbuh Timur and Payakumbuh Barat (Kurnia *et al*., 2015). These regions are dominated by annually small-scale crop estates as potential sources of fodder feed. *A. gangetica* is widely grown in various areas, like plantation areas, river banks, rice fields, idle lands, forest edges, and roadsides. This wild forage which called "akar jalar" or "aka jala" by locals was found to be very palatable and as a predominant species used for feeding goat in Payakumbuh (Khalil, 2016). The present research was aimed to identify the dominance and to determine crude nutrient and mineral composition of *A. gangetica* derived from five different growing areas, i.e. banana and cacao plantations, road sides, idle lands and rive banks.

Materials and Methods

Fresh samples of *A. gangetica* were collected at 5 growing areas, i.e. banana and cacao plantations, road sides, idle lands and river banks. The sampling areas were distributed in 3 different subdistricts of South Payakumbuh, Payakumbuh and Luhak. Samples were collected at 5 sampling points each area by using quadrants plate mater of 0.5 x 0.5 m^2 in size. Plant materials in plate meter were cut about 10 cm above ground level and placed in individual plastic bag. The fresh samples were weighed, separated into species and then weighed for determination of botanical composition.

Samples of *A. gangetica* at each sampling area were chopped and mixed. Representative samples of about 100-150 g were dried in a forced draught oven at 60ºC for 24 hours, weighed again and ground in meal form prior to analysis for dry matter (DM), crude ash, crude protein (CP), crude fiber (CF), acid detergent fiber (ADF), cellulose and minerals (Ca, P, Mg, Zn, Cu, Mn). Data were subjected to analysis of variance using a completely randomized design of 5x3 consisting of of 5 growing areas and 3 subdistricts as replications. Duncan's Multiple Range Test was applied to compare means. Differences were considered significant at $P < 0.05$ (Steel *et al*., 1997).

Results and Discussion

There were in total about 12-16 wild plant species growing together with *A. gangetica*. As shown in Table 1, *A. gangetica* dominated plant colonies which composed of about 90% in banana and cacao plantations, road sites, and idle lands and 76% in river bank. This plant is known as a rapidly growing struggling herb, spreads very quickly as weed which infests crops, such as rubber, coffee, and particularly palm oil plantations (Ong *et al*., 2008). It adapts well to low fertility soils and shaded areas (Ong *et al*., 2008; Samedani *et al*., 2013). *A. gangetica* contained relatively low DM of 9.3-11.6%. The DM content of *A. gangetica* of the present study was comparable with the result of Bindelle *et al*. (2007) who reported that *A. gangetica* contained DM of about 10.5%, but lower than the DM content of 14.6% and 15.0% of those reported by Khalil (2016) and Odhav *et al*. (2007), respectively. This plant is presumably favored by goats because of its soft leaf texture and high-water content.

The nutrient content ranged from 15.4 to 25.0% CP, 23.2 to 28.6% CF, 16.8 to 20.9% crude ash, 42.5 to 46.3% ADF, and 26.5 to 29.7% cellulose in DM. *A.*

gangetica grown in banana plantation showed significantly higher crude protein concentration of about 25.0%, while four other sources showed relatively low variation of about 15-19% CP. Crude fibers were varied among the feed. *A. gangetica* from cacao plantation contained the highest crude fiber of about 28.6% followed by road sides and idle lands of 25.8 and banana plantation of 24.4%, while the lowest fiber was found by *A. gangetica* from river banks of about 23.2% ($P<0.05$). There was no statistically different in crude ash, ADF and cellulose content ($P>0.05$).

There were no significant differences in macro mineral content. Calcium varied from 18.3-20.5 g/kg, followed by P (11.2-17.3 g/kg), and Mg (6.8-8.5 g/kg DM). In term of mean values, *A. gangetica* grown at river banks tend to have the highest macro mineral content presumably due to high mineral sedimentation carried by river water flow. In compare to other dominant forages fed to goat in Payakumbuh region, *A.gangetica* was found as reliable sources of Ca and P with relatively narrow Ca/P ratio. It contained significantly higher Ca of 8.2 g/kg DM than that of grasses (2.1 and 2.2 g/kg DM) and *C. pubescens* (3.5 g/kg DM) (Khalil, 2016). The P mineral content of 11.2-17.3 g/kg DM of *A. gangetica* was found comparable to P content of *C. pusbescens* (12.6 g/kg DM) and cassava leaf (11.4 g/kg DM) (Khalil, 2016).

Table 1. Plant dominance, dry matter and crude nutrient content and mineral composition of *A. gangetica* grown in different areas

Parameter	Growing areas				
	Banana plantations	Cacao plantations	Road sides	Idle lands	River banks
Plant dominance (%)	94.3±5.0	90.2±3.0	89.1±11.3	95.0±3.9	76.2±8.1
DM content (%)	9.3±0.7	10.6±1.2	11.9±0.5	10.1±1.3	11.6±2.7
Crude nutrient (% DM)					
- Crude protein	25.0±3.7^{a}	15.4±3.6^{b}	18.7±4.2^{b}	18.5±3.8^{b}	18.7±1.0^{b}
- Crude ash	20.9±2.4	18.5±2.1	17.0±2.2	17.4±1.4	16.8±4.4
- Crude fiber	24.4±2.8^{b}	28.6±0.8^{a}	25.7±2.2^{ab}	25.8±2.0^{ab}	23.2±2.1^{b}
- ADF	42.5±2.5	46.4±3.7	45.0±3.9	45.2±3.0	45.2±4.7
- Sellulosa	27.4±1.5	29.7±2.7	26.5±3.7	29.0±1.5	29.0±1.6
Macro minerals (g/kg DM):					
- Ca	18.3±0.9	19.0±1.7	18.5±4.7	20.5±3.5	20.3±1.3
- P	14.4±2.8	11.2±3.6	15.6±7.0	12.6±1.2	17.3±3.8
- Mg	7.4±1.6	8.3±0.6	8.5±0.6	6.8±0.4	7.7±1.3
Micro minerals (mg/kg DM)					
- Zn	17.4±2.3^{d}	22.5±3.8^{a}	18.5±2.5^{cd}	22.1±1.5^{a}	19.9±1.8^{bc}
- Cu	29.4±1.6^{a}	27.2±2.4^{a}	22.0±0.7^{b}	24.8±3.3^{ab}	29.1±3.1^{a}
- Mn	40.2±4.1	41.3±3.5	38.1±5.0	37.8±3.1	36.2±1.6

Different superscript in the same line means significantly different ($P < 0.05$)

A. gangetica was found a relatively rich on trace mineral Zn, Cu, and Mn. *A. gangetica* derived from cacao plantation and idle land contained the highest Zn, while the highest Cu concentration of 29 mg/kg DM was found by *A. gangetica* derived from banana plantation and river banks. There was no significant difference in Mn concentration. Concentration of Zn (17.7-22.5 mg), Cu (22.0- 29.1 mg), and Mn (36.2-41.3 mg/kg DM) were comparable to the previous results reported by Khalil (2016).

Conclusions

A. gangetica was favored by goats presumably because of its availability, palatability and high nutritional values. This plant grown in the banana plantation areas showed the highest CP, while the highest fiber was found by *A. gangetica* collected from the cocoa plantation. *A. gangetica* grown in the river banks tended to have the higher mineral content of Ca, P, Mg, and Cu.

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Selection of irradiated 50 Gy Lamtoro (*Leucaena leucocephala*) Callus on Acid Stress through Tissue Culture

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Abstract

Lamtoro (*Leucaena leucocephala*) cv Tarramba is a good forage that has a high crude protein, insect tolerance and drought resistant but only grow well at pH >5 and have high mimosine content. The aim of this study was to select irradiated 50 Gy Lamtoro callus on acid stress by $AlCl_3$ addition. This study was used a complete randomized design with 6 treatments and 20 replications. The treatments were the addition of $AlCl_3$ with levels of 0 ppm with pH 6.1 (P0), 100 ppm with pH 5.1(P1), 200 ppm with pH 4.1 (P2), 300 ppm with pH 3.55 (P3), 400 ppm with pH 3.45 (P4) and 500 ppm with pH 3.36 (P5). The variables observed were height and width of callus, viability, contamination, texture, pH alteration, media shrinkage, and callus weight. These treatments significantly affected ($P<0.05$) height and width callus, media shrinkage, and weight of callus. The conclusion of this study was that the tolerance level of irradiated 50 Gy Lamtoro callus at 200 ppm with pH 4,1 (P2).

Keywords : *acid stress, Leucaena leucocephala,* callus, tissue culture

Introduction

Legumes have high nutritional value used to complianced protein and fiber needs for livestock. Legume commonly found in Indonesia is lamtoro (*Leucaena leucocephala*) that has a digestibility of 70% (National Academy Press 1977). According Siahaan (1982), that lamtoro has a chemical composition such as dry weight 34.5%, crude protein 21.5%, non-nitrogen extract 49.5%, crude fiber 14.3%, crude fat 6.5%, ash 6.28%, Ca 2.7%, and Phospor 0.17%. Lamtoro grow well in Indonesia, especially in eastern Indonesia. One of lamtoro plants that exist in this area is lamtoro cv. Tarramba. According to Nulik *et al*. (2004), Lamtoro cv. Tarramba are tolerant of insect attacktion and drought, but there is not tolerance to acidic conditions. Indonesia has the potential land with extensive dry soil with acidic condition. Acidic soil characterized by low pH can be caused by a fairly high aluminum content (Prasetyo and Suriadikarta, 2006). Aluminum excess can be toxic to plants grow, therefore lamtoro plants tolerant to low pH conditions can exploit the potential of marginal landscapes in Indonesia especially with acidic conditions. This problem can be solved by applying of plant biotechnology through tissue culture that can select acid-tolerant lamtoro plant. In vitro cultures, genetic diversity can be enhanced by somaclonal diversity. Genetic diversity can be enhanced by various treatments such as the provision of physical mutagen (gamma rays) on embryogenic callus (Agisimanto et. al., 2016). The aim of this study was to select irradiated 50 Gy Lamtoro callus on acid stress by $AlCl_3$ addition.

Materials and Methods

This research was conducted in Forage Tissue Culture Laboratory, Division of Forage Technology and Pasture Science, Faculty of Animal Science, Bogor Agricultural University. This research was conducted from January - March 2018.

The equipment used in this study were laminar air flow, tissue culture bottles, calipers, magnetic stirrer, pH meter, balance, scissors, scalpel, tweezers, autoclave, Leaf color chart, and stationery. Materials used in the study were irradiated 50 Gy lamtoro callus obtained from the collection of Plant Tissue Culture Laboratory, 70% alcohol, laundry soap, clorox 10% - 20%, distilled water, plant growth regulators 2,4D (dichlorophenoxyacetic acid), sugar, agarose, MS (Murashige Skoog) medium, $AlCl_3$. Experimental design was a complete randomized design (CRD) with 6 treatments based on $AlCl_3$ addition. The treatment were 0 ppm $AlCl_3$ (control, pH 6.1), 100 ppm $AlCl_3$ (pH 5.1), 200 ppm $AlCl_3$ (pH 4.1) , 300 ppm $AlCl_3$ (pH 3.55) , 400 ppm $AlCl_3$ (pH 3.45) , dan 500 ppm $AlCl_3$ (pH 3.36). Observations were carried out within 4 weeks with 3 days of interval that resulted 10 observations along this experiment. The variables observed were plant height and width, viability, contamination, texture, pH alteration, media shrinkage, and callus weight.. The mutant callus response was analyzed using analysis of varance (ANOVA) by using SPSS software, and continued with Duncan test if there was a significant difference among treatments (Matjik dan Sumertajaya 2006).

Results and Disscusion

Height grow optimal occurred at the addition of $AlCl_3$ 100 ppm and the lowest at the addition of $AlCl_3$ 500 ppm (Table 1). Decreasing in callus growth due to high acidic treatments. Callus growth disorder was caused the interaction between Al with P in planting medium. This interactions caused Phosphor not available on acidic media. Aluminum formed a bond with adenosine triphosphate (ATP), this caused energy supply was not available to the plant (Marschner 2012).

The results of this study showed that calluses grow up until the last week were P0 (pH 6.1), P1 (pH 5.1) and P2 (pH 4.1), while P3 (pH 3.55), P4 (pH 3 , 45), and P5 (pH 3.36) did not survive due to addition of $AlCl_3$. Aluminum accumulated in cell walls and cell membranes will bind phospholipid compounds which disrupted cell permeability and nutrient uptake into cells and resulting in growth inhibition (Rengel 1997).

The results of this study showed contamination of 5% in P0 (Control, pH 6.1) and P2 (200 ppm, pH 4.1) and 10% in P1 (100ppm, pH 5.1). Contamination in the calluses culture were caused by temperature, and humidity that was well conditions for development of bacteria, viruses and fungi. The results of this study indicated that all calluses textures were compact (non friable). According to Street (1973), the compact calluses structure have a denser cell structure. The rapid entry of external fluid into the cell caused rapidly increasing the formation of cell walls and the calluses becomes compact (Nisak et al.2012).

Table 1. Height and Width of Plant, Viability, Contamination, Texture, pH Alteration, Medium shrinkage, Callus Weight of irradiated 50 Gy Lamtoro (*Leucaena leucocephala*) 50gy

Variables	Al^{3+} (ppm)					
	P0	P1	P2	P3	P4	P5
height (mm)	0.098±0.01ab	0.11±0.01a	0.04±0.01bc	0.02±0.02c	0.05±0.02bc	-0.002±0.01c
width (mm)	0.13±0.01a	0.11±0.01ab	0.10±0.02ab	0.06±0.01bc	0.10±0.01ab	0.05±0.01c
Viability (%)	100	100	52.63	10	20	5
Contamination (%)	5	10	5	0	0	0
Texture	compact	compact	compact	compact	compact	Compact
pH alteration	-0.62	0.63	1.09	0.46	0.75	0.055
Medium shrinkage (g)	0.62±0.11d	1.72±0.22a	1.37±0.16ab	0.68±0.12cd	1.3±0.1ab	1.06±0.13bc
Callus Weight (g)	1.10±0.18ab	1.38±0.16a	1.16±0.18ab	0.57±0.23b	1.15±0.26ab	0.77±0.23ab

Notes: P0(Control): MS0 + 2,4D 2 ppm (pH: 6.1), P1: P0 + Al^{3+} 100ppm (pH:5.1) , P2: P0 + Al^{3+} 200ppm (pH:4.1) , P3: P0 +Al^{3+} 300ppm (pH: 3.55) , P4: P0 + Al^{3+} 400ppm (pH: 3.45), P5: P0 +Al^{3+} 500ppm (pH: 3.36). The small letters on the rows showed a significant difference at the level of 5% ($P<0.05$).

Measured pH alteration ranged from -0.62-1.09. The highest of pH alteration was found at P2 (200 ppm, pH 4.1) and the lowest was found at P0 (control, pH 6,1). The pH alteration in media showed rate of growth was increased. This was due to the balancing of anion and cation absorption and plant capacity to synthesize organic acids. According to Haynes (1990), if anion absorbed more than cation will cause the excretion of OH^- so that the pH of the media will increase, if more cation is absorbed than anion will cause the excretion of H^+ so that the pH of media will decrease.

The results of the analysis variance showed that $AlCl_3$ addition treatments significantly affected ($P<0.05$) media shrinkage. Average medium shrinkage ranged from 0.62-1.72 g. The highest media shrinkage on treatment P1 (100 ppm, pH 5.1). This suggestion that plant growth has affected by media shrinkage. The higher growth resulted in high shrinkage values. The high levels of Al usage will inhibit plant growth and productivity (Huang and Violante 1997). The presence of Al resulted in a disruption of nutrient uptake, and inhibit cell division that caused stunted growth (Marcshner 2012).

The results of analysis variance showed that $AlCl_3$ addition significantly affected ($P<0.05$) weight of callus. The average callus weight ranged from 0.57-1.38 g. The highest callus weight on treatment P1 (100 ppm, pH 5.1). The increasing of callus weight indicated growth of the callus (Manpaki, Karti, Prihantoro, 2017). The increasing of tissue mass can be known and showed metabolism activity in the callus. The high callus weight is caused by high water content in callus. Callus weight gain depends on speed of the cells divided, multiply and continued with growing callus (Andaryani 2010).

Conclusion

Optimal tolerance level of irradiated 50 Gy Lamtoro (*Leucaena leucocephala*) callus at 200 ppm with pH 4.1 (P2). The addition of 500 ppm $AlCl_3$ (P5) showed the highest poisoning.

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The Influence of Different Concentrate Levels on Milk Production and Quality at Local Dairy Farming

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Abstract

In order to improve the quality of feed concentrate, a cooperative in Southen Bandung produce two different quality of concentrate, i.e. regular concentrate (RC) (15% CP; 70% TDN) and super concentrate (SC) (18% CP; 75% TDN. Meanwhile, the dairy farmer used the concentrate with different formula. The farmer mixed both concentrate, even added with other feed ingredients. The objective of this research was to evaluate the level of concentrate on milk production and quality in local dairy farming. Fifty FH's lactating cows were used in randomized completely design experiment. The cows were feed with five type of rations, i.e: R1 = forage and RC, R2 = forage and SC, R3 = forage, RC and other feed ingredients, R4 = forage, RC and SC, and R5 = forage, RC, SC and other feed ingredients. Measured data included the consumption of dry matter (DM), crude protein (CP), crude fiber (CF) and TDN, as well as the production and quality of milk (TS, SNF, fat, protein and lactose). The results showed that the ration DM consumption was significantly different ($p<0.01$), where R5 was consumed higher, followed by R4, R1, R2 and the lowest R3 (17.49, 15.15, 14.80, 13.19, 12.57 kg day^{-1}). The DM consumption was correspond with the consumption of nutrient (CP, CF and TDN). Based on milk production, cows fed with a mixed of two type of concentrates added other concentrate ingredient (R5) produced the highest milk (16.6 liter day^{-1}), whereas cattle fed only with RC rations (R1) produced the lowest milk (11.0 liter day^{-1}). Cows fed with R5 had also the best quality milk, while cows fed R3 produce the lowest quality milk. This experiment concluded that the milk production and quality in local dairy farming were significantly determined by the level of consumption of DM and nutrients.

Keywords: concentrate quality, feed consumption, milk production, milk quality, dairy feed

Introduction

The use of concentrate determines the production and quality of milk dairy cow. Concentrate is a source of energy and protein. However, the quality of concentrate used by local farmer is still varied. The use of concentrates at farm level is not based on the nutrient requirements of cows, but it is by estimation. The farmers have sufficient resources to provide a good concentrate, therefore the use of concentrates in local dairy farms is still very varied. Low level of supply and the quality of concentrate causes 50% - 75% of the lactation cows in local farms causes defeciency of protein and energy (Permana *et al*., 2017), and defeciency of Ca and P (Permana *et al*., 2016)

Since 2017, dairy cooperatives in South Bandung produce two types of concentrate, i.e. regular concentrate (RC) and super concentrate (SC). Super concentrate contains more higher nutrient. Most farmers use both types of concentrates produced by the cooperative and mixed with other feed ingredients. The use of super concentrate by farmers is increasing, it is expected to have a positive impact for increased production.

Therefore, to know the effect of the level of use of concentrate on breeding and quality of milk, the research was conducted.

Materials and Methods

The study was conducted in dairy local farmer in Southen Bandung. A total of 50 Friesian Holstein lactation dairy cows with 453 $\pm$ 38.10 kg initial body weight were used in this study. The cattle are grouped into 5 groups with different feeding patterns, each consisting of 10 replications. The cows were kept in individual cages and fed forage and concentrates. Forage consisted of elephant grass and agricultural wastes, while concentrates consisted of regular concentrates (RC) containing 15% CP and 70% TDN, super concentrate (SC) containing 18% CP and 75% TDN, and other concentrate feed ingredients. The treatments were R1 = forage and RC, R2 = forage and SC, R3 = forage, RC and other feed ingredients, R4 = forage, RC and SC, and R5 = forage, RC, SC and other feed ingredients.

Table 1 showed the composition of feed ingredients and nutrient composition of the rations used in this study.

Table 1. Composition of feed ingredient and nutrient of experiment diets

	R1	R2	R3	R4	R5
Forage (%)	42.5	53.7	45.2	38.8	42.6
Concentrate:					
Reguler Concentrate (%)	57.5	-	51.2	42.1	34.4
Super Concentrate (%)	-	46.3	-	19.1	17.9
Others ingredient (%)	-	-	3.6	-	5.0
Total (%)	100	100	100	100	100
Nutrient Composition:					
Crude protein (%)	14.6	15.2	11.6	15.1	14.9
Crude fiber (%)	21.2	20.5	21.8	20.0	19.3
TDN (%)	65.8	66.5	63.3	67.1	67.6

The measured parameters were consumption of dry matter (DM), crude protein (CP), crude fiber (CF) and Total Digestible Nutrien (TDN), body weight, milk production and milk quality. The feed sample were analyzed for their chemical composition using AOAC methods (2015). Milk production is measured on the basis of volumes, while the quality of milk is measured by Lactoscan. Cows' body weights were estimated using Schoorl's formula.

The study used Randomized Block Design. The collected data were analyzed using ANOVA and followed by Duncan multiple rank using SAS application program.

Results and Discussion

Feed Consumption

The experiment results on the consumption of dry matter (DM), crude protein (CP), crude fiber (CF) and total digestible nutrient (TDN) are shown in Table 2. The table shows that there was significantly difference ($p<0.05$) on DM consumption, The highest consumption of DM was in the treatment of R4 and R5 (14.64 kg head^{-1} day^{-1} and 14.53 kg head^{-1} day^{-1}). Meanwhile, the DM consumption of cows that fed R3 rations (RC and other feed ingredients) was lowest (11.02 kg head^{-1} day^{-1}). The DM consumption was relatively the same with the consumption of dry matter from dairy cattle in Lembang (Pratiwi, 2015), and in Pangalengan (Lestari *et al.*, 2015).

The DM consuption was coressponding with the consumption of nutrient, where rations with the addition of other feed ingredients had significantly higher ($p<0.05$) on consumption of CP, CF and TDN. Although R2 ration was lower than R1, the total consumption of CP, CF and TDN was significantly higher than R1. This was because the SC nutrient content was high.

Body Weight and Milk Production

Table 3 shows the average of body weight and milk production. The table shows that tha average body weight of the cows varied from 430 – 485 kg. The daily body gain for cows fed ration R3 containing RC concentrate and other materials was significantly lower ($p<0.05$) compared to the other rations, however the daily body gain for other treatments were not significant (0.61 - 0.79 kg head^{-1} day^{-1}). Lactation dairy cow is expected to increase body weight to be able to produce better in the next period.

The difference in the type and amount of concentrate in lactation dairy cows significantly ($p <0.05$) affected milk production and 4% FCM production. Ilk production were varied from 11.04 – 16.56 liter head-1 day-1. This milk production was relatively lower compared with previous research by Lestari *et al* (2015).

Cows fed ration R1 produced milk 11.04 kg head^{-1} day^{-1} meanwhile cows fed R3 and R5 produced milk 15.87 liter head^{-1} day^{-1} and 16.56 liter head^{-1} day^{-1} respectively. The production of dairy milk was influenced by the addition of other concentrate ingredients such as cassava waste and rice bran. The milk production of cows fed with R3 and R5 were significantly higher than treatments. It was probably that the addition of other ingredients such as cassava waste and bread waste can increase the fermentability of feed in the rumen, thereby increase milk production. The use of super concentrates without additional other concentrate ingredients (R2) was still lower in milk production.

Table 2. Consumption of dry matter (DM), crude protein (CP), crude fiber (CF) and total digestible nutrien (TDN) of dairy cows

Variable	R1	R2	R3	R4	R5
DM (kg head^{-1} day^{-1})	13.34±3.05^{cd}	12.96±0.7^{b}	11.02±0.21^{a}	14.64±0.49^{d}	14.53±1.33^{d}
CP (kg head^{-1} day^{-1})	1.95±0.45^{b}	1.96±0.13^{b}	1.28±0.03^{a}	2.21±0.08^{c}	2.17±0.26^{bc}
CF (kg head^{-1} day^{-1})	2.83±0.61^{b}	2.65±0.10^{ab}	2.41±0.04^{a}	2.92±0.06^{b}	2.81±0.12^{b}
TDN (kg head^{-1} day^{-1})	8.77±2.04^{b}	8.61±0.53^{b}	6.98±0.14^{a}	9.79±0.06^{c}	9.82±1.06^{c}

* Different superscript in the same row means significantly different (P<0.05) R1 = forage and RC, R2 = forage and SC, R3 = forage, RC and other feed ingredients, R4 = forage, RC and SC, and R5 = forage, RC, SC and other feed ingredients.

Table 3. Body weight, daily body weight and milk production of dairy cows

Variables	R1	R2	R3	R4	R5
Body weight:					
Before (kg)	450±31.4	430±39.2	450±31.4	449±25.6	485±44.2
After (kg)	459±32.2	439±39.2	452±31.2	458±26.7	497±43.8
Average daily gain (kg head^{-1} day^{-1})	0.63±0.46^{b}	0.61±0.40^{b}	0.17±0.35^{a}	0.61±0.36^{b}	0.79±0.32^{b}
Milk production (liter head^{-1} day^{-1})	11.04±6.09^{a}	11.96±3.16^{ab}	15.87±3.04^{c}	14.71±3.49^{ab}	16.56±6.53^{c}
4% FCM (kg head^{-1} day^{-1})	13.00±6.43^{a}	14.23±3.18^{ab}	17.23±2.57^{abc}	17.23±3.06^{abc}	20.30±6.04^{c}

* Different superscript in the same row means significantly different (P<0.05) R1 = forage and RC, R2 = forage and SC, R3 = forage, RC and other feed ingredients, R4 = forage, RC and SC, and R5 = forage, RC, SC and other feed ingredients.

Milk Quality

In dairy cattle, feed affects not only on milk production but also on milk, because the nutrients contained in the milk depends on the feed consumed livestock (Sunu *et al*., 2013). Quality of milk is very close to the level of milk production. The higher milk production leads to decreased milk quality.

Milk quality data are shown in Table 4. The table shows that milk quality was significantly ($p<0.05$) influenced by feeding types. Different type and level of concentrate resulted in different levels of milk production and milk quality. The quality of milk is largely determined by the production of milk, the higher the milk production causes the milk quality is relatively lower. This had occurred in the treatment of R3 in which the total solid (TS), fat, protein, solid non fat (SNF) and lactose content were significantly lower than other milk. Meanwhile, the milk produced by cows fed with R5 was significantly better than the others.

Conclusions

The use of various concentrate patterns in dairy cattle rations in local dairy farms affected consumption of dry matter, nutrients and TDN, and also milk production and quality. The use of concentrates was determined by the addition of other ingredient feed. The use of RC and SC added with other ingredient feed provided the best level of production and quality.

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Table 4. Milk quality of dairy cows

Variable	R1	R2	R3	R4	R5
TS (%)	13.07 ± 0.90^{b}	13.29 ± 0.96^{b}	12.03 ± 0.81^{a}	12.93 ± 0.74^{b}	13.79 ± 1.25^{b}
Fat (%)	5.24 ± 0.70^{b}	5.14 ± 0.54^{b}	4.46 ± 0.60^{a}	5.00 ± 0.40^{ab}	5.53 ± 0.86^{b}
Protein (%)	2.92 ± 0.12^{ab}	2.97 ± 0.10^{bc}	2.81 ± 0.11^{a}	2.95 ± 0.13^{b}	3.07 ± 0.17^{c}
SNF (%)	7.83 ± 0.33^{ab}	7.98 ± 0.24^{bc}	7.56 ± 0.28^{a}	7.93 ± 0.36^{b}	8.26 ± 0.44^{c}
Lactose (%)	4.34 ± 0.18^{ab}	4.41 ± 0.13^{bc}	4.18 ± 0.16^{a}	4.38 ± 0.20^{b}	4.56 ± 0.26^{c}

* Different superscript in the same row means significantly different ($P<0.05$) R1 = forage and RC, R2 = forage and SC, R3 = forage, RC and other feed ingredients, R4 = forage, RC and SC, and R5 = forage, RC, SC and other feed ingredients.

Performance and Egg Yolk Profile of Duck Fed A Diet Supplemented with Garlic Powder and Shrimp Waste

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Abstract

This study aimed to study the effect of adding garlic and shrimp waste to the performance and lipid profile of eggs of duck. The animals used were 36 ducklings of 19-week-old that were randomly placed in 12 battery cages. The experimental design used in this study was a completely randomized design with four treatments and three replicates. The treatments were C (control) = Basal ration, CG: control diet + 2% garlic powder, CSW: control diet + 2% shrimp waste meal, CGS: control diet + 1% garlic powder + 1% shrimp waste meal. The results showed that the addition of garlic or shrimp waste can significantly increase egg production ($P < 0.05$), but the combination of both has no effect. The addition of garlic, shrimp waste or a combination of both can increase the egg yolk score significantly ($P < 0.05$). Giving garlic and shrimp waste, or a combination of both real ($P < 0.05$) could lower the cholesterol content of the eggs compared to controls. The addition of shrimp waste increased the unsaturated fatty acids content of duck eggs and in the same time increased saturated fatty acid content.

Keywords: cholesterol, duck performance, garlic, shrimp waste, yolk profile

Introduction

Ducks have a high potential for egg production. But duck eggs have higher cholesterol content than chicken eggs. Duck egg cholesterol content of 884 mg/100g egg yolks (Safitri, 2007). Dietary cholesterol is a risk factor for atherosclerosis associated with an increased risk of stroke and heart failure. There should be efforts to produce more healthy poultry eggs through nutrition engineering.

Allicin (allyl 2-propenethiosulfinate or diallyl thiosulfinate) is the main bioactive compound found in garlic (Banerjee and Maulik, 2002) which can lower blood cholesterol levels (Lu et al., 2012). Shrimp waste in the form of skin, head and tail that is about 30-40% of the total weight of shrimp, can be used for poultry feed because it has a high protein content of 42-45% (Mirzah 2000). Shrimp skin contains chitin that can bind fat (also cholesterol). Fat bound to chitin will not be absorbed by the body. Shrimp waste also contains pigments that can increase the color intensity of the egg yolks. The synthetic pigments are expensive, so it is not economist to apply for small farmer. Pigments of plant or animal origin are expected to replace synthetic pigments.

This study was conducted to evaluate the effectiveness of cholesterol reduction between ducks given shrimp waste containing fiber in the form of chitin (physical influence) and those were given garlic containing active substance alisin (chemical influence).

Materials and methods

Thirty-six Tegal ducks of 19 weeks old were used in this study and placed in cages that have been provided feeding and drinking water trough. Each cage contained three ducks. The ducks were kept for seven weeks with two weeks of feed adaptation and the following five weeks using treatment rations. Ducks were fed the diets of 200 g/head/day given in the morning and afternoon. Drinking water was given ad libitum. Feed consumption was measured by weighing the remaining feed given. Feed given to ducks was commercial feed in the form of a complete ration for laying phase. Garlic powder (GP) was made from garlic bought from Pasar Bogor. Shrimp waste meal (SWM) was obtained from Bogor Fisheries Research Center. The nutritional content of experimental diets are presented in Table 1.

Table 1. Nutrient content of experimental diet based on calculation

Nutrients	Treatments*			
	Control (C)	CG	CSW	CGS
Dry matter (%)	87	87.11	87.07	87.18
Crude protein (%)	17	17.00	17.36	17.37
Crude fibre (%)	6	5.91	5.95	5.86
Ether extract (%)	9	8.84	8.90	8.74
Ash (%)	14	13.81	14.51	14.32
Ca(%)	4	4.01	4.05	4.06
P (%)	0,8	0.79	0.82	0.81
Metabolizable energy (kcal kg^{-1})	2850	2874.92	2859.36	2826.18

*C: control diet, CG: control diet + 2% garlic powder, CSW: control diet + 2% shrimp waste meal, CGS: control diet + 1% garlic powder + 1% shrimp waste meal

The cholesterol content of eggs was analyzed using the Liberman-Buchard method. Measurements of yolk fatty acids were performed at week 7th of maintenance. Two eggs were taken from each replication in each treatment and then composted. The content of yolk fatty acids was measured using gas chromatography (GC). The yolk color score was measured using a yolk color fan in the 2nd, 4th, and 6th week of experiment.

This study used Completely Randomized Design (Steel and Torrie 1993) with four treatments and three replicates. The treatment ration in this study were: C (control diet of commercial feed), CG: control diet + 2% garlic powder, CSW: control diet + 2% shrimp waste meal, CGS: control diet + 1% garlic powder + 1% shrimp waste meal. Data were analyzed using analysis of variance (ANOVA) followed by

Duncan multiple range test if there were significant differences. Data of yolk fatty acids were analyzed descriptively.

Results and discussion

Feed intake and egg production

The effect of garlic and shrimp waste on feed consumption and egg production is presented in Table 2. Treatment has significant effect (P <0.05) on feed consumption. Ration consumption is influenced by the level of palatability. One of the factors that affect palatability is the nutritional content contained in the ration. The addition of garlic and shrimp waste as much as 2% still can not increase feed consumption significantly. The combination of garlic and real shrimp waste (P <0.05) increased consumption compared to controls. This shows an additive effect between garlic and shrimp waste on feed consumption.

The production of eggs on ducks given shrimp waste (CSW) or garlic powder (CG) was significantly higher (P <0.05) than that of egg production in control ducks (C) and a combination of garlic and shrimp waste (CGS). While the production of duck eggs given a combination of garlic and shrimp waste is not significantly different with control ducks. Garlic with its antimicrobial active ingredients (Cellini et al.1996) and shrimp wastes with its chitin content that can act as prebiotics (Sharp, 2013) and antibacterial (Natural and Mathur, 2014) can clear the digestive tract of pathogenic bacteria so that absorption food substances can be higher and more efficient. Egg production from ducks given a combination of 1% garlic addition and 1% of shrimp waste is lower than 2% of garlic or 2% of shrimp waste alone. This may be due to a mutually debilitating role between the substances contained in the waste of shrimp and garlic, but it is also possible because each of them is too small.

Table 2. Effect of waste of shrimp and garlic on feed intake, egg production, yolk cholesterol content and yolk score

Variables	Treatment*			
	Control (C)	CG	CSW	CGS
Feed intake (g/head/day)	$188.7^{a} \pm 2.61$	$193.5^{ab} \pm 3.7$	$192.4^{ab} \pm 3.0$	$195.2^{b} \pm 2.7$
Egg production (%)	54.54^{c}	75.00^{b}	83.33^{a}	58^{c}
Yolk cholesterol content (mg/100g)	$878.7^{b} \pm 7.6$	$719.5^{a} \pm 6.9$	$708.2^{a} \pm 9.0$	$709.9^{a} \pm 15.2$
Egg yolk score	$7.67^{d} \pm 0.34$	$8.83^{c} \pm 0.17$	$10.00^{a} \pm 0.00$	$9.33^{b} \pm 0.34$

Different superscripts on the same line showed significantly different (P <0.05)

*C: control diet, CG: control diet + 2% garlic powder, CSW: control diet + 2% shrimp waste meal, CGS: control diet + 1% garlic powder + 1% shrimp waste meal

Yolk cholesterol content and egg yolk score

Cholesterol content and egg yolk score due to the addition of garlic, shrimp waste, and a combination of both can be seen in Table 2. Addition of garlic, shrimp waste and mixture of both into laying ducks significantly decreased (P <0.05) yolk cholesterol content. Garlic contains allicin which is a bioactive compound (Banerjee and Maulik, 2002) that can lower blood cholesterol levels (Lu et al., 2012) and lower cholesterol eggs (Azeke and Ekpo 2008). The low content of duck egg cholesterol given by shrimp waste is caused by chitin content. Chitin plays a role in fat binding (Rismana, 2003) thus contributing to cholesterol reduction. Gallaher et al. (2000) in his research showed that fiber-based diet can lower liver cholesterol in mice.

The addition of garlic, shrimp waste and the mixture of both into laying ducks ration significantly increased (P <0.05) the intensity of the yolk color. The CSW treatment had the highest color score (P <0.05), i.e., 10, which was then followed by CGS, CG, and C treatments, respectively 9.33, 8.83 and 7.67. These results are in line with those reported by Gernat (2001) that egg yolk pigmentation increased significantly (P <0.01) with the addition of shrimp flour. This is because shrimp contains astaxanthin which is a carotinoid pigment. Increasing the color of egg yolk on ducks that were given garlic is still difficult to explain. Abdulaziz (2016) reported that the addition of garlic flour to the laying chicken ration lowered the yolk color. Rich and Macit (2012), on the other hand, reported that the addition of garlic with different levels did not produce a consistent yolk color.

Fatty Acid Profile of Egg Yolk

Table 3 shows that duck egg yolks contain higher levels of unsaturated fatty acids than saturated fatty acids. The high content of unsaturated fatty acid of duck eggs indicates that the fat content of duck eggs is good for health. Replacing saturated fats with unsaturated fats can help lower total cholesterol and LDL cholesterol in the blood (Reiner, et al., 2011).

The most saturated fatty acid component is palmitate, while the most unsaturated fatty acid component is oleic. The highest content of saturated fat is found in shrimp-fed eggs, while the lowest is in control eggs. Similarly, the content of unsaturated fats, the highest value obtained by eggs given shrimp waste, but the lowest obtained by eggs given garlic. Based on the ratio of unsaturated fatty acid to saturated fatty acid the highest value was obtained by C that was 2.08, which was followed by CGS, and CG which were 1.91, 1.74, and 1.68, respectively. All the values of these ratios can still be considered good, because according to Chang and Huang (1999) the ratio of unsaturated fatty acids to good saturated fatty acids is less than 3.

Table 3. The fatty acid profile of local duck yolk eggs fed with garlic, shrimp waste or a combination of both

Fatty acids	Treatment*			
	Control (C)	CG	CSW	CGS
	---------------------------------%--------------------------------			
Lauric	-	-	0.08	0.03
Miristic (14:0)	0.43	0.43	0.84	1.05
Palmitic (16:0)	23.69	26.84	34.96	25.26
Stearic (18: 0)	0.24	0.35	0.17	0.05
∑ saturated fatty acids	24.36	27.62	36.05	26.39
Oleic (18:1)	43.43	39.79	54.54	42.66
Linoleic (18:2)	6.99	6.46	8.15	7.56
Linolenic (18:3)	0.32	0.06	0.13	0.17
∑ unsaturated fatty acids	50.74	46.31	62.82	50.39
Ratio of unsaturated fatty acids: saturated fatty acids	2.08	1.68	1.74	1.91

- : not detected
*C: control diet, CG: control diet + 2% garlic powder, CSW: control diet + 2% shrimp waste meal, CGS: control diet + 1% garlic powder + 1% shrimp waste meal

Conclusion

The addition of garlic flour or shrimp waste can increase egg production, but not by a combinicion of both. The addition of garlic flour or shrimp waste is equally effective in lowering cholesterol, while shrimp waste can improve the egg yolk score better. Addition of shrimp waste can increase the content of unsicuriced ficty acid duck eggs as well as increase the content of sicuriced ficty acids.

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The Effect of Animal-based and Plant-based Protein on the Blood Profiles and Quality of Buck's Semen

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Abstract

Goat demand in Indonesia tend to keep growing but cannot be fulfilled yets so that goat population needs to be increased in order to fulfill the demand. The population can be increased by giving good quality feed that beneficial to production and reproduction system. The aim of this study was to compare the effect of utilization of animal-based and plant-based protein source in the ration on the blood profiles and quality of buck's semen. Nine bucks divided into 3 groups fed with soybean meal (Control), cricket meal (CM), and indigofera meal (IM) as protein sources. Parameters observed were hemotology profiles, physiological status, and semen quality such as volume, pH, viscosity, color (as microscopic) and mass movement, motility, individual movement, viability, integrity of sperm membrane, sperm abnormality, and concentration of sperm (as macroscopic). Data was analyzed using Randomized Completely Block Design by SPSS program version 25. Result showed that there were not significant different of blood profiles, except the highest number of leucocytes in cricket meal. The sperm's volume, colour, concentration, and cell membran integrity were significant different ($P<0,05$) among the treatments, where cricket meal as protein source in the treatment was the highest. This study showed that cricket-based protein gave the best improvement of semen quality.

Keywords : cricket, goat, Indigofera sp., buck, semen

Introduction

One of the efforts to increase goat populations could be done through reproduction efficiency that is determined by the success of mating. Mating succession it self is determined by many factors, one of which is the availability of a good buck with high libido levels and good quality semen production. Level of libido and semen quality is influenced by feed quality (Toelihere 2001), with protein and fat content as the most influential nutrients in semen quality.

Soybean meal is the most used protein sources in goats concentrates. Although, over time the material becomes more expensive due to the fact that most soybean meal is still imported and market competition with poultry feed. Therefore, it is necessary to find alternative protein sources that could replace soybean meal, even protein from animals or plants. Cricket meal and indigofera meal have a potential as an alternative sources of protein in the feed. Cricket meal is animal-based protein derived from old cricket (imago phase) that has egg productivity level less than 50%. Cricket waste is a potential source of cheap protein. Kalung cickets (G. bimaculatus) contains high crude protein 54.09% (Jayanegara *et al* 2017). Rismarianty (2015) reported that cricket meal can substitute soybean meal up to 100% or 15% in lamb rations. *Indigofera zoliingeriana* is also a potential legume that can be used as plant-based protein in goat feed, the plant has a good growth rate and high crude protein value of 27.9% and crude fiber of 15.25% (Abdullah 2012).

Arginine is an amino acid responsible for sperm production process. Cholesterol acts as a precursor for the synthesis of steroid hormones (Maurya *et al* 2004). Crickets contains 2.67% arginine, while indigofera contains 1.27%, and soybean meal contains 3.44% (Jayanegara *et al* 2017; Abdullah *et al* 2010; Sitompul 2004). Replacement of protein sources might also affect to the reproductive performance, physiological responses, and blood profiles. Some amino acids such as glycine contained in the diet can affect the concentration of Hb in the blood (Lee et al 1999). Amino acids like histidine, arginine, and glutamine can affect the number of leukocytes in the body (Toruan 2012). Therefore, this study was conducted to examine the effect of cricket meal as a source of anim protein and indigofera as a source of plant protein to the physiological response, blood profile, and quality of semen.

Materials and Methods

The research was conducted at Animal Reproduction Lab and blood analysis was done at nutrition of draught anim lab Bogor Agricultural University Indonesia. 9 etawah crossbred bucks with reproductive phase devided into 3 treatments, P0: Control concentrate (containing 15% soybean meal). P1: Concentrate cricket (containing 15% cricket flour). P2: Concentrate indigofera (contains 30% indigofera flour). Ratio concentrate to forage (elephant grass) was 65:35.

Animals was grouped based on the quality of the semen. Prior to treatment (a week), buck's semen was evaluated and then graded. The result were contain cassava, rice brand, coconut meal, molases, NaCl, premix, DCP and soybean meal, cricket flour, indigofera flour as main treatment. The concentrate have isoprotein (13%) and iso TDN (67%). Quality of semen was assessed from three parameters such volume, concentration, and motility divided into three, grade A (good), B (medium), and C (bad). Each treatment received the same grade of semen. Sperm was collected again 40 days after treatment. The quality of cement observed included mass movement (total sperm count and also motility). Viability (ratio of live and dead sperm), the intagrity of plasma membrane (ability of spernm to hold cell fluid) and all microscopically and macroscopically variable. Physiological responses were recorded weekly and blood sampling was collect at the end of experiment two hours after morning feeding time.

Results and Discussion

Nutrient Consumption

The results showed that there were no significant different of nutrient consumption between treatments it means that different sources of protein have same palatability effect to the animal.

Table 1 Nutrient consumption of bucks fed different protein sources

Variable	Treatment		
	P0	P1	P2
Dry matter consumption ($g^{-1}t^{-1}d^{-1}$)	1142.21±550.32	1006.23±270.21	862.34±110.04
Crude protein consumption ($g^{-1}t^{-1}d^{-1}$)	148.76±74.79	139.09±41.70	115.15±15.92
Crude fat consumption ($g^{-1}t^{-1}d^{-1}$)	47.56±23.96	51.09±15.66	33.09±4.69
Crude fiber Consumption ($g^{-1}t^{-1}d^{-1}$)	210.68±90.10	164.12±56.03	158.76±21.10

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein.

Quality of Semen Makroscopically and Mikroscopically Before & After Treatment

The semen volume after treatment was not significantly different between treatments but all three had increased. The increasing semen volume wa be related with an improvement of function of the vascular glands. The genital accessory gland plays role on producing semen plasma organ. The accessory gland secretory produces the largest volume (60-90%) of the total semen plasma volume (Hafez 2000). The average pH of fresh semen before and after treatment was considered as normal according to Garner and Hafez (2000). There was no effect of feed on semen pH and consistency of semen. Meanwhile there was significant difference in semen color on before and after treatment ($P<0.05$). Colors of bucks semen in according to Ax et al. (2000) the color of cement on goat is milky white to cream mean same with our results.

There was no effect of feed on mass movement, range of mass movement both before and after treatment is normal, individual movement and sperm motility ranges from 70-90% normal according to Ax et al. (2000). Also in Viability to semen. There was no effect of feed on viability on each treatment. The viability range before treatment was 75.70-86.02% and increased to 86.76-89.53% The intagrity plasma membrane. range before treatment was 60.81-73.22% and increased to 88.22-93.17% The concentration ml^{-1} There is influence of feed on sperm concentration ml^{-1} at P1 with concentration increase up to 32%. The real difference in P1 is thought to be caused by feed combined with cricket flour can increase the digestibility coefficient of food substances derived from feed treatment so that it can become amino acid especially arginine which is beneficial for growth and development of body cell tissues. P1 has the highest total concentration per ejaculation with concentration increase up to two times compare to before treatment. Arginine is an amino acid responsible for sperm production process. Arginine content of cricket flour reached 10 mg kg^{-1}, while arginine in Indigofera zollingeriana 1 mg kg^{-1}, and on soybean meal up to 3.94 mg kg^{-1} (Jayanegara *et al* 2017; Abdullah *et al* 2010; Sitompul 2004).

Table 2 The quality of bucks semen fed different sorces of protein (macroscopically before and after treatment).

Variable	Stage	Treatment		
		P0	P1	P2
Volume (ml)	Before	0.33±0.08^{b}	0.57±0.12^{a}	0.62±0.01^{a}
	After	0.68±0.20	0.80±0.11	0.83±0.16
pH (1-14)	Before	6.70±0.20	6.60±0.10	6.60±0.10
	After	6.50±0.10	6.40±0.10	6.40±0.10
Consistency (1-3)	Before	2.33±0.66	2.33±0.33	2.33±0.33
	After	2.00±0.00	3.00±0.00	2.00±0.00
Color (1-5)	Before	3.67±0.88^{ab}	3.00±0.57^{b}	2.00±0.00^{b}
	After	2.33±0.66^{b}	4.00±0.57^{ab}	5.00±0.00^{a}

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein. [consistency: 1=Dilute, 2=Medium, 3= thick; Color: 1=Yellow, 2=White-Yellow, 3= beige, 4=white-beige, 5=milk white] Different superscript in the same line means significantly different (P<0.05)

Tabel 3 The quality of bucks semen fed different sorces of protein (microscopically before and after treatment).

Variable	Stage	Treatment P0	P1	P2
Mass Movement (0-3)	Before	2,00±0,00	2,67±0.33	3.00±0.00
	After	2.77±0.33	3.00±0.00	2.00±1.00
Motility (%)	Before	78.33±1.67	78.33±1.67	76.67±4.41
	After	76.67±3.33	81.67±1.67	70.00±15.00
Individual movement (1-5)	Before	4.67±0.33	5.00±0.00	4.67±0.33
	After	5.00±0.00	4.67±0.33	4.33±0.67
Viability (%)	Before	84.00±4.08	86.02±1.43	75.70±3.83
	After	86.76±6.99	88.60±1.24	89.53±4.12
integrity of plasma membrane (%)	Before	73.22±2.2^{ab}	70.4±12.84^{ab}	60.81±7.30^{b}
	After	88.22±5.72	93.17±0.59	89.69±2.35
Normal Sperm (%)	Before	88.42±4.61	87.62±2.79	91.91±0.47
	After	88.50±2.55	94.77±1.01	86.56±5.23
Consentration ml^{-1}(x 10^6)	Before	2868.50±1634.29^{b}	4689.50±1630.68^{ab}	2943.75±344.05^{b}
	After	3283.33±896.68^{b}	6202.08±1393.30^{a}	3287.50±240.956^{b}
Total Consentration (x10^6)	Before	457.38±169.87^{c}	2327.67±409.35^{b}	2159.17±274.78^{b}
	After	2341.77±1205.60^{b}	4772.5±998.65^{a}	2679.16±455.64^{ab}

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein. [Mass Movement: 0=Not Moving. 1=Slow. 2=medium. 3=fast; individual movement: 1=Very Slow. 2=Slow. 3= medium. 4=fast. 5=very fast] Different superscript in the same line means significantly different (P<0.05)

Physiological Response

Table 4 Heart rate, respiratory rate, and goat rectal temperature during treatment

Variable	Treatment P0	P1	P2	Normal[1]
Rectal temprature (°C)	38.67 ± 0.21	38.83 ± 0.15	38.86±0.11	38.5-40
Heart rate (beat $minut^{-1}$)	83.78 ± 0.15	83.52 ± 7.34	89.33±4.63	70-135
Breath frequency ($minut^{-1}$)	36.28 ± 1.96	33.18 ± 5.55	32.21±1.73	26-54

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein. [1] normal rate Frandson (1996).

Treatment has no significant effect on breath frequency, heart rate and rectal temperature. Frequency of breath, heart rate and rectal temperature are considered as normal physiological responses according to Frandson (1996).

Blood Hematology

Results showed that treatments of different protein sources gave same resuls on blood hematology except to leukocyts (P<0.05). hematology data presented in Table 5.

Tabel 5 Buck's blood hematology fed different protein source

Variable	Treatment			Normal
	P0	P1	P2	
Hematocrit (%)	30.00 ± 5.56	33.00 ± 3.00	31.33 ± 3.21	23-33[1]
Hemoglobin (g%)	12.33 ± 1.15	11.30 ± 1.47	11.26 ± 1.55	8-14[2]
Eritrocyt (10^6 butir mm^{-3})	11.15 ± 2.85	12.70 ± 2.75	11.13 ± 1.00	8-17[2]
Leukocyt (10^3butir mm^{-3})	6.53±2.56^b	14.85±3.03^a	10.03±2.41^b	6-16[2]
- limfocyt (%)	47.10 ± 12.46	51.04 ± 3.10	51.19 ± 4.76	24-81[3]
- monocyt (%)	1.78 ± 1.06	1.93 ± 0.88	2.61 ± 1.32	0-4[4]
- neutrophil (%)	45.41 ± 12.37	41.17 ± 1.80	42.44 ± 7.29	17-50[3]
- eusonophil (%)	5.09 ± 1.37	5.14 ± 1.71	3.21 ± 0.78	0-8[4]
- basophil (%)	0.59 ± 0.51	0.72 ± 0.06	0.52 ± 0.51	0-3[5]

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein Different superscript in the same line means significantly different (P<0.05). [1]Soeharsono (2010), [2]Raguati and Rahmatang (2012), [3]Smith dan Mangkoewidjojo (1988), [4]Feldman *et al* (2002), [5]Hafizhiah (2008).

Goats that were given cricket meal had higher leukocyte counts than those given indigofera meal ration and soybean meal. Leukocytes is an active unit in the body's defense system and are responsible for fighting against antigens or foreign substances that enter the body. This indicates that the treatment of cricket meal has immunostimulant. According to Ravi et al. (2011) Amino acids derived from insects are one source of antimicrobial peptides (AMP) capable of inhibiting the development of pathogenic microbes. Amino acids that play a role in boosting immunity are histidine, arginine, and glutamine (Toruan 2012). The content of amino acid glutamine cricket flour is 5.73% , while in soybean meal is about 3.81%. Histidin content of cricket flour 4.31%, soybean meal as much as 0.87 and indigofera meal 0.67%. The content of amino acid glutamine cricket flour 5.05% and 3.81% for the soybean meal (Jayanegara *et al* 2017; Abdullah *et al* 2010; Sitompul 2004).

Blood Metabolite

Blood metabolites is reflect of nutrients wich absorbed and distributed throughout the body. Total protein and cholesterol in study goat blood is presented in Table 6.

Tabel 6 Buck's blood metabolite fed different protein source

Variable	Treatment		
	P0	P1	P2
Blood cholesterol(mg.dl^{-1})	48.42±18.94^{b}	98.46±31.6^{a}	50.04±13.32^{b}
Total blood protein (g.dl^{-1})	5.79±1.10	6.35±1.38	5.72±1.06

P0 = Ration contains 15% of soybean meal as a control; P1 = Ration contains 15% cricket flour as animal-based protein; P2 = Ration contains 30% indigofera flour as plant-based protein Different superscript in the same line means significantly different (P<0.05)

The treatment result a significant different on blood cholesterol levels (P<0.05) were P1has highest. This can be due to the crude fat content of P1 5.14% while the crude fat content P0 4.18 and P2 ranges from 3.86%. In addition, cricket meal also contains many saturated fatty acids such as palmitic acid 24.28% stearic acid 5.9% lauric acid 0.3%. These saturated fatty acids will then be used as a cholesterol-forming agent in blood (Tuminah 2009). Cholesterol levels are still normal referring to the statement Latimer et al. (2011) High cholesterol levels in P1 may support reproduction of male goats. Blood cholesterol acts as a precursor for the biosynthesis of steroid hormones and bile acids (Maurya et al., 2004). This result is consistent with higher P1 goat sperm concentration than other treatments. Different treatment of protein sources did not give a significant effect on total protein in blood. This level is in the normal range of Okoruwa and Ikhimioya (2014) the total blood protein levels in goats is 6.09 g.dl^{-1}

Conclusion

Addition of 15% cricket flour in bucks rations can improve sperm quality (concentration and volume) compared to plant-based protein form soybean meal and indigofera flour. The use of cricket meal in ration can also improve the immune system. A significantly higher concentration of cholesterol in cricket-flour treatment can support reproduction by activity especially steroid hormone.

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Effect of Feed Aditive Selacid, Presan, and Selko pH on *Cobb* Broiler Performance

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Abstract

The aim of this study was to evaluate the effect of Selacid, Presan in diet and Selko pH in drinking water as feed additive on broiler performance. A Factorial completely randomized design 2 x 3 with 4 replicates was used in this study. Factors A were dringking water with Selko pH 1 ml L^{-1} (A1) and dringking water without Selko pH (A2) and factors B were diet without Salicid and Presan (B1), diet contained Selacid 0.1% (B2) and diet contained Presan 0.1% (B3). A total 600 Day Old Chicks (DOCs) of Cobb strain Broilers were randomly distributed in 24 cages with 25 birds each replicate and were reared for 35 days in the litter cage. The parameters observed were broiler performances (feed intake, body weight, body weight gain, feed conversion and mortality). The results showed that the addition of Selacid 0.1% or Presan 0.1% in diet and Selko pH in drinking water significantly increased feed intake, body weight, body weight gain and feed efficiency in starter phase. The conclusion was the addition of Selacid 0.1% in diet with Selko pH in drinking water resulted the highest body weight, body weight gain and the lowest feed conversion in starter phase.

Keywords: Broiler, performance, Presan, Selacid, Selko

Introduction

Indonesia is the fourth highly populated country in the world with population more than 250 millions. High population needs high availability of food including chicken meat. High chicken meat demand is a promising opportunity because chicken business has some advantages such as rapid capital turn over, easy to handle, and does not require large area. Currently, most chicken productions use antibiotics growth promoter to increase feed efficiency, improve the production and to prevent diseases. The use of antibiotics for growth promoter in Indonesia has been banned because it stimulates microbial resistant especially pathogenic bacteria such as *Salmonella*, *Escherichia coli* dan *Clostidium perfrinens* (Murdiati, 2002) and accumulation of antibiotics residue in the animal products. This is dangerous for human as chicken consumers because resistant antibiotic gen can be transferred to human pathogenic bacteria. Based on that, it is necessary to find an alternative ways to replace the utilization of antibiotics in animal production. One of the way to reduce pathogenic bacteria such as *Salmonella* and *E. coli* is the use of organic acids in feed to improve livestock performance through creating a suitable environment with the development of intestinal microflora and reducing pathogenic bacterial. In addition, organic acids are generally produced automatically in the livestock through fermentation process as an energy source (Gordon and Charles 2002). Salicid, Presan and Selko pH are commercial feed additive that produced by PT Trouw Nutrition Indonesia. Salicid, Presan and Selko contain some organic acids such as formic acid, acetic acid, propionic acid and citric acid. Organic acid as acidifier increases gastric proteolysis, protein and amino acid digestibility and utilization of minerals and thus improving performance of the animal (Haque et al, 2009). This experiment was to evaluate the effects of organic acids (Selacid , Presan, and Selko pH) on broiler performance.

Material and Method

Animal and Diet

The experiment used 600 Day Old Chiks of Cobb strain and were reared up to 35 -weeks-old in the cage with the size of 2 x 1.25 m with 25 birds per cage. The experiment was arranged in factorial completely randomized design in 2 x 3 factorial with four replications for each treatment. Factor A was A1 = with Selko pH and A2 = without Selko pH, factor B was the addition of a feed additive : B1 = control, B2 = Selacid and B3 = Presan). The diet and drinking water were provided *ad-libitum.* The content of Selko pH, Presan and Salicid are showed in Table 1.

Table 1. The Content of Selko pH, Salicid and Presan

Product content*	Selko pH	Salicid	Presan
Formic Acid (%)	3.60	3.70	2.16
Formic ammonium (%)	3.60	5.00	3.45
Acetic acid (%)	7.30	3.00	2.98
Propionic acid (%)	-	3.50	2.00
Fatty Acid of coconut oil (%)	-	40.0	-
Copper (%)	5.20	-	-
Citric acid (%)	4.10	-	-

*Analyzed by Laboratory of Asia Trouw Nutrition (2014)

The diet ingredients used were maize, fish meal, soybean meal, bakery waste, oil, meat bone meal, corn gluten meal, wheat pollard, premix. Nutrient requirement of broiler was arranged as pre starter phase with the content of the gross energy 3981 kcal kg^{-1} and crude protein 22.83%, starter phase with the content of the gross energy 4133 kcal kg^{-1} and crude protein 22.91%, and finisher phase with the content of the gross energy 3350 kcal kg^{-1} and crude protein 22.66%). The composition and nutrient content of diet are showed in Table 2 and Table 3.

Table 2. The composition and nutrient content of diet for pre starter phase (1-10 days)

Ingredients	A1B1	A2B1	A1B2	A2B2	A1B3	A2B3
	----------------------------(%)-------------------------					
Maize	52.10	52.10	52.10	52.10	52.10	52.10
Soy Bean Meal 46	29.50	29.50	29.50	29.50	29.50	29.50
Bakery waste	5.00	5.00	5.00	5.00	5.00	5.00
Fish Meal 55%	3.00	3.00	3.00	3.00	3.00	3.00
Crude Palm Oil	2.64	2.64	2.64	2.64	2.64	2.64
Meat Bone Meal 50%	2.50	2.50	2.50	2.50	2.50	2.50
Corn Gluten Meal 60%	1.50	1.50	1.50	1.50	1.50	1.50
Wheat pollard	1.26	1.26	1.16	1.16	1.16	1.16
Selacid	**0.00**	**0.00**	**0.10**	**0.10**	**0.00**	**0.00**
Presan	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.10**
Max Pou Bro Fhr	2.50	2.50	2.50	2.50	2.50	2.50
Total	100	100	100	100	100	100
Selko pH (ml L^{-1})	**1.0**	**0**	**1.0**	**0**	**1.0**	**0**
Nutrient content						
Gross Energy (kcal kg^{-1})	3981	3981	3981	3981	3981	3981
Dry matter (%)	88.73	88.73	88.73	88.73	88.73	88.73
Ash (%)	5.63	5.63	5.63	5.63	5.63	5.63
Crude Protein (%)	22.83	22.83	22.83	22.83	22.83	22.83
Crude fat (%)	2.17	2.17	2.17	2.17	2.17	2.17
Crude fiber (%)	4.40	4.40	4.40	4.40	4.40	4.40
Lysine (%)	1.13	1.13	1.13	1.13	1.13	1.13
Methionine (%)	0.39	0.39	0.39	0.39	0.39	0.39
Cystine (%)	0.31	0.31	0.31	0.31	0.31	0.31
Calsium (%)	1.70	1.70	1.70	1.70	1.70	1.70
Phosphor (%)	0.67	0.67	0.67	0.67	0.67	0.67
NaCl	1.83	1.83	1.83	1.83	1.83	1.83

A1B1 : Diet + Selko pH(1 ml L^{-1} of drinking water), A2B1 : Diet without Selko pH, A1B2 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Selacid 0.1%, A2B2 : Diet without Selko pH + Selacid 0.1%, A1B3 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Presan 0.1%, A2B3 : Diet without Selko pH+ Presan 0.1%

Table 3. The composition and nutrient content of diet for starter phase (10-21 days)

Ingredients	A1B1	A2B1	A1B2	A2B2	A1B3	A2B3
	----------------------------(%)-------------------------					
Maize	56.00	56.00	56.00	56.00	56.00	56.00
Soy Bean Meal 46	23.50	23.50	23.50	23.50	23.50	23.50
Bakery waste	6.00	6.00	6.00	6.00	6.00	6.00
Fish Meal 55%	3.50	3.50	3.50	3.50	3.50	3.50
Crude Palm Oil	2.42	2.42	2.42	2.42	2.42	2.42
Meat Bone Meal 50%	2.40	2.40	2.40	2.40	2.40	2.40
Corn Gluten Meal 60%	2.50	2.50	2.50	2.50	2.50	2.50
Wheat pollard	1.18	1.18	1.18	1.18	1.18	1.18
Selacid	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Presan	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Max Pou Bro Fhr	2.50	2.50	2.50	2.50	2.50	2.50
Total	100	100	100	100	100	100
Selko pH (ml L^{-1})	**1.0**	**0**	**1.0**	**0**	**1.0**	**0**
Nutrient content						
Gross Energy (kcal kg^{-1})	4133	4133	4133	4133	4133	4133
Dry matter (%)	89.36	89.36	89.36	89.36	89.36	89.36
Ash (%)	5.67	5.67	5.67	5.67	5.67	5.67
Crude Protein (%)	22.91	22.91	22.91	22.91	22.91	22.91
Crude fat (%)	2.81	2.81	2.81	2.81	2.81	2.81
Crude fiber (%)	2.95	2.95	2.95	2.95	2.95	2.95
Lysine (%)	1.13	1.13	1.13	1.13	1.13	1.13
Methionine (%)	0.39	0.39	0.39	0.39	0.39	0.39
Cystine (%)	0.31	0.31	0.31	0.31	0.31	0.31
Calsium (%)	1.99	1.99	1.99	1.99	1.99	1.99
Phosphor (%)	0.61	0.61	0.61	0.61	0.61	0.61
NaCl	1.82	1.82	1.82	1.82	1.82	1.82

A1B1 : Diet + Selko pH(1 ml L^{-1} of drinking water), A2B1 : Diet without Selko pH, A1B2 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Selacid 0.1%, A2B2 : Diet without Selko pH + Selacid 0.1%, A1B3 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Presan 0.1%, A2B3 : Diet without Selko pH+ Presan 0.1%

Variable Measured

The parameters observed in this experiment was the performances of broiler chickens (feed consumption, body weight, body weight gain, feed conversion ratio and mortality). Feed consumption (g $bird^{-1}$) was calculated from the difference between the ration given to the residual ration every week. Body weight (g $bird^{-1}$) was weighed weekly and feed conversion ratio was calculated weekly from feed intake divided by body weight gain.

Data Analysis

Data were statistically analyzed using Analysis of Variance (ANOVA) by SPSS application (SPSS version 21.0). Duncan Multiple Range Test (DMRT) analysis was used to determine the differences between means among the treatments (Steel and Torrie, 1995).

Results and Discussion

Broiler performance during starter phase (1-21 days) for feed consumption, body weight, body weight gain, and feed conversion ratio were 1129 to 1245 g $bird^{-1}$, 567 to 897 g $bird^{-1}$, 523-848 g $bird^{-1}$ and 1.48-2.06 respectively (Table 4). According to guidance performance of Cobb (2012) broiler performance for starter phase was of 1053-1150 g $bird^{-1}$ of feed consumption, 800-851 g $bird^{-1}$ of body weight, and 1.18-1.26 of feed conversion.

Addition of Selacid 0.1% in the diet significantly increased ($P < 0.05$) feed intake of broiler starter phase. Selacid contained higher organic acid than Presan which was 3.80% and 2.64% respectively. According to Patten and Waldroup (1988) that addition organic acid 3% -5% gave positive influence to feed consumption through the increasing of feed palatability. Besides that, distillation of fatty acid from coconut oil in Salicid component could improve feed palatability. Celik *et al.* (2003), stated that essential oil in feed could improve the performance of livestock through increasing the palatability and improving the production of enzymes in digestion tract. According to Adams (2000), organic could improve the performance by creating the suitable environment for good bacteria growth and stimulate the production of endogenous enzymes.

Giving Selacid 0.1% or Presan 0.1% combined with Selko pH in drinking water significantly improved ($P < 0.05$) body weight and body weight gain. Selacid 0.1% in feed with Selko pH in drinking water produced higher body weight and body weight gain than the treatment of Presan 0.1% in feed and giving Selko pH in drinking water . Atapattu and Nelligaswatta (2005), reported that addition 3% formic acid in broiler feed was able to improve digestibility in ileum. Selacid and Presan contained formic acid as much 3.70% and 2.16% respectively. Formic acid and acetic acid in intestines will support the activity of digestion enzyme, and improve nutrient absorption (Denli and Celik 2003). Gunal *et al.* (2006) stated that addition organic acid in feed could improve production of B- glucanase enzyme and lowered the digesta viscosity .

Table 4. Broiler performance during Starter phase (1-21 days)

Parameters	Feed Additive A	Feed Additive B			
		B1	B2	B3	Average
Feed Consumption (g bird^{-1})	A1	1101.15±134.80	1280.52±31.00	1193.59±107.01	1191.75±90.80
	A2	1157.22±7.61	1209.60±31.45	1219.04± 44.40	1195.28±27.82
	Average	1129.19±71.20b	1245.05±31.02a	1206.32±75.71ab	
Body Weight (g bird^{-1})	A1	616.45±19.40c	897.96±15.03a	757.41±54.90b	745.27±29.80
	A2	567.66±72.51c	801.07±30.34ab	829.04±57.74ab	732.59±53.54
	Average	592.06±46.00	831.51±22.70	793.23±56.30	
Body Weight Gain (g bird $^{-1}$)	A1	572.59±19.40c	848.10±15.03a	713.55± 0.15b	701.41±11.52
	A2	523.80±72.51c	757.21±30.34ab	785.18± 0.11ab	688.73±34.33
	Average	548.20±4 5.95	787.65±2 2.70	749.37± 0.14	
Feed Conversion Ratio	A1	1.80± 0.20b	1.49± 0.05c	1.48±52.50c	1.62±50.91
	A2	2.06± 0.30a	1.51± 0.04c	1.58±12.72c	1.68± 4.35
	Average	1.92± 0.23	1.50± 0.05	1.53±82.61	
Mortality (%)	A1	6.55	0.00	0.00	2.18
	A2	2.00	5.26	6.49	4.58
	Average	4.28	2.63	3.25	

A1B1 : Diet + Selko pH(1 ml L^{-1} of drinking water), A2B1 : Diet without Selko pH, A1B2 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Selacid 0.1%, A2B2 : Diet without Selko pH + Selacid 0.1%, A1B3 : Diet + Selko pH(1 ml L^{-1} of drinking water)+ Presan 0.1%, A2B3 : Diet without Selko pH+ Presan 0.1% Means in the same column or raw with different superscript differ significantly (P<0.05)

Selacid and Presan combined with Selko pH in drinking water significantly decreased (P <0.05) feed conversion ratio. Addition Selacid 0.1% or Presan 0.1% in feed as well as with or without giving Selko pH in drinking water resulted the smaller feed conversion ratio (1.48 to 1.58) than the treatments without Selko pH. The smallest feed conversion ratio (A1B2) improve feed efficiency up to 5%. According to Scott (2005), additions formic acid and ammonium formats can decrease feed conversion and increase feed efficiency. Giving Selko pH in drinking water could not improve feed consumption, however giving Selko pH combined with Selacid 0.1% and presan 0.1% could be improve feed efficiency feed up to 16%. Deepa *et al.* (2011) stated that the usage of organic acid in feed improve the integrity of the intestinal mucosa and feed efficiency. Adding acidifier in drinking water will produce acid drinking water. Drinking water with pH 3-4 will suppress the growth of pathogenic bacteria without disturbing water consumption (Trouw nutrition 2015). Acid organic could minimize the mortality, Selacid 0.1% or Presan 0.1% in feed combined with Selko pH in drinking water produced the lowest mortality. According to Karaoglu et al. (2004) formic acid, acetic acid, zinc and copper combination have function as anti stress that can minimize the mortality.

Conclusion

The addition of Selacid 0.1% in diet with Selko pH in drinking water resulted the highest body weight, body weight gain and the lowest feed conversion in starter phase.

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Effect of Dietary Bamboo Charcoal Enriched with Acetic Acid (BCAA) on Egg Quality and Intestinal Morphology of Laying Hens

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Abstract

Bamboo charcoal is an activated carbon which can bind to various molecules and contains pores with various sizes and shapes. Acetic acid is widely known as antimicrobial organic acid. The objective of this study was to examine the combined effect of bamboo charcoal with acetic acid on egg quality and intestinal morphology of laying hens. Thirty six laying hens (320 days of age) were randomly divided to five treatment groups involved basal diet added 0% (control), 0.5%, 1.0%, and 1.5% bamboo charcoal enriched with acetic acid 6% (BCAA), and 1.0% bamboo charcoal (BC), respectively. Egg quality was obtained after 30 days of feeding treatment from measuring egg weight, eggshell thickness, eggshell strength, albumen weight, yolk weight, yolk color score, and Haugh unit of each egg. Duodenum villus height was assessed by Haematoxylin and Eosin (HE) staining, and its surface observed by Scanning Electron Microscope (SEM). Dietary BCAA showed to significantly improve eggshell thickness ($P<0.05$). Villus height of duodenum was higher at 0.5% and 1% BCAA, and lower at 1% BC ($P<0.05$). According to the results, it could be suggested that supplementation of BCAA in laying hen feed promoted intestinal function, which may help to assimilate more nutrients.

Keywords : bamboo charcoal, acetic acid, hen

Introduction

Many studies have been done to improve eggshell quality using varied approaches. Most of the studies on nutrition effect focused on dietary Ca manipulation as the primary way to increase eggshell quality. Currently, it was reported that laying hens fed with high Ca (4.4% Ca) decreased eggshell quality (shell thickness) compared to control (3.7% Ca) (Jiang et al. 2013). Therefore, our concern do not only increasing the Ca level, but also enhancing Ca availability and absorption in the gut. Bamboo charcoal is well-known as adsorbent which contains a complex network of pores in varied shapes and sizes. It had been used as an oral antitoxin to lower the absorption of poison in the gastrointestinal tract (Anjaneyulu et al. 1993). Acetic acid is a synthetic carboxylic acid with antibacterial and antifungal properties, and also known as the main component of acid portion in vinegar besides water (Yatagai et al. 2002). In previous study in aged laying hens, supplementation of bamboo charcoal vinegar decreased pathogenic bacteria, stimulated intestinal functions and improved eggshell thickness (Rattanawut et al. 2017). Thus the objective of this study was to examine the combined effect of bamboo charcoal with acetic acid on egg quality and intestinal morphology of laying hens.

Materials and Methods

Birds and Management. Thirty six 320-days-old Boris Brown strain laying hens were randomly assigned to five treatments based on egg production level and maintained in individual cages. They had free access to water and mash feed and were exposed to a 16L: 8D lighting schedule during the experiment period of 30 days. Before starting the feeding, hens were fasted for 24 hr. Bamboo charcoal in powder form and acetic acid 6% solution (v/v) were mixed 4:1, then added to commercial layer feed as basal diet (Table 1) at levels of 0 (as control), 0.5, 1.0, 1.5%, and bamboo charcoal only 1%, respectively. All experiments were performed according to the human care guidelines for the use of animals for experimentation provided by Kagawa University in Japan (Kagawa University, 2006).

Measurement of Egg Quality. Egg quality was assessed from measured egg weight, eggshell thickness, eggshell strength, albumen weight, yolk weight, yolk color score, and Haugh units as described by Rattanawut et al (2017).

Tissue Sampling and Measurement. Four hens randomly selected in each group were anesthetized and slaughtered. A part of duodenum was immediately collected, fixed in 4% paraformaldehyde phosphate buffer solution (pH 7.4) and embedded in paraffin wax. Duodenum tissues were sectioned at 5 μm-thick paraffin sections. Haemotoxylin and eosin (HE) staining was performed by conventional method and observed at 4 x magnification under light microscope Keyence BZ-9000 (Keyence Corp., Osaka, Japan). Villus height was estimated as described by Gianenas et al. (2010) using WinROOF software V7.4 (Mitani Corporation, Fukui, Japan).

Scanning Electron Microscopy (SEM) Observation. Duodenum fixed by 1% glutaraldehyde and 1% osmium tetraoxide in 0.1 M cacodylate buffer (pH 7.4) were dehydrated by ethanol, performed freeze drying method, and sputter coated with gold using an auto finer coater (DII-29010SCTR, JEOL Ltd., Tokyo, Japan). The surface of duodenal villi were examined by SEM at 5 kV (JCM-6000, JEOL Ltd., Tokyo, Japan). Bamboo charcoal powder also observed using SEM at 5 kV.

Statistical Analysis. All data were analyzed by one-way analysis of variance (ANOVA) using SPSS statistical package (SPSS Version 19, IBM Corp., USA). Significant differences was carried out by Duncan's test at a probability level of P <

0.05 amongst the experimental treatments. The results are expressed as the mean and pooled standard error of the mean (SEM).

Table 1. Feed formulation and chemical composition of the basal diet

Ingredient	Amount (gr/kg)
Corn grain + Milo	580.0
Soybean meal	160.0
Rapeseed meal	40.0
Gluten meal	40.0
Rice bran	30.0
Fish meal	30.0
Animal fat	20.0
Calcium carbonate	85.7
Dicalcium phosphate	4.0
Salt	1.5
Choline chloride	1.5
Paprika extract	0.3
Sodium bicarbonate	2.0
Premix[a]	5.0
Nutrient Composition	
Crude protein	170.0
Crude fat	30.0
Crude fiber	50.0
Crude ash	150.0
Calcium	31.0
Phosphorus, available	4.0
Metabolizable energy (kcal/kg)	2,850

[a]Premix including (per kg of diet): retynil acetate 2106 mg; cholecalciferol 35 mg; DL-a-tocopherol acetate 12.5 mg; menadione 1.5 mg; thiamine 2.6 mg; riboflavin 2.7 mg; pyridoxine 6 mg; cobalamine 9 mg; biotin 0.2 mg; folic acid 0.5 mg; pantothenic acid 15 mg; niacin 22 mg; choline 1000 mg; iodine 1.05 mg; manganese 50 mg; iron 160 mg; zinc 70 mg; copper 8 mg.

Results and Discussion

Result of egg quality tested by supplementing bamboo charcoal enriched with acetic acid in basal diet is summarized in Table 2. There was no significant difference found among the groups regarding to egg weight, eggshell weight, eggshell strength, albumen weight, yolk weight, and Haugh unit (HU). Eggshell thickness was significantly improved in 1.0% and 1.5% BCAA diet ($P<0.05$). Supplementing 1.0% BC yielded the same result as control (0.0%). Rattanawut et al. (2017) also reported that eggshell thickness significantly improved by dietary 1.5% bamboo charcoal vinegar diet, as acetic acid is the main organic acid component in bamboo vinegar.

The addition of organic acids in layers and old breeder hens suggested to improve the utilization of minerals that positively affect eggshell quality (Park et al. 2002; Sengor et al. 2007). Organic acids supplementation decreased intestinal pH and increased Ca solubility, which increased Ca level in blood and improved eggshell quality (Abdel-Fattah et al. 2008; Soltan 2008). In this study, therefore, BCAA addition improved eggshell thickness better than BC due to acetic acid additional in BCAA.

Table 2. Effect of supplemented bamboo charcoal enriched with acetic acid in basal diet on egg quality of laying hens

Parameters	Dietary BCAA, %				BC, %	SEM
	0.0	0.5	1.0	1.5	1.0	
Egg weight, g	66.91	66.34	66.48	65.68	63.37	0.63
Eggshell weight, g	8.00	8.17	8.17	7.89	7.56	0.09
Eggshell thickness, mm	0.420^{b}	0.426^{ab}	0.442^{a}	0.435^{a}	0.420^{b}	0.003
Eggshell strength, kg/cm^2	3.66	3.96	3.92	4.36	3.77	0.13
Albumen weight, g	41.70	41.04	41.52	40.81	39.66	0.48
Yolk weight, g	17.21	17.13	16.79	16.97	16.15	0.16
Haugh unit (HU)	90.65	90.04	90.50	94.95	91.21	0.99

BCAA stands for bamboo charcoal enriched with acetic acid. Different superscript in the same line means significantly different (*P*<0.05).

Villus height of duodenum is presented in Table 3. Villus height was higher in hens fed with 0.5% and 1.0% BCAA (*P*<0.05). Villus height is increased by enhancing the efficiency of digestion and absorption in the small intestine, as population of beneficial bacteria supplies nutrients and stimulates intestinal villus development (Gilmore and Ferretti 2003). Taller villus indicated more mature epithelia and enhanced absorptive function due to increase absorptive area of the villus (Gao et al. 2008). Regarding the results, acetic acid inclusion in the bamboo charcoal may promoted villus height of duodenum of hens

Table 3. Villus height of duodenum in hens

Parameters	Dietary BCAA, %				BC, %	SEM
	0.0	0.5	1.0	1.5	1.0	
Villus height, mm	1.38^{ab}	1.45^{a}	1.42^{a}	1.41^{ab}	1.35^{b}	0.63

BCAA stands for bamboo charcoal enriched with acetic acid. Different superscript in the same line means significantly different (*P*<0.05).

Figure 1 shows the surface of duodenal villi which observed by scanning electron microscope (SEM). Many intestine histological studies have revealed that the intestinal villi and cells are affected by dietary components (Khambualai et al. 2009; Incharoen and Yamauchi, 2009). Villi surface in hen fed with 0% BCAA seen to have less protuberant cells than other treatment groups. It showed a lowest level of morphological change among groups. Incharoen et al. (2010) reported that the decreased duodenal villus provided lower level of morphological change on villus surface in chicken duodenum.

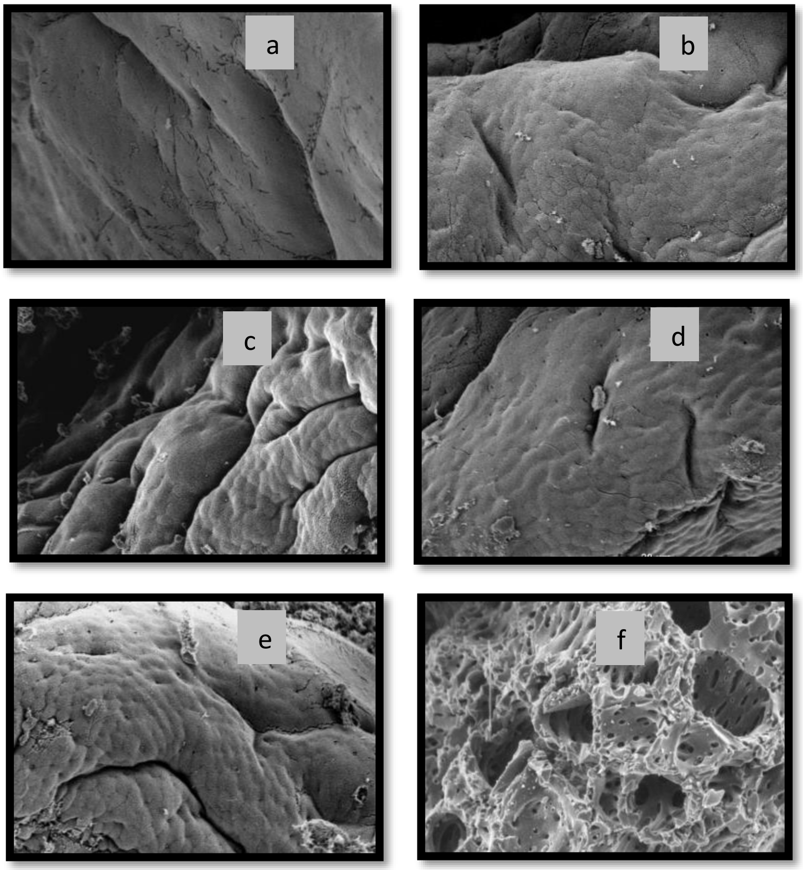

Figure 1. Duodenal villus surface of hens fed with (a) 0% BCAA, (b) 0.5% BCAA, (c) 1.0% BCAA, (d) 1.5% BCAA and (e) 1.0% BC [BCAA = bamboo charcoal enriched with acetic acid; BC = bamboo charcoal]. Scale bar = 20 μm, x 1000. Bamboo charcoal surface (f) with scale bar 20 μm x 1500.

Conclusions

Supplementation of BCAA in the diet of hens improved eggshell thickness, duodenal villi size and intestinal morphological changes at 1% level. However, supplementing BC only did not affect as BCAA did.

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FULL PAPERS
PARALLEL SESSIONS
SUBTHEME : ANIMAL LOGISTIC

Comparison of Feed Logistic Efficiency between Urban and Rural Dairy Farming

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Abstract

Dairy Farmers should provide feed from the nearest source with minimal transportation and handling costs to achieve feed logistics efficiency. The aim of this research was to compare feed logistic efficiency in dairy farm located in urban and rural area. This research was conducted at traditional urban dairy farms member of Koperasi Peternak Susu (KPS) Bogor cooperative which are located in Kebon Pedes, Bogor and rural dairy farmers member of Koperasi Peternak Bandung Selatan (KPBS) cooperative which are located in Pangelangan, South of Bandung. Twenty farmers in both location have been interviewed and observed. The results of this study showed that dairy farmers in urban area used feed from farther distance in compare to rural farmers. However, for feed transport facilities, urban farmers were more efficient than rural, so the feed transportation and handling cost in urban farms were cheaper than rural. The average transportation and handling cost per kg concentrate in urban and rural area were IDR 75.71 per kg and IDR 129.91 per kg, respectively. The average transportation and handling cost per kg forage in urban and rural area were IDR 71.5 per kg and IDR 193.67 per kg, respectively. Urban farms that are far from feed sources got advantage from efficient feed transport and handling costs, while rural farms got advantage from their closer location to feed sources. It is concluded that feed logistic efficiency in both dairy farming locations can be improved by considering advantage of each location.

Keywords: feed, logistic, efficiency, dairy farm, transportation

Introduction

One important factor in increasing productivity of dairy farming is feed efficiency. Feed is an important component of dairy business economy, as it was estimated to contribute 50 to 60% of total production costs (Devendra and Sevilla, 2002). In traditional dairy farm, the component was even higher (Despal et al., 2017). In addition, feed is an input production that should always be available during production period. Therefore, the logistics aspects of feed on dairy farms become very important. Feed logistics efficiency need to be considered to get the right feed, at the right time, the right amount and the right conditions with least cost and provide added value. Feed should be provided from the nearest source with minimal transportation and handling costs to achieve feed logistics efficiency. Source, type, and transportation and handling cost can be affected by location of farms, for example urban and rural area.

Urban dairy farming in Indonesia are located some area, such as Mega Kuningan Jakarta Selatan, Pondok Rangon Jakarta Timur, and Kebon Pedes Bogor. There are advantage and disadvantage of urban dairy farming. The advantages were closed to the market, higher price of milk (Gillah *et al,* 2012), have more technologies, and better road transportation. The disadvantage of this system were limited land availability (Duguma *et al,* 2011), high labor price, and high temperature due to the location at lowland (Despal et al, 2014). Competitive price of land made the fresh forage availability become scarce. Farmers tried to used agricultural by products or vegetable waste from traditional market to substitute the fresh forage (Despal *et al,* 2017).

Rural dairy farming in Indonesia are mostly located in Java Island, especially West Java and East Java. There are advantage and disadvantage of rural dairy farming. The advantages were high land availability, low labor price, low temperature, and high feed resources. The disadvantages were less technologies, less infrastructure, far to the market, lower milk price, and high cost transportation (Baliyan and Gosalamang, 2016). Rural dairy farming are mostly located in highland. Transporting milk from highland to costumer in lowland needs cold chain that can only be provided by large company or collectively by cooperative. Small holder farmers should pay some costs for the service or sell their milk in lower price which will reduce their income (Despal *et al,* 2017).

The objective of this research was to compare feed logistic efficiency including type of feeds, feed sources, distance to transport, transport and handling cost, and feed price in dairy farm located in urban and rural area.

Materials and Methods

This research was conducted at traditional urban dairy farms member of Koperasi Peternak Susu (KPS) Bogor cooperative located in Kebon Pedes, Bogor and rural dairy farms member of Koperasi Peternak Bandung Selatan (KPBS) cooperative which are located in Pangelangan, South Bandung. Twenty farmers in both location have been interviewed and observed.

At each location, this study observed the type of concentrate and forage used. Type of feed used by the farmer have been sampled and the amount of the feed offered have been measured. This study also identify feed source, distance, transportation and handling cost, and feed price. The data of type of feed and source were analyzed using descriptive statistics. The data of distance, transportation and handling cost, and feed price were analyzed using T-test.

Results and Discussion

The type of feed and its source were showed in Table 1. The result showed that type of feeds by urban farmers were less than rural farmers because of limited feed sources. Urban farmers did not have their own land for forage cultivation due to lack of land (Duguma *et al,* 2011). Urban dairy farmer purchased fresh forage and vegetable market waste far from the farm. Urban farmers used vegetable waste from traditional market to substitute the fresh forage (Despal *et al,* 2017).

The transportation and handling cost per kg and distance (km) of feed in urban and rural area were showed in Table 2. The results of this study showed dairy farmers in urban area used concentrates from farther distance in compare to rural farmer (P<0.05). This is due to urban location in city and far from feed resources (Gillah *et al*, 2012). The average distance for concentrate transportation in urban and rural area were 3.57 km and 2.5 km, respectively. For distances to transport forages, the results showed there were no significant, but its average in urban (4.33 km) tend to farther than then rural area (1.75 km). Because of shorter distance to transport feeds, rural dairy farming have more feed resources. That was advantages of rural dairy farming.

Table 1. Type of feed and source in urban and rural area

Urban Dairy Farm		Rural Dairy Farm	
Type of Feed	Source	Type of Feed	Source
Concentrates			
Concentrates	Jampang	Pollard	KPBS
	Cooperative	Onggok	KPBS
Tofu waste	Bogor	Concentrates	KPBS
	Citerep	Total Mix Ration	UPBS
	Cimanggu	DDGS	UPBS
Tempe waste	Citerep	Dried Brewery	Collectors
	Cimanggu	Tofu waste	Collectors
Forages			
Napier Grass	Bogor	Rice Straw	Rice field
Vegetable waste	Market	Natural Grass	Pasture
		Kubis	Plantation
		Tebon Jagung	Plantation

Table 2. The transportation and handling cost per kg, distance (km), and feed price in urban and rural area

Parameters	**Urban**	**Rural**
Concentrates		
Transport and handling cost (IDR per kg)	75.71^{b}	129.91^{a}
Distance (km)	3.57^{a}	2.50^{b}
Feed Price (IDR per kg)	1069.14	1985.71
Forages		
Transport and handling cost (IDR per kg)	71.50	193.67
Distance (km)	4.50	1.75
Feed Price (IDR per kg)	379.13	573.00

Note: Means with different superscripts differ significantly (P<0.05)

For feed transport facilities, urban farmers were more efficient than rural. The result showed concentrate transportation and handling cost in urban farms were cheaper than rural (P<0.05). The average transportation and handling cost per kg concentrate in urban and rural area were IDR 75.71 per kg and IDR 129.91 per kg, respectively. For forages transportation and handling cost, the results showed there were no significant, but its average in urban (IDR 71.5 per kg) tend to cheaper than then rural area (IDR 193.67 per kg). Because of lower transportation and handling cost in urban area, therefore the feed prices were also tend to cheaper in rural area. However, the result showed there were no significant. Low feed price, transportation and handling cost were advantages of urban dairy farming.

Rural areas were by definition remote, sparsely populated, often dependent on natural resource based industry, and less improvement transportation (Kilkenny, 1998). That causes transportation and handling cost in rural farms were more expensive. The characteristic of rural logistics were low rural economic and logistics development; rural logistics operations were difficult because of the seasonal and perishable character of agricultural products; rural production and the logistic demand were fragmented and the insufficient logistic supply; the basic logistic facilities were becoming outdated, however, it causes logistic costs were expensive (Huang *et al*, 2012).

Urban and rural dairy farming have advantages and disadvantage about feed logistic efficiency. However the location of urban dairy farms were far from feed resources and lack of land, urban dairy farm got advantages from the low feed price, transport and handling cost. On the other side, although the transport and handling cost in rural dairy farms was higher than rural farms, but rural farmers got advantage from higher feed resource availability.

Conclusions

Urban farms that are far from feed sources got advantage from efficient feed transport and handling costs, while rural farms got advantage from their closer location to feed sources. It is concluded that feed logistic efficiency in both dairy farming locations can be improved by taking advantage of each location.

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Conditioning and Feed Adaptability Periods on Cattle Behavior After Transportation

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Abstract

Cattle transportation is a part of the supply chain in the livestock logistics system. Transport can cause stress and will affect on feeding consumption and behavior on the livestock. This study aimed to conduct an observation of livestock conditioning and adaptation observation, as well as feeding behavior of the livestock after transportation. The research used descriptive method in a colony fattening business unit at Central Borneo, Indonesia. The results showed that the process of conditioning and adaptation of livestock was done for 2 weeks. The feeding behavior shown by the animals varies depending on the type of feed ingredients given. The level of consumption can be determined based on the adaptability and the level of palatability of livestock to feed. The conclusion is that the process of livestock reconditioning and feed adaptability needs to be done with the right time to maintain feeding efficiency in the fattening program that will be done.

Keywords: Feeding behavior, animal logistic, supply chain, cattle transportation

Introduction

Livestock is one of the sector that became the center of attention to the Indonesian government. The need for beef in Indonesia is currently filled with three sources: local cattle, export cattle fattening, and imported meat from abroad. The import of live cattle and frozen meat is one of the efforts to avoid a gap between production and consumption level of beef in the country (Rivai 2009). Currently fattening cattle breeding business has a very important role in improving productivity to meet the needs of consumers of meat products. Livestock Logistics is a process which involves the process of planning, implementation, efficiency, and storage of products ranging from on-farm activities to the consumer. Live cattle transportation is part of the supply chain contained in the livestock logistics system. Livestock rural transportation plays an important role as an effort to meet consumer needs in urban areas and to balance supply-demand activities. The existence of Indonesia as an archipelago country is related to the high time and cost that must be spent for the process of distribution and transportation between islands. This is a critical issue that needs to be studied and resolved with stakeholders who play a role in every chain production. Livestock transport has an impact on livestock performance during the trip and the recovery process or recovery time required. Transport influences feeding behavior on cattle. Progar *et al.* (2015) explain that transportation influences feeding behavior and lying time of cattle to optimize production.

Transport can cause stress and will affect on feeding consumption and behavior on the livestock. Reported by Duff and Galyean (2007) that stress has been shown to have a negative impact on feed intake, growth, and production. In addition, Krawczel *et al.* (2012) also explained that the impact under stress can occur due to overcrowding, causing livestock to reduce feed consumption and simultaneously can change the activity of rumination, and changes into eating behavior. Feed has an important role to fulfill the maintenance, growth, and livestock production. This study aimed to conduct an observation of livestock conditioning and adaptation observation, as well as feeding behavior of the livestock after transportation

Materials and Methods

The research used descriptive method in a colony fattening business unit at Central Borneo, Indonesia. Data is collected by using sampling technique from each pen inside the cage using 4 cows on each pen. Descriptive data were taken simultaneously for observation of conditioning and eating behavior. The flow of sick cow handling is observed simultaneously with paramedic officers accompanied by the interview process.

Results and Discussion

Conditioning Process

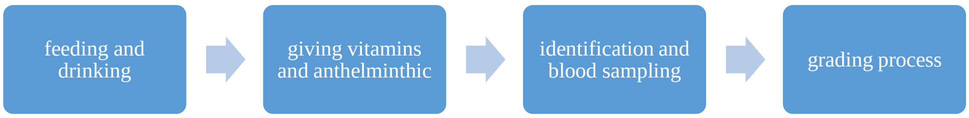

Figure 1. Graphic of Conditioning Process

The fattening program started with conditioning treatment shortly after the new cattle arrived. Newly arrived cattle are put into the pen that has been bedding. Bedding used is bedding of palm oil processing waste. Livestock is also fed forage and concentrate. For drinking water given *ad libitum* (unlimited). According to Nuraini H *et al.* (2015), handling newly arrived cattle needs to be done so that the livestock is no more stress. Some things to do include the provision of medicines and vitamins, provision of quality forage and drinking water.

Treatment of Diseases Caused After Transportation

The long journey certainly has another impact on some cattle other than stress. Some of the animals exhibiting unhealthy symptoms are further incorporated into separate pens for specific treatment treatments. Some of the diseases that livestock meet in the fattening program are limp (laminitis), fever, runny nose, pneumonia, exudate buildup, and acidosis.

Feeding and Feed Consumption Systems

The need for ruminants to feed is reflected by its need for nutrition. The amount of nutritional needs each day depends on the type of livestock, age, physiological status, body condition (normal, pain) and the environment in which it lives (temperature, humidity, air), and body weight. So each livestock different conditions required different feed (Kartadisastra 1997). Management conducted by the current company for the feeding of fattening cattle is 3.5% (BK) of body weight. The comparison between forage use and the concentrate is 70:30, but during the adaptation period, feeding between forages and concentrate is done gradually, feeding schedule can be seen in table 2. Forage given by the company consists of 3 types namely, elephant grass, jabon, natural grass, and palm stem. Nutrient composition of forage and concentrate can be seen in table 1.

Table 1. Nutrient composition of Forage and Consentrate

Nutrient (% DM)	*Pennisetum purpureum*	Jabon*	Palm stem	Concentrate
Ash	8.16	4.4	6.16	7.13
CrudeProtein (CP)	2.67	3.3	6.52	15.21
Ether extract (EE)	1.29	20.2	3.22	8.53
Crude Fiber (CF)	8.82	-	37.36	33.18
Nitrogen Free Extract (NFE)	-	-	-	35.97
Total Digestible Nutrient (TDN)	55.63	16.3	88.4	95.31

*Matondang and Fadwiwati (2005)

Table 2. Feeding schedule forage and Concentrate

Schedule		Type of feed	Total
Morning	05.00	*Pennisetum purpureum* + Jabon	105 kg^{-1} pen
	07.00	Concentrate	1600 kg^{-1} cage
Noon	11.00	Natural grass	1 Bin^{-1} cage
	14.00	Concentrate	1600 kg^{-1} cage
Evening	19.00	Palm stem	105 kg^{-1} pen
	21.00	Concentrate	1600 kg^{-1} cage

Concentrate feeding is done by using a feeder unit in the form of cars ready to be mobilized to each cage. While granting *Pennisetum purpureum* and palm stem are given in the form of a sack. For the natural grass done by using open-air minibus that is allocated to each cage.

Feeding Behavior

Palatability is the livestock's liveliness to a feed ingredient. Parakkasi (1995) states that the palatability of feed is one of the factors that influence the amount of feed consumption. One of the ingredients commonly ingested in ruminants feed ingredients to improve the palatability of feed is salting (Pardede *et al.* 1997). The consumption of livestock kept in the fattening program for two weeks of adaptation is almost 100%. It can also be concluded that livestock likes all kinds of forage and concentrate to feed given by the management. In addition to the level of palatability, the behavior of feeding on cattle can also be observed from the number of ruffles and chewing done by cows. The results of observed behavior of ruffles and chews can be seen as follows.

Table 3. The results of observed behavior of cows when consuming several types of feed

No.	Type of feed	Number of ruffles (times/min)	number of chews (times/min)
1	*Pennisetum purpureum* + Jabon	4.00 ± 2.36	45.50 ± 0.00
2	Palm stem	5.00 ± 0.58	20.33 ± 4.37
3	Natural grass	4.00 ± 0.96	44.25 ± 16.60
4	Concentrate	4.25 ± 0.96	43.75 ± 36.51

The result showed that cattle do the most chew on *Pennisetum purpureum* and Jabon, and the lowest chew on the palm stem. It can be caused due to the smooth surface area of palm stem, so the cattle do not chew for too long. This chew rate will affect the saliva produced by livestock during chewing so that saliva serves as a buffer that can offset the stability of pH rumen and also the level of consumption. Arora (1989) states that the smaller the surface area of feed will increase the rate of gastric emptying so that consumption also increases.

Conclusions

The conclusion is that the process of livestock reconditioning and feed adaptability needs to be done with the right time to maintain feeding efficiency in the fattening program that will be done.

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Factors Influencing Beef Imports in Indonesia

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Abstract

The increase of population growth rate and living standards improvement of Indonesian people will encourage the households consumption pattern changes gradually to the consumption of animal protein. Beef is animal product with good flavor and high nutritional value and also elastic to increased income. Indonesian beef production has not been able to meet the needs of the national beef consumption. The government imported beef to overcome this problem. The increasing Beef imports trend could have negative impacts on the economy, and also to the national food security. This study aimed to analyze the factors influencing beef imports in Indonesia using time series data between 1981-2016. The analysis tool used is the cointegration and error correction method. Our findings suggested a significant long-run and short-run relationship between beef import volume and explanatory variables (beef consumption, beef real price, beef production, and population of cattle) performance with 58.12 percent of speed of adjustment to restore equilibrium condition in the long run. Based on the research results, significant factors that affected the beef import volume in the long run is beef real price.

Keywords: Beef, cointegration, import, price.

Introduction

Demand for animal foods in Indonesia tends to increase, along with economic development, improvements in education levels, and changes in people's lifestyles caused by urbanization and globalization. Increased population growth and improved living standards of Indonesians will lead to a gradual shift in household consumption patterns towards the consumption of animal protein (including livestock products). Meat, eggs and milk are food commodities with high taste and nutritional value and have relatively more expensive prices compared to other food commodities. One of the animal foods that have high taste and nutritional value and elastic to increase the income is beef. Beef is very beneficial for the fulfillment of nutritional intake of animal protein in the human body. The need of beef in Indonesia has been obtained from three sources, namely the production of local beef, imported beef cattle, and imported beef.

Average beef consumption in Indonesia from 2002 to 2014 is 1.56 kg/capita/ year. Indonesia beef consumption currently reaches an average of 2.56 kg/capita/year (Statistics Indonesia 2014). This figure is lower when compared with other countries in Southeast Asia such as in Malaysia reach 46.87 kg/capita/year, while in the Philippines at 24.96 kg/capita/ year. Indonesia needs about 600 thousand tons of beef per year to meet the needs of national beef . But only about 70% can be met by domestic beef production and the rest still comes from imports of other countries (Ministry of Agriculture 2014).

The national production of beef in 2014 was 539 thousand tons, mostly filled with small-scale cattle farms with the number of cattle ownership of 1 - 2 head per farmer. When compared to the year 2013, beef production increased by 6.99 percent from 505 thousand tons to 539 thousand tons (Ministry of Agriculture 2014). The high protein in beef causes consumers to increase their consumption of beef, thus encouraging increased production. The production has not been able to meet the needs of national beef by 760 thousand tons. Therefore, to cover the shortfall, the import is 322 thousand tons. If the volume of imports continues to increase, it can cause animal food sovereignty, especially beef, further away from expectations and cause Indonesia to enter the exporter's food trap.

The condition of imported beef prices is relatively lower with better quality due to more efficient production management, in addition to the dumping of price policy by the exporting country. While in Indonesia, the price of meat is relatively expensive, as a result of the inefficiency of domestic livestock business which is indicated by the high cost of business production including inefficiency in trade trading line from production center (upstream industry) down to consumer (downstream industry). Such conditions have an impact on the development of domestic livestock business, both the efforts made by the *feedloter* and traditional livestock business people who are traditional (Ardiyati 2012).

Based on the description of the condition of the production, consumption and import of beef in Indonesia, study of factors affecting beef import in Indonesia is needed so that we know the important factors in the import of beef as well as to analyze the action that should be done to achieve self-sufficiency of beef. This research is necessary to overcome two main issues related to beef self-sufficiency policy, namely the gap between beef production and consumption resulting in the tendency of increasing import volume, and the negative impact of beef imports on the economy, especially the livestock sub-sector. Therefore, this research is conducted with the aim of: (1) to analyze the condition and the tendency of beef import in Indonesia, and (2) to analyze the factors influencing the import of beef in Indonesia.

Methodology

Types and Data Sources

The data used in this research is secondary data such as time series data *(time series)* from 1980 to 2016 from Statistics Indonesia and the Directorate General of Livestock and Animal Health Ministry of Agriculture. The time series data used is annual data from 1980 to 2016 with a period of 37 years. The types of data include the import volume of beef (ton), the real price of domestic beef (Rp/kg), domestic beef consumption (ton), domestic cattle population (head), and domestic beef production (ton).

Analysis Method

The analysis process of this study follows the following stages:

Stationary test. A time series is called stationary if the mean and its variance remain constant all the time. Otherwise, this series is said to be non-stationary. A non stationary time series is not used in econometric analysis because it can produce false regressions. The stationarity test of data uses the Augmented Dickey-Fuller (ADF) root unit test .

Co-integration test. If the observed variable is not stationary at the *level* and becomes stationary at the same order (cointegrated in same order) then the co-integration test can be applied to check whether there is a long-run relationship between the variables. For analytical purposes, the equations are expressed in linear form. The variables included in the model are grouped into two, namely the dependent variable and the independent variable. The dependent variable is a variable hypothesized in the equation, this variable describes the volume of beef imports in Indonesia (IDS). While the independent variable is a variable that affects the dependent variable in the system. The independent variables in this study include: real price of beef (HDS), beef consumption (KDS), livestock population (PTS), and beef production in Indonesia (PDS). The following is a linear combination equation to determine whether or not there is a long-run linear combination relationship:

$$IDS_t = \beta_0 + \beta_1 HDS_t + \beta_2 KDS_t + \beta_3 PTS_t + \beta_4 PDS_t + \varepsilon_t$$

Test Error Correction Model (ECM). Engle and Granger (1987) showed that if the null hypothesis (no co-integration) can not be rejected, the error correction model of the appropriate coordinated sequence. That means if the co-integration test reveals that there is a long-run relationship between beef import volume (IDS), real beef price (HDS), beef consumption (KDS), cattle population (PTS), and beef production in Indonesia (PDS) then the Error Correction Model (ECM) can be applied to evaluate the short-run nature of a coordinated series. Error Correction Model for IDS (HDS, KDS, PTS, PDS) can be expressed as least squares regression of changes in IDS (HDS, KDS, PTS, PDS) on past changes in IDS, HDS, KDS, PTS and PDS, and lag of the residuals of the co-integration regression. The regression equation for VECM is as follows:

$$\Delta IDS_t = \gamma_1 \Delta HDS_t + \gamma_2 \Delta KDS_t + \gamma_3 \Delta PTS_t + \gamma_4 \Delta PDS_t + \gamma_5 ECT_t + \varepsilon_t$$

Δ is operator *difference* , ECT is the estimated *residual* of the co-integration equation, ε_t are random error and γ_1 , γ_2 , γ_3 , γ_4 , and γ_5 are parameters.

Results and Discussion

Imported Beef Conditions and Trends in Indonesia

Import is a form of international trade by entering commodities from other countries into the country. Imports are conducted if a country can not meet the public demand for a commodity or shortage in domestic production. In addition, imports can also be made if the cost required to import is relatively smaller than producing the commodity domestically. Beef in Indonesia comes from two sources, namely import and domestic. Imported beef comes from producer countries such as Australia and New Zealand.

The availability of beef and buffalo in 2017 experienced a deficit of 250.20 thousand tons. Production of beef and buffalo is available only 354.77 thousand tons, while the demand for both types of meat reaches 604.97 thousand tons (Statistics Indonesia 2017). So most of national beef consumption is supplied by import of meat and cattle. Therefore, it can be said that the portion of import is still quite large in order to meet the national beef consumption .

The volume of beef imports in Indonesia decreased from 2000 to 2003 with an average decline of 19.9 thousand tons (Figure 1). From 2004 to 2010 the volume of beef imports tend to increase with the highest import volume reached in 2009 of 302.3 thousand tons, and in 2010 to 2012 the volume of beef imports again tend to decline with an average decrease of 83 thousand tons. The decline was caused by the reduction of import quota of beef and the increase of beef production as part of the policy of beef self-sufficiency program 2014. In the period of 2013 to 2014, the volume of beef imports again increased with an increase in import volume of 145.5 thousand tons. Furthermore, in 2015, beef imports fell by 73.6 thousand tons, and again rose in 2016 to 312.5 thousand tons. The average volume of imported meat from 1980 to 2016 around 95.5 thousand tons.

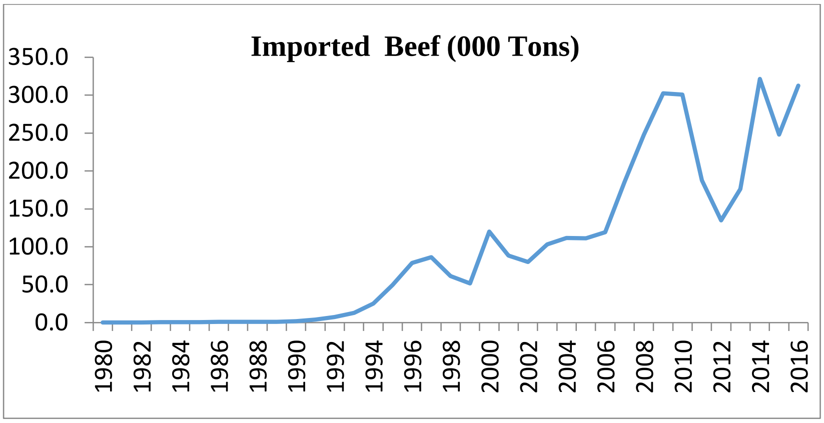

Figure 1. Imported beef volume 1980-2016

The real price of beef in Indonesia has an upward trend every year. According to Figure 2, the rate of increase in real price of beef moved slowly from 1980 to 1998. The rise in real prices of beef moves up and slightly fluctuates from 1998 to 2016. The real price of beef dropped in 2015 to Rp. 83676.2, then rose again in 2016 to Rp. 847331.1. This is allegedly due to the government's policy of importing meat from India and the regulation on the determination of the reference price of beef.

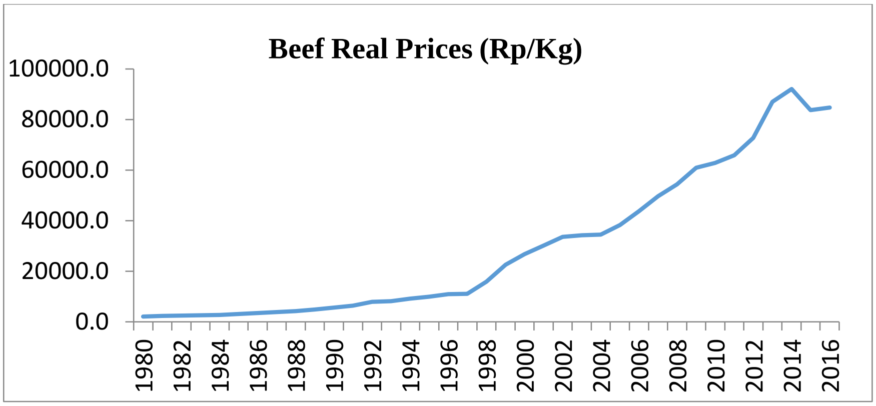

Figure 2. Real beef prices 1980-2016

Based on Figure 3, the consumption of beef in Indonesia tends to be greater than beef production. The shortage of beef production to meet national demand for beef began in 1985 when beef consumption reached 397 thousand tons while beef production only reached 227 thousand tons. The surplus of beef production surplus to beef consumption occurred in 1995 to 1997 with an average surplus of 56 thousand tons. After that period, Indonesia experienced a shortage of production amount to meet the needs of domestic beef consumption. Therefore to cover the shortfall, beef imports are imported mainly from Australia, New Zealand, and India.

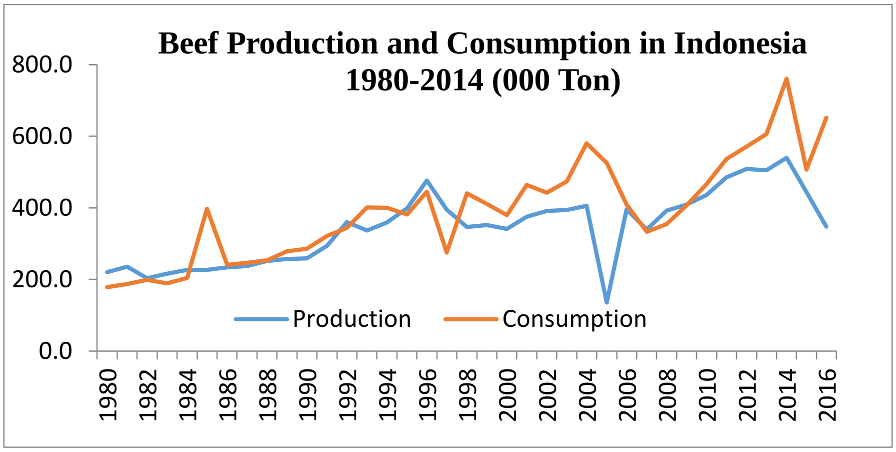

Figure 3 . Beef production and consumption in Indonesia 1980-2014

Stationarity Test. The Augmented Dickey-Fuller (ADF) stationarity test states that the variables beef consumption (KDS) and beef production (PDS), which is stationary at level I (0). While for beef import (IDS) variable, real beef price (HDS), and cattle (PTS) population stationary at first difference I (1). According to Lee and Granger (1990), although there is a difference in degree of integration on each variables there can still be linear combinations and long-run relationships between variables. The results of theADF stationarity test are shown in Table 1.

Table 1. Augmented Dickey-Fuller (ADF) test result

Variable	I(0)			I(1)		
	Trends and constant	Constants	Without trends and constants	Trends and constants	Constants	Without trends and constants
IDS_t	0.0797	0.8762	0.8000	0.0000*	0.0000*	0.0000*
HDS_t	0.9932	1.0000	1.0000	0.0000*	0.2678	0.2819
KDS_t	0.0056*	0.6215	0.8764	0.0000*	0.0000*	0.0000*
PTS_t	0.6273	0.6034	0.9656	0.0000*	0.0000*	0.0000*
PDS_t	0.0246**	0.1123	0.6901	0.0000*	0.0000*	0.0000*

Description: (*) significant at 1%, (**) significant at 5%, (***) significant at 10%.

Co-integration test. Co-integration test in this research using Engle and Granger approach (1987) to know the long-run linear combination between the variables studied . The Johansen co-integration test results can be seen in Table 2 .

Table 2. Co-integration Test Results

Variable	Coefficient	Standard Error	t-statistics	Prob
KDS	-0.115375	0.098491	-1.171429	0.2501
HDS	0.003376	0.000494	6.831711	0.0000*
PTS	0.004195	0.006991	0.600071	0.5527
PDS	0.028055	0.115718	0.242441	0.8100
Constants	-16.56516	55.17892	-0.300208	0.7660
R-squared		0.850232	AIC	10.46816
Adjusted R-squared		0.831511	SC	10.68585
S.E. of regression		42.63168	HQ	10.54491
Sum squared resid		58158.72	DW stat	1.135059
Log likelihood		-188.6610	Prob (ADF error)	
F-statistic		45.41601		
Prob(F-statistic)		0.000000		

Description: (*) significant at 1%, (**) significant at 5%, (***) significant at 10%.

The estimation of co-integration equation with ordinary least square method (OLS) resulted in Adjusted R2 is 83.15 percent. It shows that the diversity of dependent variable can be explained by independent variables equal to 83.15 percent so that the model of co-integration equation is fit. The results of the F-statistic test showed significant p-value so that it can be stated that the independent variables (real price of beef, beef consumption, cattle population, and beef production) simultaneously affect beef imports.

The real price variable of beef has significant p-value with coefficient of 0.003376 which is positive. This showed that the real price of beef has a significant effect on beef import or when the real price on beef increased Rp. 1 000 then the volume of beef imports will rise by 3376 tons. Results of ADF stationarity test on the error of co-integration equation showed significant at level. It states that there is a linear combination or long-run relationship between independent variables (real price of beef, beef consumption, cattle population, and beef production) with dependent variables of beef import).

Error Correction Model Test (ECM). The ECM estimation result in this research model showed the relationship of both short run and long run variables. The response variables in the estimates in the model were beef imports, while the explanatory variables were the real price of beef, the consumption of beef, the population of cattle, and the production of beef. ECM model of beef imports has error correction coefficient of -0.581289 and statistically significant at the level of one percent, so that the estimated error correction parameter can be used to correct the equation of short-run and long-run. ECT_{t-1} coefficient value showed 58.12 percent speed of adjustment to restore equilibrium in the long run. This result also implies the correct model specification without error and bias. The ECM model estimation results are shown in Table 3.

Table 3. ECM Estimated Results

Variable	Coefficient	Standard Error	t-statistic	Prob
KDS	-0.008035	0.065959	-0.121822	0.9039
HDS	0.003338	0.002134	1.564230	0.1283
PTS	0.013028	0.007966	1.635494	0.1124
PDS	0.006548	0.091728	0.071385	0.9436
ECT_{t-1}	-0.581289	0.170601	-3.407304	0.0019*
Constants	-2.174903	23.55725	-0.092324	0.9271

Description: (*) significant at 1%, (**) significant at 5%, (***) significant at 10%.

Conclusion and Implications

Conclusion

Indonesian beef imports from 1980 to 201 6 tends to increase. In 2010 to 2012 the import volume of beef tends to decline. The decline was caused by a reduction in import quota of beef and increased beef production as part of the 2014 beef self-sufficiency program. In the period 2013 to 2014, the volume of beef imports increased again.

Based on the results of this study are known factors that significantly affect the volume of imports of beef in Indonesia, the real price of beef, the variable positive effect on the volume of imports of beef in Indonesia. The estimation results also show a short-run and long-run relationship between response variables (beef import) and explanatory variables (real price of beef, beef consumption, cattle population, and beef production) with adjustment speeds to restore equilibrium conditions in the run length of 58.12 percent.

Policy Implications

Beef real price variable have significant effect to import volume of beef. This implies that the policy of controlling or stabilizing the price of beef in the domestic market is needed to reduce the volume of beef imports. Related to price stabilization, the government is expected to be able to reformulate the beef trading policy so that the price of beef at the consumer level is affordable and can compete with imported beef prices.

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Regression Analysis on Physical Quality of Straw, Elephant Grass, Leucaena, and Indigofera Leaves for Shipping Cattle Feed

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Abstract

Feeding management on shipping cattle in Indonesia still need some improvement. Mostly, shipping cattle has been given only straws as their feeds which could lead to body weight shrinkage. Few studies concluded that cattle didn't prefer to choose concentrate except forages. Forages characteristics are bulky, voluminous, hard to handle, and not durable for long storage time. Forages processing into compacted feed such as pellet or wafer hopefully could resolve this problems. Before compacted feed will be made, forages physical quality needs to be studied. This research was aimed to observe forages physical characteristics and their interactions for shipping cattle feed. Forages that had been used were straw, elephant grass, Leucaena and Indigofera leaves as legume. Forages were chopped and dried under the sunlight for 3 days. After dried, forages were grinded with 5mm dies into forage mash. Forage mash was mixed into 6 different formulations, then the physical quality including angle of repose, bulk density, compacted bulk density, mass density, modulus of fineness, and particle size was observed on each forages and formulations. Result showed that there were significant difference for each forages ($P<0.05$) in a few physical quality. An equation has been made by using regression analysis for each variables including angle of repose ($R=0.644$), bulk density ($R=0.209$), compacted bulk density ($R=0.224$), mass density ($R=0.077$), modulus of fineness ($R=0.655$), and particle size ($R=0.692$). The conclusion is forages needs special processing treatment in order to be utilized as shipping cattle feed.

Keywords: physical quality, forage mash, cattle shipping, forage processing, local cattle

Introduction

Feeding management on shipping cattle in Indonesia still need some improvement. Mostly, shipping cattle has been given only straws as their feeds. Straws contain bad nutrient quality that doesn't meet cattle's nutrient requirement (Van Soest 2006). This occurrence will lead to body weight shrinkage which lead into loss between farmers and consumers. To prevent this loss, another feed source beside straw need to be examined for shipping cattle.

An observation had been conducted to observe some feed types in shipping cattle. Somehow cattle didn't prefer to choose concentrate and any other feed types beside forages. Majority of shipping cattle in Indonesia are sent from Nusa Tenggara Timur (NTT) province. Most of the cattle in NTT province have been raised in grazing area which the cattle have never been given concentrate before. The only available feedstuff for shipping cattle from NTT province is forages. There are some forages that could fulfill the nutrient requirements of shipping cattle. But there are another problems which need to be resolved in forage utilization for shipping cattle. Forages characteristics are bulky and voluminous (Herrero *et al.* 2005), this make forages hard to handle in ship because it will use a lot of storage space inside the ship. Beside, forage are not durable for long storage time. Forages processing into compacted feed in the form of pellet and wafer hopefully could resolve this problems.

Before compacted feed is made, forages physical quality need to be studied. A feed for shipping cattle should have a high bulk and mass density because the higher bulk and mass density, the lower small storage space is utilized. Besides, the feed should also have a low angle of repose and particle size. A low angle of repose indicated that the feed is easy to flow throughout a fabrication processing (Geldart *et al.* 2006). Lower particle size is correlated into higher bulk density (Wang *et al.* 1994). If one of the forages physical quality is not good, forages need to be mixed with the other forages to obtain an ideal physical quality of the feed.

Materials and Methods

Four types of forage consisting leucaena, indigofera, elephant grass, and straw were combined with cassava dregs into six ration treatments and three repetitions. Feedstuffs composition of each treatments are contained on Table 1. Variables that being used in the experiment are bulk density, compacted bulk density, mass density, angle of repose, modulus of fineness, and particle size. Analysis for each variables are conducted for each forage (leucaena, indigofera, elephant grass, straw) and each ration treatments (R1, R2, R3, R4, R5, R6). Before conducting the analysis, all forages were processed into mash. Forages were dried under the sunlight for 3 days, after that dried forages were grinded into forage mash by hammer mill. Bulk density analysis was measured by pouring 25 gram forage mash into graduated cylinder and divided by the volume. Compacted bulk density analysis was conducted by pouring 25 mash into graduated cylinder, slam the beaker glass to a hard surface for 1 minute. The mass divided by the volume represent compacted bulk density. Mass density was measured by pouring 10 gram of mash into beaker glass, add 300 mL of water into graduated cylinder. Mass density is obtained by dividing the mass with volume difference between before and after the addition of water. Angle of repose analysis conducted by pouring 100 gram mash to a funnel with 50 cm height from the ground and measure diameter and height of the mash on the ground. Modulus of fineness and particle size were measured by pouring 100 gram mash into *Vibrator Ballmill German The Sieve Analysis* tools and shake it for 10 minutes. Weight of each sieves were recorded to obtain modulus of fineness and particle size value.

Table 1. Feedstuff composition of each treatments

	R1 (%)	R2 (%)	R3 (%)	R4 (%)	R5 (%)	R6 (%)
Leucaena	35	33	0	0	0	23
Indigofera	0	0	35	33	23	0
Elephant grass	0	13	0	13	68	68
Straw	65	53	65	53	0	0
Cassava dregs	0	0	0	0	8	8

Results and Discussion

Result of mash physical quality for each forages are showed on table 2. Each forages have different physical characteristics with each other. Besides, leucaena and indigofera leaves have a similar physical characteristics. Indigofera has higher bulk density than other forages. The compacted bulk density of leucaena and indigofera are lower than elephant grass and straw. Mass density of leucaena and indigofera is lower than elephant grass and straw. The lowest angle of repose is leucaena leaves, indigofera is the second, elephant grass and straw is the highest. The highest modulus of fineness is obtained in elephant grass and the lowest is indigofera. Elephant grass particle size is the highest and the other forages are the lowest. Forage mash bulk density is lower than commonly used feedstuff for ruminant and the particle size is higher in forage mash (Giger-Reverdin 2000). According to Woodcock and Mason (1987), leucaena and indigofera have the angle of repose value below 30° and categorized as feedstuff that very easy to flow when being storaged. Elephant grass and straw are hard to flow because the angle of repose value is higher than 45° and below 55°.

Table 2. Mash physical quality of *leucaena, indigofera*, elephant grass, and straw

	Leucaena	*Indigofera*	Elephant Grass	Straw
Bulk Density (gdm^{-3})	53.2 ± 0.57^{a}	57.5 ± 0.66^{b}	54.8 ± 1.36^{a}	52.1 ± 2.17^{a}
Compacted bulk density (gdm^{-3})	70.4 ± 6.05^{a}	67.6 ± 3.20^{a}	98.1 ± 3.40^{b}	91.1 ± 4.98^{b}
Mass density (gdm^{-3})	176.8 ± 8.75^{a}	166.7 ± 0^{a}	579.4 ± 83.62^{b}	555.6 ± 96.23^{b}
Angle of repose (°)	20.28 ± 0.42^{a}	26.07 ± 4.44^{b}	51.47 ± 2.60^{c}	52.43 ± 1.77^{c}
Modulus of fineness	4.01 ± 0.068^{b}	3.46 ± 0.079^{a}	5.61 ± 0.43^{c}	3.74 ± 0.068^{ab}
Particle size (mm)	1.67 ± 0.08^{a}	1.15 ± 0.063^{a}	5.22 ± 1.50^{b}	1.39 ± 0.06^{a}

Different superscript in the same line means significantly different (P<0.05)
R1 = Formulation 1; R2 = Formulation 2; R3= Formulation 3; R4= Formulation 4; R5= Formulation 5; R6= Formulation 6

Physical quality of six different ration treatments are showed in Table 3. Mostly, the physical quality of each variables on Table 3. are higher than Table 2. This could indicated that the mixture of different forages could lead into higher physical quality of the rations. Each treatments have different physical quality variables that hard to conclude, because each treatments contain different forages composition. Regression analysis has been made on Table 4. to simplify the conclusion from Table 3.

Table 3. Physical quality of forage mash with 6 different formulations

	R1	R2	R3	R4	R5	R6
Bulk density (gdm^{-3})	67,2±1,88^{b}	78,0±18,7^{b}	70,4±3,44^{b}	52,1±1,93^{a}	71,3±4,95^{b}	75,8±1,96^{b}
Compacted bulk density (gdm^{-3})	112,5±2,47	110,1±12,44	111,3±10,58	98,7±3,01	125,2±32,56	110,3±2,85
Mass density (gdm^{-3})	444,3±42,19^{a}	528,2±81,07^{b}	500±0^{ab}	444±0^{a}	505,0±5^{ab}	490,4±16,68^{ab}
Angle of repose (°)	54,25±0,87^{c}	52,72±2,02^{bc}	55,24±1,49^{c}	49,60±1,98^{ab}	50,55±2,85^{b}	46,74±1,75^{a}
Modulus of fineness	4,09±0,08^{b}	3,92±0,05^{ab}	3,92±0,10^{ab}	3,70±0,14^{b}	3,74±0,23^{b}	3,71±0,02^{b}
Particle size (mm)	1,78±0,10^{b}	1,58±0,05^{ab}	1,58±0,11^{ab}	1,36±0,13^{a}	1,40±0,21^{a}	1,36±0,02^{a}

Different superscript in the same line means significantly different (P<0.05)

R1 = Formulation 1; R2 = Formulation 2; R3= Formulation 3; R4= Formulation 4; R5= Formulation 5; R6= Formulation 6

Table 4. Regression equation of bulk density, compacted bulk density, mass density, angle of repose, modulus of fineness, and particle size for leucaena, indigofera, elephant grass, and straw ration combinations

Variables	Equation	R square
Bulk Density	-0,079(%L) - 0,079(%I) + 0,028(%E) + 0,044(%S)	0.209
Compacted bulk density	-0,145(%L) -1,45(%I) + 0,051(%E) + 0,08(%S)	0.224
Mass density	0,096(%L) + 0,097(%I) – 0,025(%E) – 0,045(%S)	0.077
Angle of repose	-43,125(%L) – 43,07(%I) + 15,292(%E) + 24,049(%S)	0.644
Modulus of fineness	-2,601(%L) -2,596(%I) + 0,933(%E) + 1,461(%S)	0.655
Particle size	-2,561(%L)-2.556(%I)+ 0,886(%E)+ 1,404(%S)	0.692

%L= Leucaena utilization percentage in ration; %I= Indigofera utilization percentage in ration; %E= Elephant grass utilization percentage in ration; %S= Straw utilization percentage in ration

An equation has been made by combining the results from Table 2. and Table 3. using regression analysis on Table 4. According to Hinkle *et al.* (2003), the correlation strength of the equation is divided to few categories. Equation of bulk density and compacted bulk density have a negligible correlation (R^2<0.30). Equation of angle of repose and particle size have a moderate correlation (0.50>R^2>0.70). Mass density, modulus of fineness, and particle size have a high correlation (0.70>R^2>0.90) with the equation. The equation that recommended to be used is the equation for mass density, angle of repose, modulus of fineness, and particle size because the variables have a strong correlation with the equation.

Conclusions

Leucaena and indigoera have a same physical characteristics with each other but have different physical quality with elephant grass and straw. The mixture of different forages into a ration could increase the physical quality of the ration. Forages ration mixture have a complex interaction with each treatments. An equation had been made for mass density, angle of repose, modulus of fineness, and particle size with strong correlation.

Acknowledgement

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Physical Properties of Various Types of Feed for Warehousing Management Efficiency

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Abstract

Feed density and durability are important factor in feed logistic especially for warehouse management and feeding storage. The aim of this reasearch was to determine feed physical quality. The parameters that used in this study are bulk density, durability, water absorption, and water content. Five different type of feed [pellet (A1), wafer (A2), mash (A3), and hay (A4)] used in cattle transportation. The research was condducted in feed industry laboratorium of Animal Science, Bogor Agricultural University. The result show that density of feed type from the largest to the smallest were pellet 1.955±0.126 gr/cm3, wafer 0.248±0.009 gr/cm3, mash 0.191±0.027 gr/cm3, hay 0.052±0.003 gr/cm3. While, feed durability showed pellet was the highest with score 96.033%, than wafer 0%, mash 0%, and hay 0% respond. It can be concluded that space needed for transportation feed is vary according to the type of feed used. Efficiency of each and their comparison will be discussed.

Keywords: feed, physical quality, storage

Introduction

Live cattle transportation is still dominant in Indonesia due to lack of cold chain facilities to transport frozen beef. According to Kristedi et al (2011), it took long journeys to move cattle from production areas that are mostly located in eastern part of Indonesia to slaughterhouse or end consumers that are mostly located in western part of Indonesia. As archipelago country, the journey frequently involved sea transportation. Limited space available and bulkiness of cattle feeds properties make a proper cattle feeding during sea transportation became a huge challenge.

Fresh forage was the most favourable feed for cattle reared in natural pasture (Despal et al., 2017). However, feeding fresh forage during five days of sea transportation was impossible. Conserved low quality forage such as rice straw and natural grass hay were frequently used. This type of feeds were not only less dense in nutrient (Asti et al. 2009) but also less efficient in warehousing and feeding. It frequently led to body weight loss during transportation and late recovery respond after transportation (Asplund et al. 1982).

Conserved feeds were frequently dried to prevent spoilage and compacted to increase storage capacity. However, dried feeds were less digestible if they are less soluble in water. Too compact feeds were less digestible due to reduction in surface area for rumen microbial contact. There is a need to improve storage efficiency during long journey of sea cattle transportation with various type of conserved feeds but still maintain their nutrient quality.

The objectives of this research was to compare physical properties of several conserved feed for live cattle transportation including feed density, durability, solubility and water content to improve storage capacity and efficiency during transportation of live cattle.

Materials and Methods

The research compared physical properties of hay, pellet, mash, and wafer type of feeds. Ingredients and nutrients that were used in pellet, mash, and wafer making were similar. The variables observed were bulk density, durability, water absorption, and water content. Density was analysed based on WHO (2012) method. Durability was measured using pellet durability machine with 10 minutes of duration. Water absorption was analysed by comparing feed sample weight before and after soaking in water until the feed cracked, and water content was measured using moisture meter.

This experiment used completely randomized design with four type of feeds as treatment and three replication of each. Data observed were analysed using varian analysis (ANOVA) followed by contrast orthogonal.

Results and Discussion

The physical properties of various feeds observed were shown in Table 1. Pellet had 0.51±0.03 gr/cm3 density, it was higher than other forms of feed. Pellet could be stored more efficiently in compare to mash, hay or wafer form of feeds. According to Khalil (1999), the density of feeds were influenced by water content and particle size of the feeds, therefore, water content and particle size of the feed should also be observed. Feed durability for hay, mash, and wafer were 0%, by means they were fully broken after turning in the durability machine for 10 minutes. Wafer made from similar feed ingredients with pellet and added with up to 15% molasses as binder still could not produce good quality wafer for transportation feed. It needed stronger binder or higher pressure to produce better wafer quality to be used as compact feed for transportation.

Feed durability of pellet was 96.03% and categorized as a good pellet. The value closed to durability value found by Ismi (2017) in goat pellet (97-98%). A compact feeds which did not easily broken maintained their shape longer during handling, transportation, storage and feeding. In opposite, an easily broken feed increased the fines or dust and waste such as hay, mash and wafer produced in this experiment.

Water absorption of wafer was 2.15%. It was higher in compare to other form of feeds. Capacity to reabsorb water was determined by the surface area, characteristics of the materials and the existence of coating such as fat or gelatinised materials. Low water absorption in pellet form of feed due to lower surface area and gelatine coating material of the pellet. High water content caused feed easily to spoil during transportation. Increasing further of feed moisture resulted in a decreasing of feed durability.

Water content of pellet, mash, and wafer were 11.70%, lower than hay (15.43%). According to Liu and Wayman (2015), moisture content for long-term deposit good quality feed should be in the range of 5-12 % for optimal density and other feed properties. Lower water content increased feed shelf life, while higher water content provided suitable environment for mold growth (Castellano et al., 2015). Giving the fact that high moisture condition in humid tropic especially during sea transportation, lower initial feed water content should be considered in all form to prevent high water absorption.

Table 1. Physical properties of feed

Variables	Types of Feed			
	Hay	Pellet	Mash	Wafer
Density (gr/cm^3)	0.05±0.00^d	0.51±0.03^a	0.19±0.03^c	0.25±0.01^b
Durability (%)	0.00±0.00	96.03±1.46	0.00±0.00	0.00±0.00
Water Absorption (%)[1]	1.59±0.25^b	0.50±0.0.16^c	2.07±0.05^a	2.15±0.28^a
Water Content (%)	15.43±1.15^a	11.70±0.80^b	11.70±0.80^b	11.70±0.70^b

Storage capacity of a warehouse was developed on the ratio of the cubic storage capacity of the storage space (where materials are stored on the floor), divided by the total cubic volume of the portion of the building occupied by the storage. If the feed density is converted from gr/cm^3 to kg/m^3 the following values will be obtained as 50 kg/m^3 for hay, 510 kg/m^3 for pellet, 190 kg/m^3 for mash and 250 kg/m^3 for wafer. By giving example of a warehouse with capacity of 10m x 10m x 2m = 200m^3, the amount of feed that can be stored during transportation were 10 tons for hay or 102 tons for pellet or 38 tons for mash and 50 tons for wafer. If actual amount of feed can be stored was 70-80% of the warehouse's surface capacity and remaining of 20-30% was required for ventilation, passageways, handling space etc then the storage capacity will be less.

Conclusions

By considering physical properties of different type of feed used in this experiment and storage capacity, it is concluded that pellet is the best type of feed for cattle during transportation.

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FULL PAPERS

PARALLEL SESSIONS

SUBTHEME: ANIMAL MANAGEMENT AND PRODUCTION

Pre-Weaning Growth of Bali Calf from Cows that Kept Semi-Intensive in Palm Oil Plantations

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Abstract

The success of the cattle-oil palm plantations integration can be measured from several production parameters, one of which is the quality of calves produced. This study aim to determine the growth of pre-weaned calves of cows that was kept in oil palm plantations. The research was conducted using 20 calves produced from 20 cows and 1 bull that were kept semi-intensive in Rokan Hulu oil palm plantation, Riau. The colony was grazed in oil palm plantation area from 08.00 to 17.00 without additional feeding. The forages in the plantation contain dry matter 22.29%, crude protein 10.67%, crude fiber 36.85%, and total digestible nutrients 54.37%. Cows and calves were measurment at birth and every month until weaning (5 month old), including body weight (BW). The results showed that the average BW of cows after partus and at weaning were 250.17 ± 24.27 and 240.39 ± 21.82 kg, respectively. The BW of the calf from birth, 1st, 2nd, 3nd, 4nd, and 5nd month old were 15.08 ± 4.12, 25.86 ± 3.49, 33.58 ± 6.96, 44.42 ± 8.56, 53.89 ± 10.59, and 62.41 ± 14.07 kg, respectively. The body frame of calves at birth was body length 42.59 ± 3.96, shoulder height 57.76 ± 4.31, hip heigth 58.52 ± 5.25, and chest size 58.35 ± 5.89 and reached 65.71 ± 4.64, 84.64 ± 6.41, 85.59 ± 6.20, and 95.82 ± 7.47 cm, respectively at weaning. Bali calf growth produced in oil palm plantations integration with semi-intensive system is good enough.

Keywords : Pre-weaning growth, Bali calf, Semi intensive, Oil Palm plantations integration

Introduction

The semi-intensive management system of cattle is one of the most common methods used by smallholder farmers in Indonesia. Semi-intensive provides the animal to free feeding when grazed during the day and intensively monitored when housed at night. This method gives two benefits for the smallholder farmers, i.e. there did not need for feeding because the cattle had a chance to grazed, and had the fecal for their farm when it housed. Integrated cattle-palm oil plantation allows animal for grazing, this makes 8% of the smallholder farmers of the Teluk Merbau, Siak, Riau, who is a palm oil farmer of PT Perkebunan Nusantara V kept their cattle with semi-intensive methods (Baliarti *et al.*, 2017). The success of the cattle-oil palm plantations integration can be measured from several production parameters, one of which is the quality of calves produced. Pre-weaning was an important period for animal growth. Pre-weaning management can be affected by the growth and mortality of livestock (Gyofai *et al.*, 2003). This study aims to determine the growth of pre-weaned Bali calves of cows that were kept semi intensify in oil palm plantations. The results would be useful for the development of integrated cattle-oil palm plantation in the future.

Materials and Methods

Twenty Bali calves from 20 cows (body length (BL) 110.10±5.55 cm, shoulder height (SH) 119.00±5.70 cm, hip height (HH) 109.20±5.15 cm, and chest size (CS) 160.40±4.16 cm) mated with 1 bull (BL 121 cm, SH 137 cm, HH 125 cm, CS 182 cm) kept with semi-intensive in oil palm plantation Rokan Hulu, Riau since 2015 till 2017. The colonies grazed in the area of 10 years oil palm plantation from 8 a.m. to 5 p.m. without additional feeding. The forages in the oil palm plantation contain dry matter (DM) 22.29%, crude protein (CP) 10.67%, crude fiber (CF) 36.85%, and total digestible nutrient (TDN) 54.37% (Baliarti *et al.*, unpublished). Measurement of cattle (cows and calves) is done at birth and every month until weaning (age 5 months). Parameters of cows include body weight, and for calves are body weight and body size (BL, SH, HH, and CS). Data were analyzed descriptively.

Results and Discussion

The result of this study about growth body weight and body frame of the Bali calves and cows are presented in Table 1. Bali cows that kept semi intensify in oil palm plantations has not been able to restore body weight during the pre-weaning period (lactation period). Semi-intensive models had a direct impact on feeding behavior. Bali cows that kept semi intensify in oil palm plantation Sei Rokan, Riau had 3.61 h for feeding and 1.63 h for browsing when grazed (Baliarti *et al*., 2016). The amount of feeding time is less than that reported by Baliarti *et al.*, (2017) that Bali cows in the lactating period that were kept intensive in palm oil plantations can feeding up to 8.06 h a day. Less feeding time had an impact on nutrient intake can be absorbed by livestock. Lack of nutrient intake during lactation periods could have an impact on the body's nutrients reshuffle to produce milk seen from the cows average daily gain (ADG) during lactation (Figure 1). Furthermore, fewer feed nutrients intake would have an impact on the recovery of reproduction organs so that the reproductive cycle will be longer.

The weight of weaning Bali's calf, age 150 days, from the parent which is kept in oil palm plantation in semi-intensive, is 62 ± 14 kg. The weaning weight from this study is almost same as the weight of Bali calf weaning at age 205 days reported by Hafsah (2013) which is also kept semi-intensive in Makassar, 62.6 - 66.7 kg. Birth and weaning weight is an interrelated matter, the calf which had higher birth weight would be had a higher weaning weight too (Hasfsah, 2013). Bali calves developed in BPTU Bali have an average birth weight of 18 kg and reach the weaning weight at age 205 d of 87 - 93 kg (Tavares *et al.*, 2012). Mudhita *et al.* (2016) reported that Bali cattle maintained with a complete feed from oil palm plantations can produce calves with a birth weight of 15-18 kg, whereas in this study, the weight of Bali cattle births that were kept semi-intensive in oil palm plantations amounted to 13 kg. The smaller birth size affects the size of the weaning of cattle. Cows condition during pregnancy can be the cause of low birth weight of calf related to nutrient adequacy. Further research on the adequacy of the mother nutrient during pregnancy and lactation needs to be done.

Table 1. Body weight and frame of Bali cows and calf on pre-weaning period

Traits	Month					
	Birth	I	II	III	IV	V
Body weight (kg):						
Cows	250±24	246±22	243±22	236±21	238±22	240±21
Calf	13±2	25±3	33±7	44±9	54±11	62±14
Body Frame (cm) :						
Calf body length	42±4	43±4	48±6	58±9	66±4	66±5
Calf shoulder height	58±4	58±4	64±4	72±8	81±6	85±6
Calf hip height	59±5	59±5	66±6	75±8	82±5	86±6
Calf chest size	58±6	58±6	69±7	82±11	93±6	96±8

The ADG of pre-weaning Bali calf up to age 5 months in this study were 0.39 to 0.40 kg. ADG in this study is similar to that of Tavares *et al.* (2012) who reported that the pre-weaning ADG of Bali calf in BPTU Bali was 0.34-0.37 kg. The results of this study are also not much different from the ADG of Ongole Crossbreed (PO) cattle maintained under low external input conditions in the pre-weaning period of 0.33 - 0.35 kg (Hartatik and Dikman, 2007). Factors affecting ADG of pre-weaning calves are the parent body's condition for producing milk (Pasambe *et al.*, 2000). Bali cows that were kept semi-intensive in oil palm plantations are able to maintain their body condition to produce milk needed by calves.

Body frame is used as the visual identification and measured growth of a livestock. Some commonly used as an indicator of body frames such as shoulder height, chest size, and body length can be used to predict body weight and describe livestock performance (Widi *et al.*, 2016). Weaning Bali calf in this study can reach BL 58 cm; SH 72 cm; HH 75 cm; and CS 82 cm at 3 months. Body frame is not much different from the research was reported by Hardiono *et al.* (2016) in pre-weaning calves aged 3 months were maintained intensively that feeding with native grass in southern Konawe district, BL 65,5 cm; SH 72.6 cm; and CS 83 cm.

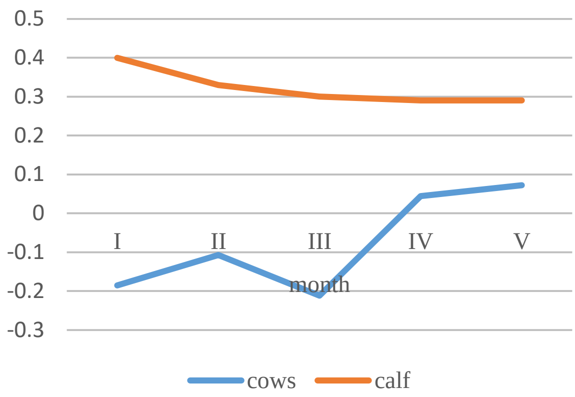

Figure 1. ADG calf and Bali cows kept semi intensive in oil palm plantation

In Figure 1. ADG of pre-weaning Bali calf down with age approaching weaning. These results are in line with the statement Hardiono *et al.* (2016) that pre-weaning Bali calf tended to decrease ADG until the age of three months. Reduced pedaling of bovine calves maintained semi-intensive in oil palm plantations followed by increased ADG of the mother to weaning age. The decline ADG of Bali calf were reared semi-intensive in oil palm plantations, followed by an increase in ADG of cows until the age of weaning.

Conclusions

The growth of Bali calf produced from cows that kept in oil palm plantations with semi intensive management system has good productivity.

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The Use of Antioxidants in Increasing Duck Welfare in Commercial Farms and Its Impact on Farmers' Income

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Abstarct

Reducing heat stress by using antioxidants could be an important management practice to increase duck productivity. This experiment purposed to study the effect of vitamins C and E on welfare and egg production of local ducks, and its impact on farmers' income. The study was conducted for three months in collaboration with 'Berkah Abadi' duck farmer group located in the coastal area of the Tegal City as one of the most famous duck centers in Indonesia. The materials used were local laying ducks at 8 to 10 months of age which were reared by the farmer group. The study used Completely Randomized Design with vitamins and its level as the treatments. Vitamins consisted of vitamin C and vitamin E, while the level comprised 0 doses, 200 mg/kg feed, 400 mg/kg feed, and 600 mg/kg feed. There were 7 treatment units which were replicated 3 times, so in total there were 21 flocks. Each flock had 50 females and one male, therefore this study involved 1,071 ducks. Vitamins were applied each morning, mixed thoroughly in duck ration. It can be concluded that vitamin supplementation significantly increased duck welfare, egg production, and farmers' income. Vitamin C at 600 mg level seemed to be the best treatment in this study.

Keywords: welfare, ducks, vitamins, antioxidants, farmers' income

Introduction

Ducks have a very significant role in rural poultry production in Indonesia. The birds are mainly raised for producing eggs as famous traditional salted duck eggs. As a tropical country, high ambient temperature is a serious obstacle in developing poultry production in the country, especially in recent climate change phenomenon. Climate change now is one of the big issues in the world. It is understood that climate change has a severe impact not only on the human being but also on animals. Indonesian National Aviation and Space Agency reported that the climate in Indonesia has become warmer during the 20th century with an average annual temperature increased by about 0.3°C since 1900 (LAPAN, 2012). Ducks, as homoeothermic animals, are susceptible to heat stress which leads to decreasing their welfares and productivities. The failure of ducks to adapt to stress condition causes physiological and behavioral changes which in turn resulted in abnormal behavior and increased susceptibility to diseases (Cheng, 2003). The most important daily duck husbandry management is to provide the duck with condition which is free from stress (Prayitno, 2004).

A previous study concluded that under a dry intensive system at commercial farms, local ducks suffered from heat stress as indicated by the increased rectal temperature, changed behavior, body, and plumage condition (Suswoyo *et al.*, 2014). Therefore, releasing heat stress is an essential factor in improving duck welfare. Manipulation of daily management is required to protect the ducks from heat stress suffering, among others by using antioxidants such as vitamins as functional feed.

Several studies have been conducted to investigate the use of antioxidants for alleviation of heat stress in poultry. In broiler chickens, supplementation of vitamin C significantly increased feed consumption and body weight (Kusnadi, 2006). A study on duckling showed that administration of vitamin C improved hematological status thus improved health status of the duckling (Kontecka, 2006). Vitamin E supplementation had positive impact on growth of *Cairina moschata* (Selim *et al.*, 2012) and increased egg production, fertility, and hatchability in local ducks (Giri, 2012). However, most previous studies concerned with vitamin supplementation on productivity. Thus, the study on the effect of vitamin supplementation on duck welfare is lacking, especially under commercial farm management. Duck farming is the main income for many rural farmers; therefore its economic study is considerably important to be investigated.

The purpose of this study was to evaluate the effect of vitamin C and vitamin E supplementations on the welfare and egg production of local ducks reared in commercial farms, and their impacts on farmers' income.

Materials and Methods

The study was conducted for three months in collaboration with 'Berkah Abadi' duck farmer group which keeps the birds under dry system intensively. The study site was in Tegal City which is located in the northern coastal area of Java Island. The City and its surrounding areas are ones of the most important duck centers in Indonesia with their very famous local laying duck namely Tegal Duck. It is believed that the duck belongs to Indian Runner family.

The materials used were local laying ducks at the age of 8 to 10 months which were reared by the farmer group. The study used Completely Randomized Design with type of vitamins and their doses of administrations as the treatments. Vitamins administered consisted of vitamin C and vitamin E each with the doses of 200 mg/kg feed, 400 mg/kg feed, and 600 mg/kg feed. The control group was without administration of vitamins C and E. Therefore, there were 7 treatment units which were replicated 3 times, so the total number of flocks was 21. Each flock had 50 females and one male; therefore this study used a total of 1,071 ducks. Vitamins were administered each morning, mixed thoroughly in the ration. The ration used was locally available feedstuff which mainly consisted of rice bran, dried rice, and fresh fish (Leiognathidae) with proportion of 39.65%, 25.11%, and 35.24%, respectively. The nutrient contents of the ration were 26.38% crude protein, 2.923 kcal/kg metabolic energy, 2.29% calcium, and 0.78 % phosphorus. Average daily feed consumption was 176 grams. The feed was given twice a day i.e., in the morning and in the afternoon. Drinking water was provided *ad libitum* three times a day i.e., in the morning, noon, and afternoon.

Parameters measured. Parameters measured in the experiment were heterophils to lymphocyte ratio (H/L), percentage of duck day production, egg weight, and income over feed cost, ambient temperature and humidity. The measurement of heterophils to lymphocyte (H/L) ratio was designed to evaluate the stress indicator as a welfare status. To measure heterophils and lymphocyte concentrations, blood samples were taken from 5 ducks per flock on the day 90^{th} of experiment. Laying percentage/duck day production (expressed as the average number of eggs laid per day in relation to the number of female ducks per flock), and average egg weight (g) per flock as indicators of egg production were measured to evaluate the effect of vitamin C and vitamin E supplementations on egg production. Income over feed cost was evaluated to measure the effects of vitamin C and vitamin E supplementations on the income. Daily ambient air temperature and humidity as indicators of environmental conditions were measured at 6 am, noon, and 3 pm.

Data Analysis. The data collected were analyzed using Variance Analyses and continued to Honestly Significant Different test.

Results and Discussion

The H/L ratio, egg production, and IOFC of experimental ducks during three months study are summarized in Table 1.

Table 1. H/L ratio, egg production, and IOFC of experimental ducks during three months administration of vitamin C and vitamin E

Parameter	**Control**	**Vitamin C**			**Vitamin E**		
		200 mg	400 mg	600 mg	200 mg	400 mg	600 mg
H/L ratio	1.64^a	0.98^b	1.09^b	0.84^b	0.79^b	0.75^b	0.72^b
HDP (%)	50.84^a	53.20^b	60.00^b	72.92^c	61.06^b	58.86^b	57.98^b
Egg weight (g)	66.51^a	69.45^a	67.02^a	68.60^a	69.35^a	67.31^a	70.44^a
IOFC (mil. Rp)	3.55^a	3.11^a	3.58^a	4.59^b	1.94^c	1.11^c	0.40^c

Different superscripts in the same row indicate a significant difference (P<0.05) or very significant difference (P<0.01)

Duck welfare. H/L ratio in this study ranged from 0.874 to 2.175 with an average of 0.97 $\pm$ 0.17. This result was lower than previous finding in which the average of H/L ratio was 1.45 $\pm$ 0.2 (Suswoyo and Rosidi, 2016). Compared to the report stated that H/L ratio of Indian Runner ducks was 0.32 (Sturkie, 1986), the H/L ratio found in this study was higher. Most probably, the daily husbandry management and the environmental conditions were the main reason of the difference. This result indicates that under rural commercial farms management systems, ducks are in stressful conditions, as indicated by the higher H/L ratio. Fujita *et al*. (1998) stated that under normal physiological condition at a comfortable environment, birds had lower H/L ratio compared to those under stress condition. Behavioral observation showed that during the day most of the ducks were panting. About 36-70% of ducks were panting between 9 am to 4 pm (Suswoyo *et al.*, 2014).
Statistical analyses indicated that H/L ratio in the control group without vitamins C and E administrations was higher significantly ($P<0.05$) compared to the ducks supplemented with various doses of vitamin C and vitamin E. The results of this study indicated that ducks supplemented with vitamins C and E showed higher resistances to heat stress compared to control ducks without vitamins C and E administrations as indicated by the lower H/L ratio. Supplementations of vitamin C and vitamin E were very important relating to their roles as antioxidants (Fortina *et al*, 2013; Surai and Fisinin 2012). Supplementation of vitamin E was significant to combat heat stress; thus vitamin C and vitamin E supplementations improved body protection against heat stress.

Egg production. The average egg production was 59.27 $\pm$ 7.08% ranging from 45.68 to 76.36%. This finding confirmed the results of the previous research done by Suswoyo *et al.* (2014). Statistical analyses showed that the egg production was significantly higher ($P<0.05$) in ducks supplemented with various doses of vitamin C and vitamin E compared to control ducks without vitamins C and E supplementation, and very significantly higher ($P<0.01$) in ducks supplemented with 600 mg vitamin C compared to control ducks without vitamins C and E supplementation. Further analyses indicated that 600 mg vitamin C supplementation had significantly higher egg production ($P<0.05$) compared to the other treatments. Vitamin C has very important role in metabolic reactions inside the body. The vitamin also has significant impact on amino acid metabolism i.e., proline, lysine, and anilin hydroxylase which are very important for comfort physiological condition in ducks. Vitamins supplementation was an appropriate step to anticipate heat stress for improving growth, immunity, egg production, and many biological processes inside the body (Esmail, 2012).

Egg Weight. The egg weights of experimental ducks ranged from 62.40 to 67.22 grams with an average of 63.39 $\pm$ 4.05 grams. This finding was slightly lower than the result of previous research which found that egg weight was 71.142$\pm$6.077 grams on average (Ismoyowati and Purwantini, 2013). Statistical analyses showed that supplementations of experimental ducks with various doses of vitamin C and vitamin E did not affect ($P>0.05$) egg weight. However, experimental ducks supplemented with vitamin C at a dose of 600 mg tended to have the highest egg weight.

Puthpongsiriporn (2001) reported that vitamins supplementation could increase egg biomass.

Income over Feed Cost (IOFC). The average IOFC during the study period was Rp1.45 millions ranging from Rp0.38 to Rp4.76 millions. The highest IOFC was found in the experimental ducks supplemented with vitamin C at a dose of 600 mg which was significantly higher compared to control group without vitamins C and E supplementation and those supplemented with vitamin C at doses of 200 and 400 mg. The average of IOFC in the ducks supplemented with vitamin C at a dose of 600 mg was also very significantly higher ($P<0.01$) compared to those supplemented with vitamin E at doses of 200, 400, and 600 mg. Egg production as the main source of income was the first factor contributed to this finding. The second factor was the cost of feed in which the price of vitamin E was much higher than that of vitamin C. Thus, vitamin C supplementation was economically more beneficial compared to control and vitamin E supplementation groups.

Environmental condition. The environmental condition at the study site is presented in Table 2.

Table 2. Average ambient temperature and humidity during the experiment

Environmental condition	Morning	Noon	Afternoon	Average
Temperature (°C)	28.18±1.70	32.00±1.15	30.91±1.38	29.82 ± 1.11
Humidity (%)	89.14±3.88	80.59±5.80	82.41±5.07	84.05 ± 3.14

Table 2 indicates that environmental temperature of the study site was 29.82 ± 1.11°C which was higher than the maximum ambient temperature for poultry. The study site which is the coastal region of Tegal City considerably suffers from climate change. At the same time, the relative humidity was also high with the average of 84.05 ± 3.14%. It seems that environmental conditions in the area were higher than the thermo-neutral zone required by ducks. Thermo-neutral zone for poultry is between 18 and 25°C and the most efficient ambient temperature for ducks ranges between 23 and 25°C (El-Badry *et al.*, 2009).

Controlling the ducks' environment, particularly temperature, humidity, litter moisture, and ammonia is crucial for duck welfare (Jones and Dawkins, 2010). If the ambient temperature is higher than the thermo-neutral zone, panting will increase ten times which decreases productivity (Ahmad and Sarwar, 2005).

Conclusions

Supplementation of vitamins significantly increased duck welfare, egg production, and farmers' income. Supplementation of vitamin C at a dose of 600 mg seemed to be the best treatment in this study.

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Carcass Quality and Abdominal Fat of Broiler Given Ration Containing Fermented Dragron Fruit (*Hylocereus Polyrhizus*) Peel Meal

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Abstract

The objective of this study was to study the quality of broiler carcasses, which received ration dragon fruit meal (Hylocereus polyrhizus) fermented for 4 weeks. The design used was Completely Randomized Design (RAL) with 3 treatments, 6 replications in which each replication consisted of 5 broiler chickens so that the total 90 chicken used. The treatment given were: R0: ration without dragon fruit skin flour, R1: ration with 5% dragon fruit skin flour, R2: ration with 7% dragon fruit skin flour. Variable observed: carcass weight, carcass percentage, percentage of liver, heart, abdominal fat, shank color, intestinal and caecum length broiler chicken. The data obtained were analyzed by variance (ANOVA), if between the treatments were significantly different (P <0.05) then followed by Duncan's test (Steel and Torrie, 1990). The results showed treatment of R0, R1 and R2 are not significantly different (P> 0.05) to carcass weight, carcass percentage, percentage of liver, heart, intestinal and caecum length while R0 is significantly different (P<0.05) to abdominal fat , shank color compared to R1 and R2. It can be concluded that research of dragon fruit skin (Hylocereus polyrhizus) fermented R0 (0%) ,R1 (5%) and R2 (7%) in broiler ration no effect on carcass weight , percentage of liver, heart, intestinal and caecum but 5% and 7% giving decreased abdominal fat and increased shank color.

Keywords: broiler chicken, carcass weight, dragon fruit flour, intestinal and shank color.

Introduction

Many factors interact in the optimal production, maintenance of broiler chickens faced with the variety of problems such as the increasing feed prices are enough sharply, because the feed is a primary need at a cost of approximately 60-70%. The high feed costs due to raw materials derived from imported commodities and its use compete with humans. The high price of feed is indirectly require that farmers are looking for alternative feed ingredients so it can lower the feed costs and maximize revenues.

According Mustika (2014) dragon fruit peel is agricultural waste which has not been widely used by the community, especially in Indonesia. Dragon fruit is a key raw material in the manufacture of juices, jams, syrups, chips or other food ingredients by key material the dragon fruit. According Citramukti (2008) part of dragon fruit 30-35% is peel and still rarely or even not been fully utilized although some studies have reported peel dragon fruit contains high antioxidant and contents phenolics in the dragon fruit peel amounted 28.16 mg/100 g, in addition to having antioxidant also contain anthocyanins (Nurliyana et al., 2010). The low protein and high crude fiber in fruit peels is a constraint in the utilization as animal feed especially broiler chickens.

Fermentation process is often defined as the process of breakdown of carbohydrates and amino acids in anaerobic, that is without need the oxygen. An increase in the value of dragon fruit skin can be done by applying biofermentation by utilizing microbial services, ie utilizing the ability of the yeast Sacharomyces cerevisiae contained in tape. Sacharomyces cerevisiae yeast can increase fibrous fiber digestibility and can act as a probiotic in poultry (Ahmad, 2005). At the time of fermentation by yeast, the crude fiber content of ration can be degraded, so it can be utilized by poultry. Another benefit of fermentation products is to suppress the enzyme activity of 3-hydroxy-3-methylglutaryl Co-A reductase that serves to synthesize cholesterol in the liver (Tanaka et al., 1992), and can decrease the amount of broiler fat (Ketarin et al., 1999). However, *Sacharomyces cerevisiae* can increase the digestibility, application of feed technology is absolutely must be applied in the optimization of waste utilization (Dewi *et al.*, 2016 and 2017). Application of supplementation technology utilizing superior *Sacharomyces cerevisiae* origin of yeast is very potential developed. So this research is designed to optimize the utilization of dragon fruit leaf waste (poultry breeding business development, in order to support the diversification of national meat source and improve the farmer's welfare.

Research on dragon fruit peel for livestock feed is still rarely done according Mustika et al. (2014) dragon fruit peel can be given up to the level of 1% -4% can be given up to the level of 4%, without have negative effects on the body of livestock. However by-products of fermentation product can be used in kampung chickens productivity (Dewi et al., (2016) . From the description above, the researchers interested in using dragon fruit peel meal without and fermented as a feed ingredients in diets broiler chicken on carcass quality and abdominal fat.

Materials and Methods

Time and Location Research. This research conducted over three months and this research is located in Teaching Farm, Campus Bukit Animal Science, University of Udayana.

Livestock. Livestock used in this research is broiler chickens produced by PT. Jaffa Ciomas, Denpasar, were totally 150 bird.

Diets. Diets used in this research was independently prepared by recommendation Scott *et al*. (1982) which consisted of yellow corn, fish meal, soybean meal, rice bran, dragon fruit peel meal, dragon fruit peel meal fermented, coconut oil, premix and CaCO3. Diets given was iso energy (2,900 Kcal/kg) and iso protein (20%) Table 1.

Table 1. Composition Ingredients Ration and Nutrient Content of Diets (age 1-5 weeks)

Ingrediens (%)	Composition (%)			
	R0[1)]	R1	R2	
Corn	43.57	41.39	40.86	
Fish Meal	8	8	8	
Soybean Meal	18.44	18.49	18.51	
Race Brand	25	21.93	20.43	
Dragon Fruit Skin Flour Fermented	0	5	7	
Coconut Oil	4.79	5	5	
Premix	0.1	0.1	0.1	
CaCo3	0.1	0.1	0.1	
Nutrient Content of Diets				*Standard
Energy KCal/kg	2900	2900	2900	2900
Crude Protein (%)	20	20	20	20
Crude Fat (%)	10.35	10.14	9.95	8
Crude Fiber (%)	3.08	3.73	3.90	5
Calsium/Ca (%)	0.65	0.73	0.77	0.90
Phosfor/P (%)	0.67	0.64	0.62	0.60

Explanation: 1) R0= Ration without dragon fruit peel meal (control); R1= Ration with 5% of fermented dragon fruit peel meal; and R2 = Ration with 7% of fermented dragon fruit peel meal; *Standard (Scott et al.,1982)

Cage. Cage used in this research was battery cage with a length of 80 cm, width of 50 cm and height of 75 cm was filled with 10 chickens as many as 20 cages. The cage made from wood, the bottom of cage made from wire so that livestock faeces can be accommodated, each plot of cage was equipped with feed and drinking water made from bamboo.

Instrument. Instrument used in this research was a diet and drinking water, torch lighting cage, machine grinding feed, knife, bowl, spoons stirrer, scissors, paper labels, markers, plastic bags, oven, stove, pans, trays, thermometer, wood, bamboo, wire, plastic carpet, sprayer and digital scales.

Research Methods. In this research there are two making process stages of dragon fruit peel meal. First making of dragon fruit peel meal from fresh dragon fruit peel chopped small, then dried and grinded up into flour. Second process namely the making of dragon fruit peel meal fermented with Saccaromyces Sp. In the process of fermentation, solution was ready to use. Fermentation process was started with copping into small size of dragon fruit peel, then was dried, inserted in plastic, and moistened with solution fermentation, closed tightly (3-5 days). Fermented product was dried, ground to be flour and ready to use.

Research Design. This research uses a completely randomized design (CRD) with 3 treatments and 5 replications, each@ 10 bird . Treatments were as follows: R0= Ration without dragon fruit peel meal (control); R1= Ration with 5% of fermented dragon fruit peel meal; and R2= Ration with 7% of fermented dragon fruit peel meal.

Chickens Maintenance. One day old chickens or Day Old Chick (DOC) maintained as many as 45 individuals. Chickens being given vaccinated using ND vaccine. Chickens inserted in a cage that has been given a number treatments and every unit cage filled 5 chickens.

Variable Observed. Carcass weight, carcass percentage, percentage of liver, heart, abdominal fat, shank color, intestinal and caecum length

Slaughter Weight. Slaughter weight is obtained by weighing a live chicken at the end of the study after were fasted for 12 hours, slaughter weight expressed in grams/tail (Soeparno, 1994).

Carcass Percentage. Carcass percentage obtained dividing the carcass weight with slaughter weight multiplied 100% (Resnawati, 2004).

$$\text{Carcass percentage} = \frac{\text{Carcass weight}}{\text{Slaughter weight}} \times 100\%$$

Percentage of Carcass Parts. Percentage carcass parts is obtained by dividing the weight of carcass parts (breast, wing, thigh and the backs) with carcass weight a then multiplied by 100% (Resnawati, 2004).

$$\text{Percentage carcass parts} = \frac{\text{Weight of carcass parts}}{\text{Carcass weight}} \times 100\%$$

Liver, Heart, Abdominal Fat and Non Carcass Percentage. Taking viscera is done by inserting a hand into the abdominal cavity and attractive the entire stomachs contents out (Soeparno, 1994). Percentage is calculated include the liver, heart, abdominal fat and Non Carcass.

$$\text{Percentage Liver} \quad = \frac{\text{Weight liver}}{\text{Slaughter weight}} \text{ X 100 \%}$$

$$\text{Percentage Heart} \quad = \frac{\text{Weight heart}}{\text{Slaughter weight}} \text{ X 100 \%}$$

$$\text{Percentage Abdominal Fat } = \frac{\text{Weight abdominal fat}}{\text{Slaughter weight}} \text{ X } 100 \text{ \%}$$

Data Analysis. Data were analyzed statistic by ANOVA and the significant differences data was analyzed using Duncan multiple range test (Steel and Torrie, 1993). The data were analyzed using statistic application program SPSS 17.

Results and Discussion

Effect of Treatment on Slaughter Weight, Percentage Carcass.

The results are presented in Table 2.That Table shows in this research the everage value of broiler weight ranging between 1354.50- 1350,00 g, carcass weight (946.45-924.03 g), carcass percentage (70.11- 68,22%) (Table 2). Results of analysis variance showed that fermented dragon fruit peel meat did not affect on slaughter weight, carcass weight and carcass percentage of of broiler chicken.The Phytochemichal content of dragon fruit peel (Lycopen, Beta-carotene and Tanin) did not affect intestinal and caeca length. According Weiss and Hogan (2007) that a material having the antioxidant content of livestock can reduce the effects of free radicals such as increasing feed consumption

Table 2. Slaughter Weight, percentage Carcass and Percentage Carcass Portion of Broiler Fed Ration Containing Fermented Dragon Fruit Peel Meal

Variables	Treatment 1)			SEM 3)
	R0	R1	R2	
Slaughter Weight (g)	1354.50^a	1350.00^a	1352.17^a	11.15
Carcass Weight (g)	924.03^a	946.45^a	944.87^a	12.12
Carcass Percentage (%)	68.22^a	70.11^a	69.00^a	0.20
Intestinal length (cm)	180.17^a	172.67^a	178.17^a	0.60
Caecum length (cm)	17.50^a	17.83^a	18.00^a	0.06

Explanation : 1) R0= Ration without dragon fruit peel meal (control); R1= Ration with 5% of fermented dragon fruit peel meal; and R2 = Ration with 7% of fermented dragon fruit peel meal; 2) Values with the same superscript in the same row shows the difference was not significant (P>0,05); 3)SEM : *Standard Error of The Treatment Means*

According Mahfuzd (2000) that the broiler chicken carcass percentage is between 62% - 66%. The factors that affect the percentage chicken carcass according Brake *et al*. (1993) such as age and body weight. Analysis of variance showed no significant differences (P>0,05) on carcass percentage. This is caused by the final weights were not significantly different as a result of feed consumption and slaughter weight were also not significantly different.

According Haroen (2003) states that the carcass weight is closely associated with slaughter weight and body weight gain. Abubakar and Natamijaya (1999) adds that the carcass percentage is the ratio between carcass weight with slaughter weight, so its value is directly affected by carcass weight and the slaughter weight. The use of dragon fruit peel flour was no significant (P>0,05) on the wing and back weight.

Percentage of Liver, Heart, Gizard Abdominal Fat

Average of percentage heart on this research within the range 1,62 to 1,69%. This value is within the range of statements Putnam (1991) which states that the percentage of heart between 1,70 to 2,80% and Suyanto *et al*. (2013) is 1,98 to 2.3%. Similarly, according to research Sinurat et.al. (2002) states the percentage of the liver that is equal to 2,21% with the addition of noni pulp in the diet.

Table 3. Percentage of Liver, Heart, Abdominal Fat broiler of Broiler Fed Ration Containing Fermented Dragon Fruit Peel Meal

Variables	**Treatment [1)]**			**SEM [3)]**
	R0	**R1**	**R2**	
Liver (%)	1.69[a2)]	1.62[a]	1.65[a]	0.2
Heart (%)	0.40[a]	0.41[a]	0.42[a]	0.04
Abdominal fat (%)	2.25[a]	1.52[b]	1.54[b]	0.49
Shank color	6.00 [b]	7.00[a]	7.00[a]	0.33
Intestinal (Cm)	180.00[a]	175.60[a]	176.57[a]	0.60
Caecum (Cm)	16.88[a]	17.64[a]	17.89[a]	0.06

Explanation : 1) R0= Ration without dragon fruit peel meal (control); R1= Ration with 5% of fermented dragon fruit peel meal; and R2 = Ration with 7% of fermented dragon fruit peel meal; 2) Values with the same superscript in the same row shows the difference was not significant (P>0,05); 3)SEM : *Standard Error of The Treatment Means*

The result showed that there was no significant differences (P>0,05) on the percentage the liver. This shows that the treatment with the addition of flour diets dragon fruit peel meal without and fermented do not contain toxic substances that can cause the liver becomes excessive. One function of the liver is the detoxification of toxins and in case of abnormalities in the liver indicated by an enlargement or diminution the liver (Ressang, 1998).

Results of the analysis showed that the treatment of feeding on the heart occurred not significant differences among the treatments R0, R1, R2 (Table 3). The differences could cause by the differences of chicken activity on each treatment, according to the statement Indarto *et al*. (2011) that the size of the heart very affected by the type, age, large and livestock activities, states that the heart in broilers known to be very sensitive to toxins and antinutrition, this concerns the shape of a heart the size of the broiler. Ressang (1998) stated that the enlargement of the heart size is usually caused by the addition of cardiac muscle tissue and the heart wall thickened.

The value is within the range of statements Putnam (1991) which states the percentage of heart ranged between from 0,42 to 0,70%.

Effect of treatment on abdominal fat percentage significant differences ($P<0.05$) among the treatment R1 (1.52%) and R2 (1.52%) with R0 (2.25%) (Table 3). This indicates that by increased levels of dragon fruit peel and fermented in feed without produce abdorninal fat percentage that is relatively similar to R1 and R2 but lower than controls (R0). This occurs due to differences in strain and nutrient content of diet, among others, energy content and balance of energy in the ration. The result showed a growing number of granting dragon fruit peel meal without and fermented in the diet a tendency to lower percentage of abdominal fat. It is caused to an increase in crude fiber content of the diet between treatments. According Sajidin (1998) abdominal fat percentage decreased with increasing crude fiber in the diet, in line with the statement Bintang *et al*. (1998) that the body fat is affected crude fiber diet, the existence of crude fiber in the diet is able to bind bile acids. When most of bile acids bound by crude fiber then emulsion formed lipid particles little more so that lipase activity decreases. Decrease in lipase activity reduces the amount of lipids are absorbed and many issued with feces. A decrease in the amount of lipids in body tissue may interfere with the absorption of lipids and accelerate the movement of food in the intestine. Mahfudz (2000) states that to digest crude fiber is needed excess energy so that the chickens did not have excess energy to be stored as fat.

Shank colour treatment R0 were significantly lower ($P<0.05$) than both value of R1 and R2 (Table 3). The intensity of shank colour in this study increased whith the increasing level of the level flour dragon fruit peel fermentation. Acording to Wiset et al. (2012) because contains antthocyanin, lycopen and β- carotene from fruit peel fermentation in feed.

Analysis showed that the provision of dragon fruit peel meal without and fermented in the diet had no significant effect on the intestinal length of broiler chickens. This indicates that increasing the level of dragon fruit peel meal without and fermented produce percentage of intestinal relatively the same as controls. Average of percentage intestinal length amounted 172.67 to 187.17 cm, and the average length of the cecum of 17.50 to 22.50 cm. Score intestinal length of the cecum is still within the normal range, it is in line with the opinion of Ressang (1998) states that the length of the colon cecum of poultry normal range is between 12-25 cm. The higher the level of provision of dragon fruit peel meal there was an increasing trend of percentage intestinal length of broiler chickens. It can be caused by the content of crude fiber in the diet are difficult to digest so intestine enlarged and thickened walls, causing a high percentage of intestinal length (Djunaidi *et al*., 2009).

Conclusions

It can be concluded that research of fermented dragon fruit (*Hylocereus polyrhizus)* peel meal has no effect on carcass weight, percentage of liver, heart, intestinal and caecum of broiler, but 5% and 7% of fermented dragon fruit peel meal decrease abdominal fat and increase shank color.

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Comparisons in Morphometric Performances of Bali and Bali Cross Angus Weaning Female Cattle Using Digital Image Measurement Technique

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Abstract

Bali cattle is one of Indonesian native cattle that has a good potention as a premium beef by crossing with Angus cattle. Bone exponential growth is start up at weaning period. The goal of this research are to compare morphometric performances of Bali and Bali cross Angus weaning female cattle. The study included 10 Bali and 8 Bali cross Angus female cattle at 7-9 month of age. Digital image have taken by DSLR camera with 18Mp resolution. Cattle morphometric performance was measuring by Image J programme. The parameters that observed in this research were body length, body height, hip height, wither depth, length of ossa vertebrae cervicales, length of ossa vertebrae thoracicae, length of ossa vertebrae lumbales, length of ossa vertebrae sacrales, length of os scapula, length of os humerus, length of ossa radius-ulna, length of os metacarpale III, length of os femoris, length of ossa tibia-fibula, and length of os metatarsale III and body ratio that include body height-length ratio, wither depth-body height ratio and body height-hip height ratio. The data was analyzed by t-student test method. Almost all of parameters show the significant differences except length of ossa vertebrae thoracicae, length of os humerus, length of ossa radius-ulna. Bali cattle has longer of ossa vertebrae sacrales than Bali cross Angus cattle. Based on body ratio show that Bali cattle growth leads on fore-extremities, but Bali cross Angus cattle growth leads on hind-extremities. Bali cattle is more ladder than Bali cross Angus cattle.

Keywords: Bali cattle, Cross Angus, Female Weaning Cattle, Morphometric Performances

Introduction

Bali cattle is Indonesian native breed that has small frame size. Bali cattle has excellent anatomical structure, meat deposition and structure. Priyanto *et al*. (2013) showed that Bali cattle has smoother in myofibre structure, softer in meat texture and less number of collagen fibre than Ongole cattle. Small frame size is indicate early maturity. It is very potential for marbling acceleration faster than Bos taurus. One of strategy to improve Bali cattle for premium meat is by crossing with other breed.

One of cattle breed that corresponding with Bali cattle is Angus cattle. The excellence of Angus breed is high in fertility, good in mothering ability, good in growth and meat quality especially in marbling. Angus is one of famous breed that used for cross breed in order to improve fertility and meat quality. But, Angus has weaknes on hot climate adaptation and extoparacite resistent. Based on both potency, the crossing of Bali with Angus expected can expressing good cattle that has good adaptation in tropical climate, growth and meat quality, especially in marbling. One of region in Indonesia than improve Bali-Angus crossing is Kuamang Kuning. Kuamang Kuning is region at Bungo district, Province of Jambi. It is started crossing since 1980.

One of quantitative parameter on cattle performance assessment is morphometric frame size measuring. One of modest but sophisticated technique for morphometric measurement is photozoometer. It is one of morphometric measurement by using digital image that called photo-grammetric system (Gaudioso *et al.*, 2014). Based on Putra *et al*. (2016) showed morphometric measurement using manual and photo-grammetric system is not give significant result. This research observed morphometric of frame size using photozoometer method to compare Bali and Bali-Angus Cross weaner cows. The justification of using weaner cows is based on inflection growth point on weaning phase.

Materials and Methods

Eight Bali-Angus Cross and ten Bali weaner cows at 8-12 moth age were using in this research. The research held at Kuamang Kuning, Bungo Jambi, Indonesia. morphometric measurements were using photo-grammetric system. The instrument that used in morphometric measurement was DSLR camera with 18MP resolution, tripod, and standing gauge. ImageJ software was using to measure frame size from digital image. Measuring technique of photo-grammetric system was based on Putra (2016) methods.

The parameters observed in this research were body length, body height, hip height, wither depth, length of *ossa vertebrae cervicales*, length of *ossa vertebrae thoracicae*, length of *ossa vertebrae lumbales*, length of *ossa vertebrae sacrales*, length of *os scapula*, length of *os humerus*, length of *ossa radius-ulna*, length of *os metacarpale III*, length of *os femoris*, length of *ossa tibia-fibula*, and length of *os metatarsale III* and body ratio that include body height-length ratio, wither depth-body height ratio and body height-hip height ratio. The statistical analyses were perform using t-student test method. The model used to analyze morphometric measures was :

$$t = \frac{(\bar{x}_a - \bar{x}_b) - (\bar{\mu}_a - \bar{\mu}_b)}{\sqrt{\frac{{s_a}^2}{n_a} + \frac{{s_b}^2}{n_b}}}$$

Where $\bar{x}_a$ = a sample mean, $\bar{x}_b$ = b sample mean, $\bar{\mu}_a$ = a population mean, $\bar{\mu}_b$ = b population mean, s_a = a standard deviation, s_b = b standard deviation, n_a = a sample amount, n_b = b sample amount. Significance was declared at p<0.05.

Results and Discussion

Morphometric measurement data of Bali-Angus cross and Bali cattle are shown in the Table 1-Table 5.

Tabel 1. Comparison of Bali-Angus cross and Bali cattle general frame size parameters

No.	Parameters	Bali-Angus Cross	CV (%)	Bali	CV (%)
1.	Body length (cm)	96.39 ± 4.70^a	4.88	81.40 ± 3.46^b	4.25
2.	Body height (cm)	99.09 ± 5.83^a	5.88	86.56 ± 3.49^b	4.03
3.	Hip height (cm)	103.67 ± 4.81^a	4.64	76.73 ± 3.03^b	3.95
4.	Wither depth (cm)	47.88 ± 3.70^a	7.72	35.35 ± 1.78^b	5.03

Different superscript in the same line means significantly different (P<0.05)
CV : coefficient of variation

Tabel 2. Comparison of Bali-Angus cross and Bali cattle back bones morphometrics

No.	Parameters	Bali-Angus Cross	CV (%)	Bali	CV (%)
1.	*Ossa vertebrae thoracicae* (cm)	36.81 ± 4.36	11.84	36.31 ± 5.02	13.82
2.	*Ossa vertebrae lumbales* (cm)	28.31 ± 3.09^a	10.92	18.88 ± 1.89^b	10.03
3.	*Ossa vertebrae sacrales* (cm)	12.38 ± 1.96^b	15.83	17.53 ± 1.33^a	7.56

Different superscript in the same line means significantly different (P<0.05)
CV : coefficient of variation

Tabel 3. Comparison of Bali-Angus cross and Bali cattle fore-extremities morphometrics

No.	Parameters	Bali-Angus Cross	CV (%)	Bali	CV (%)
1.	*Os scapula* (cm)	33.96 ± 3.59^a	10.57	29.93 ± 3.29^b	11.01
2.	*Os humerus* (cm)	19.37 ± 2.42	12.48	20.63 ± 1.85	8.96
3.	*Ossa radius-ulna* (cm)	24.09 ± 2.45	10.16	23.28 ± 1.95	8.36
4.	*Ossa metacarpalia* (cm)	18.00 ± 1.87^a	10.39	15.44 ± 1.61^b	10.46

Different superscript in the same line means significantly different (P<0.05)
CV : coefficient of variation

Tabel 4. Comparison of Bali-Angus cross and Bali cattle hind-extremities morphometrics

No.	Parameters	Bali-Angus Cross	CV (%)	Bali	CV (%)
1.	*Os femoris* (cm)	33.72±5.10[a]	15.13	23.34±2.87[b]	12.30
2.	*Ossa tibia-fibula* (cm)	33.86±5.54[a]	16.37	26.18±2.17[b]	8.27
3.	*Ossa metatarsalia* (cm)	26.10±2.56[a]	9.79	19.11±2.25[b]	13.17

Different superscript in the same line means significantly different (P<0.05)
CV : coefficient of variation

Tabel 5. Comparison of Bali-Angus cross and Bali cattle body ratio

No.	Parameters	Bali-Angus Cross	CV (%)	Bali	CV (%)
1.	Body Height/Length Ratio (%)	102.83±4.30[a]	4.18	106.60±1.55[b]	1.46
2.	Wither Depth/Body Height Ratio (%)	48.30±2.09[a]	4.34	40.84±1.32[b]	3.22
3.	Body Height-Hip Height Ratio (%)	95.56±2.75[a]	2.88	112.82±0.78[b]	0.69

Different superscript in the same line means significantly different (P<0.05)
CV : coefficient of variation

All of general frame size parameters give significantly different between Bali-Angus cross and Bali cattle. Bali-Angus cross have longer, higher and deeper wither than Bali cattle. Body length have closely related with back bones morphometrics. Based on back bone morphometrics have shown of Bali-Angus significantly longer than Bali one. But both of *Ossa vertebrae thoracicae* didn't give any difference. *Ossa vertebrae sacrales* of Bali-Angus cattle was shorter than Bali cattle. It was explaining that growth development of Bali-Angus cross at body axis dominant on *Ossa vertebrae lumbales*. It mean meat deposition on *Ossa vertebrae lumbales* (striploin and tenderloin) has more developed in Bali-Angus cross. This result is very support for improvement Indonesian native cattle as premium beef.

Body height of cattle have closely related with its fore-extrimities morphometrics. *Os scapula* and *Ossa metacarpalia* of Bali-Angus cattle significantly longer than Bali cattle. But *Os humerus* and *Ossa radius-ulna* on both of cattle didn't give significantly difference. Based on this data, it predicted Bali-Angus cros has good development on blade meat deposition than Bali. Longer size on *Ossa metacarpalia* of Bali-Angus cattle and bigger of Body Height-Hip Height Ratio on Bali cattle explain both of cattle have good performance for pasture raising condition.

Hip height of cattle have closely related with its hind-extrimities morphometrics. *Os femoris*, *Ossa tibia-fibula* and *Ossa metatarsalia* of Bali-Angus cross cattle has longer size than Bali cattle. Bali-Angus cross cattle also has smaller of Body Height-Hip Height Ratio of It explain the growth of hind extrimities on Bali-Angus cross catlle better than Bali cattle.

Bali-Angus cross cattle wither depth has longer size with bigger wither depth/body height ratio than Bali cattle. It explained that Bali-Angus cross cattle has better body conformation for meat purpose than Bali cattle.

Conclusions

Almost all of parameters except length of *ossa vertebrae thoracicae*, length of *os humerus*, length of *ossa radius-ulna* of Bali-Angus cross cattle has longer size than Bali cattle. Bali cattle had longer of *ossa vertebrae sacrales* than Bali cross Angus cattle. Based on body morphometric ratio, Bali cattle growth dominant on fore-extremities, but Bali cross Angus cattle growth dominant on hind-extremities. Bali cattle is more ladder than Bali cross Angus cattle. Both of cattle have good performance for pasture raising condition. Crossing strategy with Angus for developing Bali cattle quality has a good result. Bali-Angus cross cattle has better body conformation for meat purpose than Bali cattle.

Acknowledgement

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FULL PAPERS

PARALLEL SESSIONS
SUBTHEME : ANIMAL ENVIRONMENT

Sustainable Integrated Farming System (Cattle-Crop) Environmentally Friendly In North Bolaang Mongondow Regency North Sulawesi Province, Indonesia

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Abstract

The potential of cattle farming in North Bolaang Mongondow Regency is sufficient. The data show that the cattle population amounts to 14690 heads (2015), and the population increases from 2013 to 2015 by 6.93%. The government is trying to increase the population so that various programs have been launched in this area. On the other hand the increase in population gives consequences of increased cattle waste. Cattle farming is considered as one of the causes of CO2 emissions which lead to increased global warming. Efforts that can be made to minimize greenhouse gas emission increase is by integrated farming system of cow-plant. The problem is whether the integration of cattle-crop farming benefits cattle farmers. The purpose of this research was to analyze the benefits of farming of cattle-crop integration. The research method used was survey method. The location of the research was the district that has the largest population of cattle, namely District of Sangkub and Bintauna determined by purposive sampling. The results showed that cattle farming integrated with food crops has been done by several farmer groups. Cattle were kept by using cages and the feed used was waste of rice and corn. Cattle manure has been made of solid fertilizer, and liquid fertilizer. Liquid fertilizer produced was 25 liters/day sold at Rp 30000/liter, solid fertilizer as much as 10000 kg/year, the price of Rp 1000/kg. Based on the result of the research, it can be concluded that integrated farming system, cattle-crop farming provides positive benefits for farmers in increasing income and minimize environmental pollution. Income solid organic fertilizer was Rp 31,250 per day per head. Suggestions submitted need socialization and assistance in the development of integrated cattle farming.

Keywords: integration, cattle, food crops, environmentally friendly

Introduction

The potential of cattle farming in Regency of North Bolaang Mongondow is sufficient. The data show that the cattle population amounts to 14690 heads (2015), and the population increases from 2013 to 2015 by 6.93%. The government is trying to increase the population so that various programs have been launched in this area. On the other hand the increase in population gives consequences of increased cattle waste. Cattle waste that is directly discharged into the untreated environment will contaminate the air, water and soil causing pollution. Farmers have been dumping and making cattle waste accumulate on their farms (Muis, 2015). Cattle farming is considered as one of the causes of CO2 emissions which lead to increased global warming. Efforts that can be made to minimize the increase in greenhouse gas emissions is by the pattern of integrated cattle-plant farming system. This system approach can provide optimal benefits can be achieved with the fulfillment of agricultural development criteria that combine economic interests, socio-cultural and environmental sustainability. This integration system is increasingly important given the availability of dry land for the development of livestock and feed sources is increasingly limited and expensive. The problem is whether the integration of cattle-crop farming benefits cattle farmers. The purpose of this research was to analyze the benefits of farming of cattle-crop integration.

Materials and Methods

The research material was cattle population, cattle waste, feed, organic fertilizer (solid and liquid), Cattle population was expressed from the number of cattle in Regency of North Bolaang Mongondow and cattle ownership by group members. Cattle waste was seen from the many wastes produced by cattles every year. Cattle feed was a waste of rice that has been collected by members of the group. Organic fertilizer (solid and liquid) was the amount of organic fertilizer produced and sold by group members. The research method used was survey method. The location of the research was the district that has the largest population of cattle, namely Sangkub and Bintauna Districts determined by purposive sampling. Respondents numbered each district 30 farmers. Data analysis was descriptive, revenue analysis and proximate analysis.

Results and Discussion

The population of cattle in North Bolaang Mongondow District is 14,690 heads can produce 176,280 kg of solid waste and 73,450 liters of liquid waste per day. This if not managed properly will result in greenhouse gas emissions. The results showed that the number of cattle ownership for 30 respondents in Sangkub District as much as 81 tails each day produces 972 kg of solid waste and 405 kg of liquid waste. While the ownership of cattles by 30 respondents in the District of Bintauna as much as 128 tails each day produces 1536 kg of solid waste and 640 kg of liquid waste. The respondents' cattle are left on agricultural land indicating environmental pollution.

Cattle waste that can not be internalized causing negative eksternlitas. Negative externality arising is shown from methane gas produced from cattle waste causing environmental pollution. Cattle waste can be internalized by cattle cultivated in cages so that the feces can be collected and processed into organic fertilizer. This organic fertilizer is used by farmers to reduce inorganic fertilizers are increasingly expensive and rare. Alternative solution of rising price of fertilizer according to

Rachmadhani et al (2014) by using organic fertilizer to minimize the dependence of farmers on the use of inorganic fertilizers. Furthermore, food crop waste is used by farmers as cattle feed. The results showed that cattle business integrated with food crops has been done by several farmer groups in Regency of North Bolaang Mongondow. The group includes the Keong Mas group, which develops cattle using cages and the feed used is rice straw. Jamilah (2017) argues that one of the ways the government chooses to meet the cattle fattening program is through rice straw feeding technology.

Cattle waste was processed by members into a solid and liquid organic fertilizer. The number of cattle that was caged as many as 24 tails. Liquid fertilizer produced was 25 liters per day which was sold at Rp 30000 per liter. Group members in this case earn an income of Rp750,000 per day, or Rp. 273.750.000 per year. Group members have also sold 10,000 kg of solid fertilizer per year at a price of Rp 1000 per kg so that the income earned was Rp 10,000,000 per year. This condition shows that the economic value of waste in the form of feces and urine increases, as well as a new source of income that affects the improvement of farmers' welfare. Samples of liquid fertilizer from the Keong Mas group have been analyzed at the Research Center and Industrial Standardization Manado. The nutrient elements analyzed from this research are the macro elements of Nitrogen (N), Potassium (K) and Phosphor (P) as Table 1.

Table 1. Result of Analysis of Liquid Fertilizer produced by Keong Mas Group

No.	Parameter	Value
1.	Nitrogen (%)	0,1
2.	Kalium (%)	0,24
3.	Phosphor (%)	0,03
4.	Ph	9,0

Source: Analysis results of Industry Research and Standardization Center, Manado (2016)

Nitrogen elements according to the results of this study in accordance with Musnamar (2006) that is for the fertilizer derived from cattle dung N content element ranged from 0.1 to 0.96. While the element of Potassium and Phorphor is lower than Musnamar (2006). Phosphorus element in manure is mostly derived from solid waste, while Nitrogen and Potassium comes from liquid waste. The content of K element in liquid manure is five times larger than solid waste. While the content of N in liquid feces is only 2-3 times greater than solid impurities.

The function of organic fertilizer was further socialized to other farmers in the research area. Organic fertilizer (manure) has been widely used in other areas in Indonesia for agricultural land both wetland and dry land. The goal is to improve soil fertility considering most of the agricultural land has been very lack of organic elements. Dry land is generally nutrient-poor, lack of water and less fertile so it is less productive to produce food sources and feed ingredients (Nurdiati et al, 2012). Compost fertilizer is used as an option in support of increased green mustard greens (Ohorella, 2012), tomato production (Pangaribuan et al., 2012). The productivity of feed crops according to Jasmani and Haryanto (2015), also can still be improved by providing organic fertilizer from cattle manure.

Management of crop and livestock integration systems increases farmers' income compared to non-integrated farming systems. This approach is recommended for farmers in the research area. Integrated farming system approach as a business done so that production costs can be reduced, unused agricultural land optimized with forage introduction, cattle as a source of labor (up to a certain age) and can contribute in saving the purchase of fertilizer. Research on integrated farming system has been done, among others Forero and Gonzalo (2013) which aims to explain the natural resources without negative impact on the environment. Integrated livestock management is less risky if managed efficiently and benefits are gained and achieved environmental health (Walia and Kaur, 2013). Integrated farming according to Wulandari (2014) is the right choice because of the limited ability of agricultural resources. Wahyuni (2015) argued that integrated agriculture is an alternative effort in order to improve the efficiency of cattle business in farmland. Furthermore, the Farming System Integration is an alternative to climate change mitigation (Munandar et al., 2015), and is often recommended as one of the most promoted solutions in terms of decreasing soil fertility and the loss in intensification system productivity (Ezeaku et al., 2015). Swarnam et al (2014) suggests an integrated approach to farming systems leads to improved household nutrition, income and employment creation. Development of cattle with the concept of integrated farming system is done by farmers who are members of a group. The reason is because according to Suprianto (2017) farmer group is one of the formal institutions that exist in the community.

Conclusions

Based on the result of the research, it can be concluded that integrated farming system, cattle-crop farming provides positive benefits for farmers in increasing income and minimize environmental pollution. Income solid organic fertilizer was Rp 31,250 per day per head. Suggestions submitted need socialization and assistance in the development of integrated cattle farming.

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The Physiological Response of Angus X Bali Crossed Calf on Tropical Environment as an Indicator of Adaptability

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Abstract

Bali cattle (Bos sondaicus) with small body frame as Indonesian native cattle has been widely crossed with large frame such as Angus cattle (Bos taurus) from subtropical region to more productive offspring. One important thing to be considered if we want to develop this crossed is their adaptability in tropical environment. This research aims to look the adaptability of Angus x Bali crossed calves on tropical environmental based on physiological responses. Pelepat Ilir Subdistrict, Bungo District, Jambi Province has been selected as research locations. Average daily temperature in the area was 27.45 ± 2.14ºC with 90.17 ± 8.21% humidity. Temperature humidity index (THI) of the research sites were 79.97 ± 2.64 with 0.23 ± 0.49 m/s of wind speed. Fifteen Angus x Bali crossed calves compared to 10 Bali calves (5 - 12 months of age) kept by the farmer used to observe their physiological status (body temperature, respiratory rate, heat tolerance coefficient (HTC) and pulsus) for 24 hours in 7 days. Data were analyzed by t-test. The results showed that body temperature, respiratory rate, and HTC of Angus x Bali crossed calves (39.18 ± 0.75ºC, 50.33 ± 10.63/min, 3.21 ± 0.48) were higher ($P<0.05$) compared to Bali calves (38.53 ± 0.48ºC, 38.80 ± 11.22/min, and 2.69 ± 0.49), while the pulsus showed no different results (83.33 ± 8.65 vs 80.30 ± 13.66). These results suggest that based on physiological responses, the Angus x Bali crossed calves is less adaptive than Bali calves in tropical environments, thus requiring management adjustments in the production system.

Keywords: Angus x Bali crossed calf, Heat tolerance coefficience (HTC), Physiological Response, Tropical environment

Introduction

Bali cattle (*Bos sondaicus*) with a small body frame as Indonesian native cattle have been widely crossed with large cattle such as Angus cattle (*Bos taurus*) from subtropical region to produce a more productive offspring. One important thing that will be considered when we want to develop these crossed cattle is their adaptabilities to live in tropical environment. Pelepat Ilir subdistrict, Bungo District, Jambi Province, geographically is a hilly area, is a center of agriculture and plantation and has tropical climate with air temperature of 27.45 ± 2.14ºC, humidity of 90.17 ± 8.21%, temperature humidity index (THI) of 79.97 ± 2.64, and wind speed of 0.23 ± 0.49 m/s. In this subdistrict, cattle population is dominated by Bali cattle, and the total population based on the Department of Animal Husbandry and Fisheries of Bungo

District in 2016 reached 5,468 cattle and 635 are crossed cattle, dominated by the Bali x Angus crossed cattle.

Temperature, humidity, THI and wind speed are parts of the environment that have a real impact on life of livestock (West, 2003 and Mader et al., 2006). Cattle need an appropriate rearing and maintenance environment to live and produce optimally. Cattle originating from subtropical regions is difficult to be maintained and reared in tropical environments and vice versa. According to Webster and Wilson (1980), the ideal temperature for the maintenance of tropical cattle is 22 – 30ºC, while for the subtropical region is 13 - 25ºC. Environmental conditions that do not support the life of livestock will make the genetic potential of a cattle can not be expressed optimally (Yani and Purwanto, 2006). Changes in environmental conditions have a negative impact on the changes in the physiological status of livestock such as changes in body temperature, pulse rate, and respiration rate (Eniolorunda et al., 2009).

Both Indicus cattle and local cattle have been well tolerated to hot environments and have much better adaptability compared to crossed cattle (Maibam et al ,. 2018 and Hansen (2004). According to Hernandez-ceron et al. (2004) the embryo of Angus cattle (*Bos taurus*) is no more resistant to high temperatures in hot environment suggesting that the rectal temperature and respiration rate of Angus cattle (*Bos taurus*) are significantly higher ($P < 0.001$) compared to *Bos indicus* cattle and *Bos taurus* cattle adapted to tropical environment.

Based on the above description, it is necessary to study the adaptability of crossed cattle between Bali cattle (*Bos indicus*) and Angus cattle (*Bos taurus*) to find out how far the ability of crossed calves (Bali x Angus) can adapt to tropical environment conditions in Pelepat Ilir Subdistrict, Bungo District, Jambi Province based on physiological status. The result of the research is expected to be a consideration for various parties in decision making for the development of livestock, especially crossed cattle in the research location.

Materials and Methods

This study used twenty five calves with ten Bali calves and fifteen Bali x Angus crossed calves (5-12 months of age range). The observations included environmental condition in Pelepat Ilir Subdistrict, Bungo District, Jambi Province consisted of ambient temperature, environmental humidity, temperature humidity index (THI), and wind speed for seven days in December 2017. Further observation was done by observing the status of physiological parameters of livestock in these environmental conditions including body temperature, respiration rate, pulses and heat tolerance coefficient (HTC) to determine the level of stress in cattle and used them as indicators of adaptability

THI measurement is used as an indicator to measure the degree of potential heat stress in cattle which is a combination of temperature and humidity of environment. THI was calculated using the following formula (Mader at al., 2006): THI = 0.8 × ambient temperature + [(% relative humidity ÷ 100) × (ambient temperature - 14.4)] + 46.4. THI values < 71 is categorized as a thermal comfort zone, 72-79 is categorized as a mild heat stress, 80-90 is categorized as a moderate heat stress category, and THI > 90 fall into heat stress category.

Body temperature, respiration rate, and pulses were observed for 60 seconds. Measurement of heat tolerance coefficient value (HTC) was used as an indicator of stress degree and was calculated using the formula (Benezra, 1954): HTC = (daily average of cattle body temperature ÷ 38.3) + daily average of cattle's breathing for 1 minute ÷ 23. HTC value = 2 indicates the livestock category is in neutral condition, HTC > 2 indicates the livestock category is in heat stress condition, and HTC < 2 indicates the livestock category is in cold stress condition.

The environmental data were analyzed by using Microsoft excel to calculate the mean and standard deviation (±), while the physiological data including body temperature, respiration rate, pulses, and HTC were analyzed by using T-test with the SPSS 21 application.

Results and Discussion

The environmental observation data are shown in Table 1.

Table 1. Average Temperature, Humidity, THI, and Wind Speed

Temperature (ºC)	Humidity (%)	THI	Wind speed (m/s)
27.45 ± 2.14	90.17 ± 8.21	79.97 ± 2.64	0.37 ± 0.58

Table 1 shows that the temperature and humidity of the environment in the research location have a relatively high value when compared to the existing standards (Webster and Wilson, 1980), although wind speeds showed relatively ideal conditions, the wind was more functional in the process of heat dissipation from the body and only slightly can lower the ambient temperature. This condition was supported by the THI value at the level of 79.97 ± 2.64. This THI condition indicated that the environmental conditions in Pelepat Ilir District, Bungo District, Jambi during experiment were in a poor condition for traditional livestock raising either extensively or semi-intensively without improvement of maintenance management. Although the experiment was conducted under open environmental conditions, temperature humidity index of this research location was still far from dangerous category (THI > 90). Without a good management by the breeders, these environmental conditions will cause the livestock to experience a mild heat stress and the livestock is not in ideal environmental conditions (THI < 71).

The observed data on physiological status are shown in Table 2.

Table 2. Average body temperature, respiration rate, pulses, and HTC

	Bali	Bali x Angus
Body temperature (ºC)	38.53 ± 0.48	39.18 ± 0.74
Respiration rate	38.80 ± 11.22	50.33 ± 10.62
Pulses	80.30 ± 13.66	83.33 ± 8.65
HTC	2.69 ± 0.49	3,21 ± 0.47

Body temperature, respiration rate, and HTC of Bali x Angus crossed calves were higher (P < 0.05) compared to Bali cattle calves, while pulses values were similiar (P > 0.05).

Table 2 shows that the body temperature and respiration rate of Bali x Angus crossed cattle were relatively higher (P < 0.05) compared to Bali cattle. However pulses of experimental calves with different breeds were similar ($P > 0.05$). It is possible that crossed cattle require a more intense effort to adapt to a hot environment than local cattle which are indicated by the higher body temperature, respiration rate, and pulses as one of the strategy to increase body heat dissipation. According to Eniolorunda et al. (2009) this condition will have a negative impact on livestock.

Based on the calculation of the value of HTC it can be found that the higher body temperature and respiration rate affect the higher value of HTC. The results showed that both breeds of cattle experienced heat stress on environmental conditions in Pelepat Ilir Subdistrict, Bungo District, Jambi. These results were evidenced by the values of HTC in Bali cattle and Bali x Angus crossed cattle that both showed relatively high scores of HTC (> 2). Statistical analysis also showed that stress level in Bali x Angus crossed cattle was relatively higher than that in Bali cattle ($P < 0.05$). This difference could be related to the condition of local Bali cattle that were already adapted to the hot and humid tropical environment conditions. Therefore, the stress experienced by the Bali cattle was only related to the differences in maintenance and rearing location; the environmental conditions were relatively similar. While the Bali x Angus crossed cattle was produced from crossing between cattle adapted to tropical and subtropical environments. Therefore, in addition to the difference in maintenance and rearing location, the temperature difference in the subtropical environment and the tropical environment were relatively different, as was indicated by the higher stress level.

Livestock in hot environmental conditions will naturally try to dissipate body heat to keep the body temperature in a constant range as a process of adaptation, and this condition causes the cattle requires a greater energy for body heat dissipation. Yani and Purwanto (2006) explain that the condition of the maintenance and rearing environment that does not support the livestock life will make the genetic potential of a cattle can not be expressed optimally. Therefore, even though a Bali x Angus crossed cattle genetically will tend to have offspring with larger frames than the Bali cattle, poor adaptability to hot environments will cause Bali x Angus crossed cattle with a large frame type to be not optimally expressed by their offspring. Therefore, a greater attention is required especially in maintenance and rearing management so that livestock can express their genetic potential and production capability optimally.

Conclusions

In the tropical environment in Pelepat Ilir subdistrict, Bungo district, Jambi, Bali x Angus crossed cattle do not show a better adaptability compared to Bali cattle. Bali x Angus crossed cattle were in higher stress conditions than Bali cattle as were indicated by the higher values of body temperature, respiration rate, higher pulses, stress conditions, and heat tolerance coefficient (HTC).

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FULL PAPERS

PARALLEL SESSIONS

SUBTHEME: ANIMAL AGRIBUSINESS, SOCIAL ECONOMICS AND POLICY IN ANIMAL PRODUCTION

Prospect of Dairy Cattle Business Development in Padang Panjang, West Sumatra, Indonesia

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Abstract

A study had been carried out on November and December 2017 in Padang Panjang, West Sumatra to formulate the policies in expanding local dairy milk market. Survey method used to collect both primary and secondary data by a questioner guidance. Collected data were analyzed by strengths, weaknesses, opportunities and threats (SWOT) approach. The results showed that dairy business in Padang Panjang in both profit and benefit indicators revealed an increasing outlook. Dairy business activities' contribution to agricultural and domestic regional income has increased since the last five years. Based on progress to a better technical competency, dairy business would be accelarated when market demand boost up. Efforts of dairy farmers' institutional capacity building, scheme of technology introduction to prolong milk life as well as supporting policies will rapidly enlarge dairy market.

Keywords: dairy milk, enlarged market demand, supporting policy

Introduction

Both local condition and strategic environmental policy encourage the dairy cow development at the cluster of Padang Panjang, in West Sumatra province, Indonesia. Although Sumatra island contributed only 0.57 % and 0.36 % toward Indonesian dairy cow population and milk production, West Sumatra province shared 24.2 % and 38.2 % respectively in Sumatra. Then West Sumatra was the only province out of Java island that prioritized as dairy cow development cluster in 2014. Thus, Padang Panjang with 56.27 % of dairy milk production share in West Sumatra (2015), has been emerging as a key figure in dairy cow growth centre.

Mahendra (2016) showed that average dairy farmers income was Rp 70.420.000 at each lactation period resulting profit as Rp 34.997.792. Based on the data, dairy cow business was feasible due to its R/C value at 1.47 > 1. Survey also found out several items affecting non-significantly farmer income, such as; motivation, education level, age, experience, number of the family members, manpower, and number of cow. Therefore, both dairy milk price and its widespread market significantly contributed to business income.

Padang panjang municipality put forward dairy cow development – consistent with those of national policy – as an icon of local development program. Within Padang Panjang mid-term development planning period 2013 – 2018, dairy cow development plays a crucial role as a performance indicator of local economic competitiveness. Then, the document of West Sumatra provincial long-term development planning also recommended cluster or regional development supported by knowledge based economy approach. Dairy cow is a business with a highest index in sophisticated competency at animal science.

Global trade agreement, particularly in agricultural products, aimed at achieving economic efficiency, accelarate competition among dairy products. Consequently, in 2020, local dairy farmers will not only compete with those of domestic players but also overseas producers. Then policy, program and orientation of dairy cow development in Padang Panjang should anticipate the tendency with a collaborative approach among the stakeholders.

In the meantime, there are a number of activities to increase the dairy farmers capacity. Contributors were not only the local government apparatus as a main player but also networking institutions, such as; representative of West Sumatra of the Indonesian Bank; research and development division of Indonesian Agriculture ministry and Indonesian dairy excellent activity project. Therefore, while a locally conducive business, there is an urgently need to further investigate the prospect of dairy cow development and supporting policy in Padang Panjang with two concerns; (1). Prospect of expanding various dairy milk products' market resulting an attractive business and estabishing a standard and sustainable activity. (2). Pattern of local policy formation to facilitate and accelarate dairy cow development.

Methods

A survey used to collect both primary and secondary data to fulfill the study objectives. While collecting primary data was carried out by indepth interview and focus group discussion (FGD) techniques, the secondary data were retrieved by internet and library access. A representative member of each dairy stakeholders attended the FGD. Participants came from three different types institution; dairy farmers as a on farm player, local traders as a off farm actor and local government officials formulating supported policy. The SWOT procedure had been applied to formulate and analyze collected data and information. A public consultation to confirm report draft among stakeholders was carried out to complete the results.

Results and Discussion

Padang Panjang Condition

The dairy cow cluster development of Padang Panjang, West Sumatra is located in a highland area at the centre of the province, covered by 2,300 Ha of land or 0,05% of provincial region. Its position is strategic situation connecting a number of cities in West Sumatra; Padang, Bukittinggi, Solok and Batusangkar as well as North Sumatra, Riau and Jambi.

Local temperature varies at 26,1^{0}C and 21,8^{0}C with average annual rain at 270 days/year or 4,822 mm. Padang Panjang climate is subtropic with hilly region. These condition are fit to develop dairy cow due to its apropriate habitat. Therefore Padang Panjang is emerging as a centre of dairy cow growth and development in provincial level, as figured out at Table 1. In August 2017 Padang Panjang lactating cow produced 1,442 litre fresh milk a day. Although, there are a number of private owner, a dominantly holder of dairy cow is farmers group as an approach to facilitate cluster development. Table 2 figures out the farmers groups keeping dairy cow in Padang Panjang.

Table.1 Dairy Cow Population in West Sumatra.

No.	District	Population Structure			Total (head)	Average milk production (ltr/day)
		Heifer	Cow			
			Lactation	Non Lactation		
1	Padang Panjang	94	92	40	226	12
2	Padang	-	14	15	29	10
3	Payakumbuh	7	32	9	48	10
4	Agam	15	15	-	30	10
5	Tanahdatar	2	8	2	12	10
6	Padang Pariaman	27	28	5	60	10
7	Solok Selatan	7	5	2	4	10
	Total	152	194	73	419	10.3

Source: Dairy Cow Breeding Grand Design of West Sumatra (2016)

Table 2. Dairy Farmers Group in Padang Panjang

No	Name of group	Village Address	Chairman	Members (head)
1	Yuza	Sigando	Amrizal	28
2	Permata Ibu	Gantiang	Deslia Sulastri	14
3	Harapan Baru	Gantiang	Meldawitri	20
4	Tunas Baru	Gantiang	Mukhlizar	8
5	Serambi Karya Mandiri	Koto Katiak	Eko Setiawan	20
6	Lembah Makmur Hijau	Kpung Manggis	Rafles	10
7	Makmur Batu Batirai	Kpung Manggis	Amjas	23
8	Lembu Alam Serambi	Silaing Bawah	Suryadi Agus	13
9	Parmato Mudo Nagari	Silaing Bawah	Yusrianto	10
	Total	5 villages		146

Source: Monthly Report of Indonesian Bank Technical Service (2017)

The number of dairy cow has been increasing since 226 head in 2016 to 338 head in 2017. Consequently the milk production must also be escalated. These condition accompanied by annual fluctuation of fresh milk market demand in holiday and fasting Ramadan month, should be anticipated earlier. An introduction of technology scheme to prolong the expired milk date, milk products diversification and widespread of milk market locations should be considered to maintain farmers spirit and motivation.

Economics of Dairy Cow

Dairy cow contributon towards Padang Panjang economic outlook figured out at Table 3. While milk production had been fluctutated since 2010 to 2015, its contribution to regional domestic products bruto was not significantly change. These figures suggested that fresh dairy milk business confront a dynamic challenge to maintain the quality of both processing procedure and products as well as market performance.

Fresh dairy milk business played an important economic role, not only in agricultural performance but also to the city PDRB contribution. It also proved livestock role in the city economic activity. Efforts to enlarge the market destination and demand are the prioritized activites to enhance fresh dairy business.

As Erni – a main fresh milk collector and processor – in Padang Panjang supposed that market attention should not be only paid to local West Sumatra province. A bigger diversified milk products market spread over neighbour such as North Sumatra, Riau, Jambi, and South Sumatra. The last information delivered that Padang Panjang fresh milk distribution captured Jakarta and Batam in Kepulauan Riau province.

A simple calculation of fresh milk production cost in 2017 was at Rp 5,400 / litre. At a selling price of Rp 7,000 to 8,000 /litre of fresh milk, then, dairy farmer received Rp 2,600 to 3,600/ litre. However, a fluctuation demand due to holiday and fasting in Ramadan month, require a technological processing to diversify milk products.

Institutional Outlook of Dairy Cow Business

Dairy cow business and fresh milk diversified products have been introduced in Padang Panjang since the early of 1980s through cooperative approach. Although there are various pattern of organization in managing fresh milk business, a local government facilitating groups is a dominant institution running production process. In the groups development, dairy farmers group could access credit scheme from local bank to finance the industry. Local government policy subsidizes credit interest. Therefore provision of resources to produce fresh milk based on qualified breeding, feeding and producing procedure likely were appropriate enough.

In addition, dairy farmer groups still have to confront credit collateral side and legally business certification. In the one hand, credit collateral tends to weaken lending stakeholders confidence particularly in returning of the investment. On the other hand, legally business certification is a main entry point to open the formal market for pasteurized fresh milk. Processed fresh milk is adjacent to preparation of the diversified products market. Since the market opportunity is understood as attraction tool to motivate farmers in running dairy cow business.

Table 3. Economic Performance of Fresh Dairy Milk in Padang Panjang

No	Criterion/unit	2010	2011	2012	2013	2014	2015
1	Milk production / litre	250.915	254.675	533.970	246.286	294.736	621.180
2	Growth / %		1.50	109,6	-53,88	19,67	110,76
3	PDRB at livestock sector (Rp million)	42.003,4	47.972,7	52.412, 6	58.617	64.388	69.755
4	PDRB contribution to agriculture / %	45,93	47,45	49,12	50,08	49,81	50,61
5	PDRB contribution to city / %	2,73	2,78	2,76	2,80	2,74	2,76

Source: Statisical Bureau; Padang Panjang in Facts and Figures (2017)

In fact, Padang Panjang fresh milk production in October 2017 was nearly 1,600 litre a day. However, market demand among all dairy farmers was only about 1,000 litre a day. Yes, Rumah Susu (fresh milk collector) facilitated by local givernment and owned by a number of farmers institution could receive 250 litre a day. Thus, there was an over supply of Padang Panjang fresh milk resulting the need to introduce fresh milk processing technology.

As Juma (2011) stated, the introduction of biotechnology in agricultural based business must be coincided with institutional capacity building. Efforts to increase human resources competency, farmers responsibility and viable supporting administration should be considered as institutional development. At any step of developing superior breed, palatable feed, standard operating procedure and processing products are part of institutional capacity building. A social learning process approach to solve instituional problems among stakeholders should be followed in a collaborative manner. Then, based on human improvement competency resulting in institutional and communication network support a practical access to several items, such as; creative ideas, solving asymetric information, biotechnology constraints, financial restriction, and market demand.

Problems in Doing Dairy Cow Business

Dairy cow farmers have been confronting a number of crucial problems both on farm and off farm division as follow;

1. Market competition between locally fresh milk products and multi-national producers. A number of factors affecting the bargaining position of fresh milk such as; easily contaminated products, fluctuation of market demand, pupils holiday, foggy climate, and fasting month of Ramadan.
2. Fresh milk market dilemma decreases farmers motivation as well as products quality. Consumers complaint to the milk condition are the an other problem due to series of reduced motivation.
3. Effort to expand the market demand in term of its coverage and continuity has been encouraging process. However, a longer time of transportation and a shorter time of fresh milk storage constraint the expansion. Then, fresh milk processing technology introduction to guarantee the products is necessary. Certification issued by legally binding institution to protect both process and products is an entry point to continue the business.
4. Techincally, the supply of superior livestock feeding could be hindered by grass production. Option to find out grass from the city hinterland area automatically increase production cost. At the end, this will lead to tight competition in market price.
5. Farmers perspective towards dairy business focussing on the milk product only will leave them not to pay attention to an integrated approach. In fact, integration among the sub-division of businees will decrease cost, such as processing cattle manure to be organic fertilizer. On the other hand, it lets to physically clean condition and anticipate contamination.

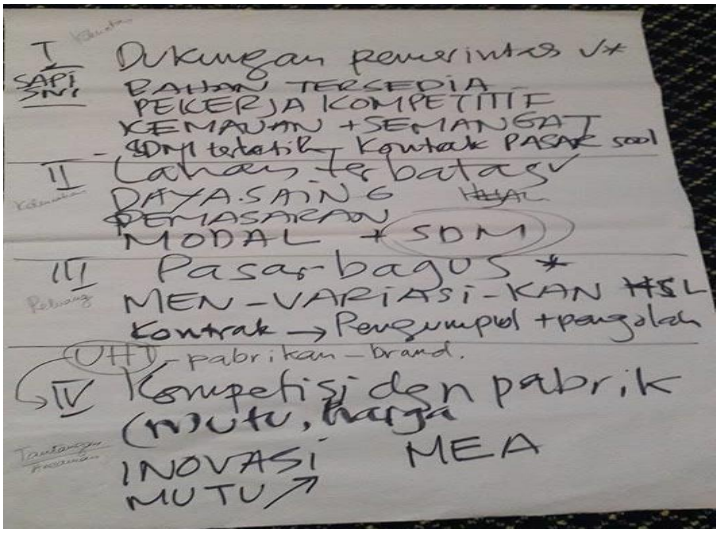

Figure 1. Result of Simple SWOT Analysis (Indonesian Bank: 2016)
Notes: I. Strength; II. Weakness; III. Opportunity; IV. Threat

Table 4. Result of SWOT Analysis

Internal	Strength	Weaknesses
	1. Milk production continues to achieve 60 % of the provincial rate 2. Outside provincial market is more expansive reaching all kinds of consumers 3. A relatively better competency of workers in production process 4. Natural fresh milk product with an unique composition 5. A quaranted product quality with on going diversification process 6. Selling price was still accessible expressing viable market development 7. Supporting policies making process at local, national and global level	1. Restricted land to develop quality feeding 2. Recording and groups administrative support were not completely appropriate 3. Limited competent workers at off farm, post harvest processing and managerial level 4. Machinery to prolong expired date and packaging process are yet to completely available 5. Packaging display is not attractive due to lack of sachet availability 6. Transportation delivery is inadequate 7. Product variation, promotion, and education are not yet maximum 8 Special website is not yet available 9. Access to resources allocation is limited to expand the business

External Opportunity	S-O strategy	W-O strategy
1.Dairy milk business still earn profit and benefit 2. Newly product demand in the market 2. Lifestyle back to *nature* 3. On going education process to entrust consumer 4. Outside provincial market and promotion 5. A business networking to create employment and standarized products	1. Maintain product quality through a standard process, quality control, and legally certification issued by authorized institution to keep consumers trust 2. Business transformation from administrative view and domain to functional perspective to create a healthy and natural lifestyle	1. Human resources improvement and institutional capacity building by reward and punishment approach based on performance indicators, collaborative action and networking 2. A maximum processing technology producing a sachet display and promotion to all segment of consumers
Threats	**S-T strategy**	**W-T strategy**
1. Availability of various milk product in the market 2. Consumers do not recognize fresh milk from Padang Panjang 3. Limited motivation to work in livestock business 4. Postponed processing technological innovation 5. Incremented policy making and not properly fixed 6. Maintain both quality and products variation	1. Skill and competency to improve products quality and standard 2. Promoting Padang Panjang fresh milk through electronic and social media as well as periodical special event	1. Promotion and education to introduce newly product variation to potential consumers 2. Access to resources supporting dairy development, livestock assurance, symetric market information, biotechnology, knowledge based economy and social business approach

SWOT Analysis.

Analysis process of Padang Panjang dairy business used a strength, weaknesses, opportunities and thread (SWOT) tool. Table 4 figures result of analysis. Then, a compare and contrast approach also used with a facilitating process result as in Figure 1.

Conclusion

Prospect of dairy cattle business in a functional cluster of Padang Panjang, West Sumatra Indonesia could be reckonned s following items.

1. Economically dairy cattle business was feasible in both profit and benefit indicators.
2. Technicallly dairy cattle business has been maintaining a better process and procedure with bioechnological innovation support.
3. Institutional capacity building was continuously facilitated by a collaborative approach among stakeholders.

Then, due to achieve a better technical competency, dairy business would be accelarated when market demand boost up. Efforts of dairy farmers' institutional capacity building, scheme of technology introduction to prolong milk life as well as supporting policies will rapidly enlarge dairy market. These could be done by a partnership setting in resources allocation, marketing mix in various milk products, standarized breed, feed and processing procedure as well as legally certification issued by authorized food and beverage regulator.

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Household Economy of Bali Cattle Farmer with Different Farming Combination in Konawe Selatan Regency of Southeast Sulawesi Province

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Abstract

The combination of cattle farming and others farming field could give big opportunity to not only increase and stabilize food security, but also farmer income. Recently, livestock development transformation start to shift from production oriented using commodity approach design to be revenue increament in agribusiness approach. This research aim was to analyse household economy increament of Bali cattle farmer, which combine with plantation, horticulture, and rice farming in Palangga, Tinanggea, and Lalembuu Sub-district of Konawe Selatan Regency, Southeast Sulawesi on April of 2017. The 150 of total respondents were taken from research locations which determined based on purposive sampling of sub-district and village which be found Bali cattle farmer with other farming activity, *i.e*: plantation, horticulture, and rice. The obtained data were analised qualitatively based on π = TR – TC formula, interpreted and explained descriptively. Research result showed that Bali cattle farming in research location using semi intensive system, while others farming activity were dominate with palm, cashew, orange, rambutan, water melon, and rice. The livestock farming revenue average for support household needed was Rp. 4.187.580 year^{-1} and other farming was Rp. 17.486.490 year^{-1}. Average revenue from combination of Bali cattle farming (BcF) – plantation, BcF – horticulture, BcF – rice farming were Rp. 5.548.017, Rp. 10.465.600, Rp. 16.497.489 year^{-1} respectively.

Keywords: Household economy, Bali cattle, Rice, Plantation, Combination.

Introduction

The Bali cattle farming is one of the rural's livestock business spread throughout the district of South Konawe Regency Southeast Sulawesi Province. However, cattle farming business in rural areas is generally still run traditionally with a relatively small scale of business between 2-5 heads per family. The obstacles to develop the business scale of cattle are: (1) limited knowledge on cattle farming techniques, (2) lack of availability of forage feed, especially in the dry season, 3) the large business capital needs, and (4) institutional groups of farmers which are not working optimally. The pattern of business approaches shifts from a commodity approach to an agribusiness approach. Integrated cattle business combined with another comodity of farming types such as plantations, horticulture and paddy rice will be more profitable, both economically, technically and environmentally.

Farming systems combined with integrated livestock farming can reduce the risk of harvest failure, dependence on one commodity, and cost-effective production (Hamdani, 2008 and Kusnadi, 2007). According Suryana (2007) that the development of livestock can be through diversification of cattle with paddy fields, plantations, and ponds. In 2016, cattle population in Southeast Sulawesi Province reaches 331,958 heads spread over 17 districts / cities and 19.7% are located in South Konawe District (BPS, South Konawe District, 2017). The management of cattle farming in South Konawe Regency is generally combined with plantation farming, horticulture or wetland rice as it is considered to contribute greatly in improving the farm household's economy. This study aims to analyze the economic improvement of cattle ranch households whose management is combined with plantation, horticulture and wetland farming in South Konawe Regency of Southeast Sulawesi Province.

Materials and Methods

This research was conducted in April 2017 by taking the research location in South Konawe District of Southeast Sulawesi Province. The determination of location is done by purposive sampling in South Konawe Regency with the consideration that the area is the center for cattle of the people with the highest population in Southeast Sulawesi. The respondents are the districts and villages where there are cattle farmers with a combination of plantation, horticulture and paddy fields, namely Palangga, Tinanggea, and Lalembuu Sub-districts of South Konawe Regency. Respondents were drawn as many as 150 farmers from 3 selected sub-districts. Qualitative data will be tabulated into percentage values and described descriptively, while data related to the household economy are analyzed quantitatively by formula: $\pi = TR - TC$;

π : farmer household income,
TR : total revenue, and
TC : total production cost (Soekartawi, 2005 and Soeharno, 2009).

Percentage of cattle farming contribution to total household income is formulated using Tulle (2005) : $Ks = \frac{\pi s}{\pi s + \pi n} \times 100$;

Ks : contribution of cattle farming income to total household income (%),
πs : cattle farming income (Rp year^{-1}),
πn : non cattle farming income (Rp year^{-1}).

Results and Discussion

The results showed that the total ownership of cattle from 150 respondents taken as sample was 840 heads with the average ownership of cattle as many as 5 heads per family. This shows that the average cattle breeding scale owned by farmers in South Konawe Regency is still relatively low and has not been categorized as the main business. The percentage of female cattle/ cow ownership reached 53% seen more than the bulls which only 47%. This study is in line with the results of research reported Sani *et. al* (2015) that the population of female cattle in cattle rural farms in Southeast Sulawesi more (63.2%) than the presence of bulls (36.8%).

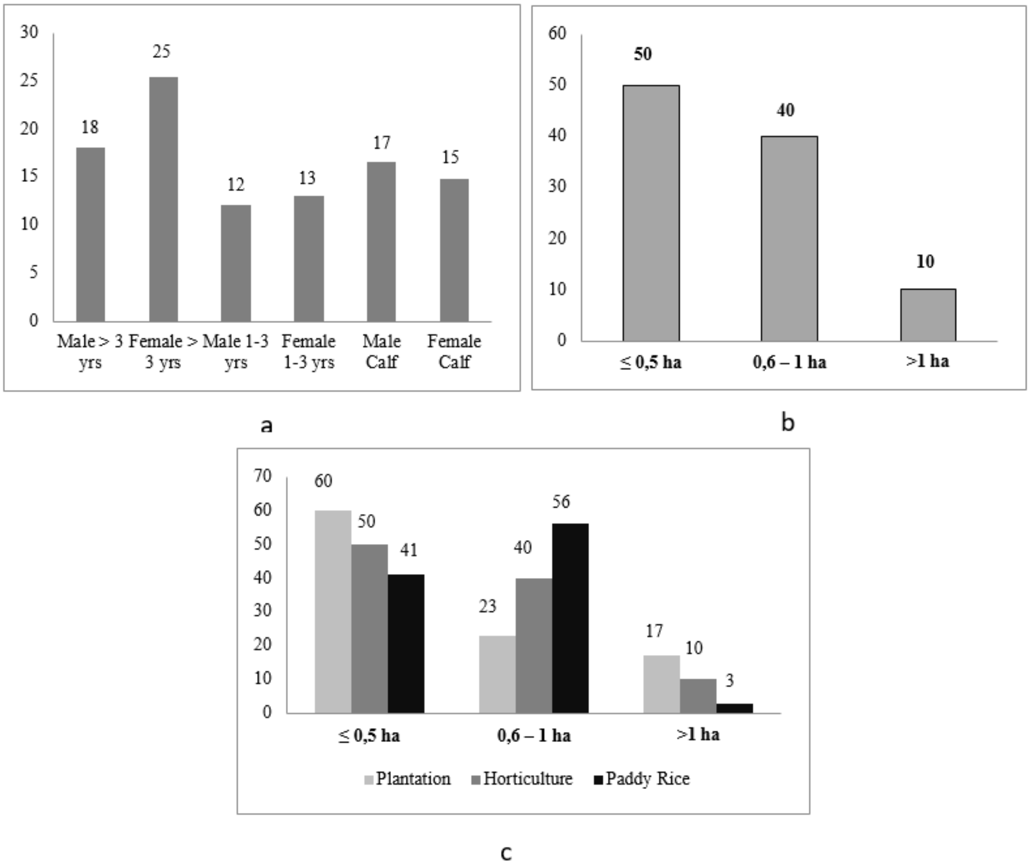
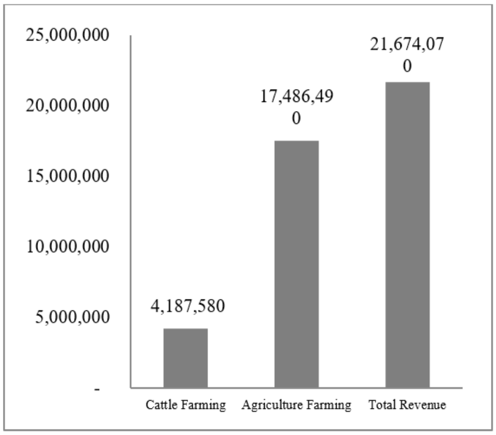


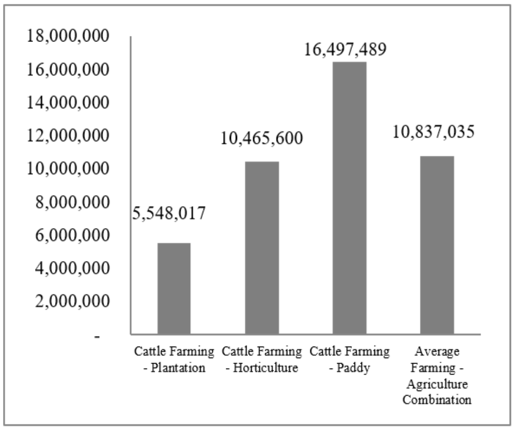
Figure 1. a) Cattle Population by Age Percentage (%); b)Total Farmland Ownership (%); c) Farmland Ownership by Comodities (%)

Figure 1.a shows that the population of cattle in the most studied areas is the mature cow population (25%) and the lowest percentage of population is at young bull (12%) of total livestock owned (of 840 heads). The results of this study also illustrates that farmers in South Konawe Regency are more motivated to maintain the cow with the aim of obtaining new calf so that they keeps the female stock as a productive parent and tends to sell more male cattle because the price is relatively more expensive. The results of this study are also supported by Sodiq and Bodiono (2012), that the maintenance of beef cattle in livestock farmer groups in rural areas is aimed to produce cow-calf operation and fattening business. The percentage of total land ownership of no more than 0.5 ha farmed in the research location shows more dominance (50%), as shown in Figure 1.b. Ownership of farm land if differentiated by comodities, the average of coconut and cashew plantation are higher (60%), as

well as paddy field (56%) as presented in Figure 1.c. Hosen and Jastra (2012) reported that small-scale livestock farming (cultivation of crops such as rice, corn, sweet potato and chili) have business scale 0.3-0.4 ha / family, while cattle owned 1-3 heads. The results showed that the cattle farmer household economy in South Konawe Regency is supported by the results of cattle farming combined with other agriculture farming. The total income obtained by farmer households in South Konawe District from the combined yield of cattle and farming farms (plantation, horticulture and wetland rice) reached Rp.21,674,070 year^{-1}, as shown in Figure 2.a. Figure 4 also shows that the average income of farmers households in South Konawe Regency that comes from cattle farms is only about Rp.4,187,580 year^{-1} with the average number of cattle ownership not more than 5 heads, while the average income from farming plantation, horticulture and paddy rice each year reach Rp.17,486,490. These findings reinforce the perception that most of the cattle business in rural areas is only used as a sideline business after farming. Cattle are only used as non-cash savings that can be sold at any time to obtain cash money. The results of this study are inline with the findings Sani (2011) that the average income of cattle farmers in the South Konawe Regency each year ranges from Rp. 4,176,385, while income from farming result tends to be higher than cattle farming income. Chavas et al. (2005) argue that farm production can be rationally reminded and achieve maximum benefit if it includes education variables in analyzing household characteristics and farming.



a



b

Figure 2. a) Household Total Revenue (Rp/ year); b. Combination Farming Income (Rp/ year)

Figure 2.b shows that the average household income of cattle farmers in South Konawe District have lower economically contribution if its business is combined with long-term plantation crops such as coconut and cashew nuts (BcF-plantation), which is Rp.5,548,017 each year. Conversely, if the farming is combined between cattle farms and rice farming (BcF-rice farming), it contributes a higher household farming economy, which is Rp.16,947,489 every year. The contribution of income from cattle breeding to total cattle farmer income in South Konawe District

a

b

of Southeast Sulawesi Province is only 19%. In contrast, the contribution of farmers' income from plantation crops, horticulture and wetland rice is 81%. This finding is in line with the results of the Sani (2011) study which concluded that the contribution of income from cattle production in South Konawe Regency tends to be small, which is only 35% of the total household income of farmers.

Conclusions

Based on the results of the study, it is concluded: Average income to support the farmer household's economy from cattle farming as a whole of Rp. 4.187.580 year^{-1} and farming of Rp. 17,486,490 years^{-1}. The average income of cattle farmer from the combination of cattle and plantation contributes a low income; Rp. 5,548,017 years^{-1}, compared to the combination of cattle and horticulture farming; Rp. 10,465,600 years^{-1}, as well as a combination of cattle and paddy fields of Rp. 16,497,489 year^{-1}.

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Empowerment For The Group of Cattle Farmer in The Village of Pinabetengan Tompaso District Minahasa Regency North Sulawesi Province Indonesia

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Abstract

Pinabetengan is one of the villages in Tompaso Subdistrict, there are two groups of farmers developing cattle. The main program of the groups is the development of cattle and food crops, namely cattle-rice and cattle-corn. The two groups are Kalooran Tawaya and Ranomasom, both groups established since 2013 with each member having 2-4 cattle. The type of cattle developed is PO. Cattle in this area was integrated with corn crops. Farmers grow maize other than for sale, some (about 20-25%) were supplied as cattle feed. Corn planting is done twice a year, using simple technology. The problem is that group members do not yet have knowledge of integrated cattle farming development with integrated system between cattle and corn. The objective of this research was to identify the problem of cattle development. The research was conducted by using survey method. The location of the sample was determined by purposive, ie the village that developed the integrated cattle. The sample farmers were determined purposively by those farmers who had integrated cattle, with minimum ownership of two cattles. Respondents were cattle farmers who were members of a group empowered with the introduction of feed technology. Data analysis used was descriptive analysis. The results showed that some of the maize was given to cattles, the maize was developed with a simple planting pattern, the cattle were grazed on the farm, the feed was not continuously available and unsustainable, the cattle waste was left on the farmland. Based on the results of the research it can be concluded that integrated cattle farming provides positive benefits for group members. Farmers responded positively with the empowerment of group members.

Keywords: Cattle, technology, sustainable

Introduction

The livestock sector in North Sulawesi is an integral part of the agricultural sector, which has a role to play in supporting community development. Livestock in this case as one sub-sector that has the potential to support the growth and development of agriculture. Farms that play a role in development aims to increase farmers' income, encourage food diversification and improve the community's nutritional quality and export development. Cattle are commodities whose development is desperately needed by rural farmers as their source of income.

The development of cattle farming needs to get serious attention both by farmers and government. This is because cattle farms in North Sulawesi, including

Pinabetengan villages, are still traditionally cultivated (Elly, 2008; Elly et al, 2008; Salendu, 2012). Development of cattle farming is certainly not apart from the role of farmer groups. Farmer groups as a community institution play a role in encouraging and seeking cattle business to provide economic value-added for the community. The value added of the economy can be improved by means of a cattle production process efficiently. Various sources of inefficiency of crop-livestock farming systems are among others due to the relatively weak institutionalization of farming systems. This phenomenon is supported by Yusran et al (2004) that one of the problems that need attention is the institutional problem.

Pinabetengan village is one of the villages in Tompaso Subdistrict, there are two groups that develop cattle farming. The main program of the group is the development of cattle and food crops (rice) and other groups developing cattle and corn crops. The two groups are Kalooran Tawaya and Ranomasom, both groups established since 2013 with each member having 2-4 cows. The type of cattle cultivated is PO. Farmers grow maize other than for sale, some (about 20-25%) were supplied as cattle feed. Corn planting is done twice a year, using simple technology. The problem is that group members do not yet have knowledge of integrated cattle farming development with integrated system between cattle and corn. The objective of this research was to identify the problem of cattle development.

Materials and Methods

The material of this research is cattle (number of cattle owned by farmer), feed (corn waste) and introduced technology that is processing of feed and organic fertilizer. Introduction of technology to overcome feed problems, fertilizer processing to overcome environmental pollution. The research was conducted by using survey method, the location of the sample was determined purposively ie the village that developed the cattle with integrated system. The sample farmers were determined purposively by those farmers who have integrated cattle with minimum ownership of two cattles. Respondents were cattle farmers who were summarized in livestock farming groups empowered with the introduction of feed technology. Data analysis used was descriptive analysis.

Results and Discussion

The results showed that Kalooran Tawaya and Ranomasom farmers lacked capital so they were difficult to increase the cattle population. The cattle farming they developed is still categorized as traditional. In addition to the lack of capital use, according to (Muis, 2015), technological mastery by group members is still low. One factor is the lack of information technology dissemination in the field of cattle farming from various sources. This phenomenon that led to the knowledge of farmers on cattle breeding management is relatively low. Whereas if the farmers joined in the group then the dissemination of information and application of technology can be implemented by members of the group. Farmers can interact in a group that shows an impact of mutual need, increase and strengthen. This has an impact on the increased knowledge and ability of farmers to manage agribusiness systems potentially.

The development of business-oriented cattle depends on the characteristics of each group member. The age of farmer group members ranges from 34 to 57 years old. The age of group members is categorized as still in the range of productive age. This condition indicates that group members have strong physical ability to carry out the farming activities. Kiswanto et al (2004) suggests that age is one factor that can affect the productivity of cattle fattening.

Characteristics of group members are seen from the educational level of group members. The education level of group members is Junior High School (33.33%) and High School (66.67%). The education level of group members can be adequately categorized. Higher educational levels have an impact on the ease of group members in absorbing the technology delivered. It is as suggested by Kiswanto et al (2004) that the higher level of education allows to change attitudes and behavior to act more rationally. Group members planted corn and some of the corn crops at two weeks before the harvest was cut and given to cattle. The amount of corn about 20-25% of the total corn that is grown is given to the cattle. This causes the production of corn for sale is reduced when corn is the main source of income for group members. This phenomenon shows that corn consumption by livestock is competing with human needs. Rural communities (Pinabetengan and surrounding villages) still consume corn in the form of milled into rice. Group members also planted corn for only 2 (two) periods in a year. According to Kusumaningrum and Suharyono (2013), corn plants play an important role in the achievement of food security. According to Bahri (2012), maize crops can be developed in different regions with different climates ie temperate climates to sub-tropical / tropical climates that are wet. Wulandari (2014) states that corn crops can be developed in sub optimal land with a wide range of handling.

In addition to corn waste, cattle feed is natural grass. This causes low productivity of cattle. Whereas feed is one of the factors that determine both the bad growth of cattle (Muslim and Nurasa, 2008; Prawiradiputra, 2011). Several studies conducted by Salendu et al (2012) and Susanti et al (2013), forage are a problem for farmers in various regions.

In addition, cattle waste on farms is not collected by farmers. Whereas cattle waste can be used for organic fertilizer. Organic fertilizers can also be used as an alternative source of income for group members. Number of cattle ownership by each member of group of 2-4 tails, with total for 8 farmers counted 15 tails. Cattles produce feces as much as 12 kg per day per tail which produces 3 kg of solid fertilizer. Feces produced daily for 15 heads are 180 kg and can be made into 54 kg of solid fertilizer. Thus, the farmers will obtain an alternative opinion of Rp 81,000 per day (fertilizer price Rp 1500 / kg) if cattle waste is processed into organic fertilizer.

The results showed that the management of maize still using the pattern of hereditary cultivation has not been using the recommended technology. Cattle also have not used cages but are cultivated on farmland. Feed consumed in the form of waste corn and natural grass. Group members have been trained to preserve fresh corn waste in the form of silage and dry corn waste for ammonia. This is done to overcome if there is excess production and can be utilized in the dry season. Group members have also been trained to utilize feces as organic fertilizer. Evaluation results show that group members' knowledge about the use of agricultural and cattle waste has increased. Respondents as much as 62.5% became interested in the technology applied. Respondents started collecting feces and they started applying the technology of maize planting. The indication of group members began to conduct an integrated production process between corn and cattle.

Conclusions

Based on the results of the study concluded that integrated cattle farming provides positive benefits for group members. Farmers responded positively (62.5% of the respondents) with the empowerment of group members.

Acknowledgment

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Introduction of Technology in Support to Duck Farming in The Tuutu Village of West Tondano District Regency of Minahasa Province of North Sulawesi Indonesia

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Abstract

Duck is one of the livestock developed and is a source of income farmers Tuutu village. The problem is how far the benefits received by the farmers and whether the introduction of the technology responded well. This research has been conducted with the aim to identify problems of duck farming and business profits for empowerment activities through the introduction of technology. This research has been done by using survey method and case study approach. Determination of sample location has been done by purposive sampling. Respondents have been determined based on the farmers who are members of the group. Data analysis conducted is descriptive analysis and RC ratio. The results showed that duck farming was developed in paddy fields. Feed consumption is rice waste after harvesting, this is because feed prices tend to increase. In addition, expensive duck breeds cause duck farming is not continuous. Based on the results of this study, it can be concluded that duck farming is feasible to be developed from RC ratio and introduction of technology responded well by group members.

Keywords: duck, introduction, technology

Introduction

Duck is one of the livestock developed and is a source of income farmers' breeders in Tuutu Village. Duck is a poultry producer of eggs and meat so that is quite potential. Wahyono and Daroini (2013), saying that breeding duck has a business process that is potential to be developed and marketed, both as a profitable business and as a side business, so it is very helpful in increasing the income and living standards of farmers.

Investment opportunities in ducks attracted people, especially in Tuutu Village, because the location of the area adjacent to the paddy's fields and Tondano Lake. This is a support in duck breeding business because of easily to get food and water. Tuutu Village is a part of West Tondano District, Minahasa Regency of North Sulawesi Province, with total area of 3,158 km2 and livestock farmers' livelihoods reach 41% (Central Bureau of Statistics, 2017). This is indicated by the increasing number of duck livestock farms. Whilst the duck meat industry is quite small in comparison to chicken meat production, it is expanding rapidly at a growth rate of 10-15% annually (Stein, 2010). However, despite its potential prospect, duck business also requires a high cost for each period of production. Feed cost has the largest component of total maintenance cost. Because the investment cost is relatively high then the level of profit from the duck business needs to be studied, so it is reasonable whether or not this business to run. The problem is how far the benefits received by farmers and whether the introduction of technology responded well. This research has been done with the aim identify problems of duck farming and business benefits for empowerment activities through the introduction of technology.

Methods

The research materials were ducks, feed, cage, hatching machine. The duck in this study belongs to members of the farmers group. This research has been conducted, using survey method and case study approach. Determination of sample location done by purposive sampling. Research location in Tuutu Village, West Tondano Sub-district, Minahasa District, North Sulawesi Province, with consideration of duck breeders farmers have breeder groups. Number of breeders who are members of the group as many as 32 people and ready to be empowered through the introduction of technology. Data analysis used is descriptive analysis and RC ratio analysis. RC ratio analysis is used by to see the feasibility of duck business.

Results and Discussion

Farmers in Tuutu village cultivate rice crops and also develop ducks. According to Polakitan et al (2011), duck livestock became the foundation of life of some people who live in wet agroecosystem (paddy field, coastal lake and watershed). Based on the existing potential, duck livestock business can be developed integrated rice plants and agribusiness oriented (Elly, 2012).

The results showed that duck breeding in Tuutu Village is still semi intensive and grazing activiy is moving from one field to another. During the day ducks grazed in the fields to find food, but at night the ducks kept to the cage. Duck ownership by group members started from 10 to 600. This condition shows that duck business is still a sideline effort so it cannot be relied upon as the main source of income. Erlina (2013) suggested that duck business can be declared not well developed indicated from 80% of farmers have duck <500 heads. According to Satrio et al (2015) that duck business needs to be developed from traditional to advanced farms by utilizing technology. Budi et al (2015) stated that 1466 cultivated ducks produce a profit of Rp 135,000,000 per year.

The feed given to ducks in the form of finished feed (manufacturers), corn, rice bran and "renga /Snails". Unfortunately, farmers usually get renga from Tondano lake, but nowadays renga can no longer be found. Yet according to farmers renga is a very reliable feed ingredients to improve the productivity of duck eggs. Instead of "renga", farmers give yellow corn (local maize in Minahasa) but not all farmers grow yellow corn. Farmers in this case provide self-managed feeds that are concentrate, corn and bran. Corn and bran were obtained in the concentrated research area purchased at the Livestock Feed Store.

The cages used for the cultivation of ducks are very simple ie made of wire without a roof. Several of them (30% farmers) make semi-permanent ducks. A farmer develops a hatching machine for seeds (DOD). Seeds produced, in addition to the cultivation itself amd is also sold to other farmers in need. Lack of utilization of hatching machine causing duck livestock business is discontinuous. Price of Rp 12,500 seedlings is considered expensive by farmers and difficult to obtain. Farmers' knowledge of hatchery is also low. DOD hatched by farmers only around 65% caused by the feed consumed sizes that do not fit both the quantity and quality. Duck breeder productivity can be improved through improved feed, management and breeding program (Hidayati, et al 2016).

The results of the study that the feed given to ducks in the form of feed manufacturers, corn, rice bran and "renga/snails". Farmers usually get snails from Tondano lake, but nowadays it is barely found. According to farmers renga is a very reliable feed ingredients to improve the productivity of duck eggs. Instead of snails, farmers feed yellow corn (local maize in Minahasa) to the ducks but not all farmers grow yellow corn. In this case, farmers provide self-managed feeds consisted of concentrate, corn and bran. Corn and bran were obtained in the research area purchased, while consentrate were taken at the Livestock Feed Store.

The cages used for the cultivation of ducks are very simple ie made of wire without a roof. Only 30% farmers made semi-permanent ducks cage. A farmer develops a hatching machine for getting day old ducks (DOD). DOD produced, besides for the cultivation itself also to be sold to other farmers. Lack of utilization of hatching machine is causing duck livestock business discontinuous. Price of DOD Rp 12,500 is considered expensive by farmers and difficult to obtain. Farmers' knowledge of hatchery is also low. Only 65% of DODs is hatched by farmers because the feed consumed do not fit both the quantity and quality. Duck breeder productivity can be improved through improved feed, management and breeding program (Hidayati, et al 2016).

The results showed that the duck business income was Rp 557,700,000. This revenue was obtained from the sale of rejected ducks and duck eggs. The farmer spent Rp 296,168.62. These costs consist of fixed costs and variable costs. Fixed costs are the cost of the cage and the place to eat / drink. Variable costs consist of DOD, feed, vaccine / medicine and labor costs. The R / C value of 1.88 means every Rp. 1,000 cost incurred by breeder in duck breeding business hence revenue earned equal to Rp. 1.880 / duck. Based on this value of RC ratio, the duck business in Tuutu Village is feasible to be developed. RC value of this ratio is still greater than the results of research by Lastinawati (2016) which obtained RC ratio of 1.42. This condition shows that duck business in Tuutu Village has prospect and opportunity to be developed. But duck breeders in Tuutu Village, West Tondano District have knowledge and experience of breeding for generations. The absorption of technology introduction in this case is always "wait and see", it means to wait and see the success of the applied technology, then the breeder will follow

Based on the problem, technological intuition has been done through empowerment of group members. Empowerment is a human-oriented development system by promoting the principle of participation (participatory), democracy (inclusive democratic) and justice (equity), the process of providing access (ease) so that ultimately achievable progress and independence (Hendayana, 2005). Empowerment is done through the use of hatching machines and the preparation of rations by utilizing local resources. The farmer's response to the introduction of feed technology at the time of the research was excellent. The absorption of technology depends on the characteristics of group members. Age of group members ranges from 29 - 56 years, are categorized as productive age. Age is one factor that can affect the productivity of the livestock business. Livestock productivity is closely related to technology adoption. Farmers who are still productive will be easier in adopting technology. The education of group members also determines the absorption of introduced technology. Group education level 6.25% at elementary school, 12.5% at junior high school, and 81.25% at senior high school. The low level of education affects the productivity of the duck business. Moreover, an increased level of education can allow a person to change his attitude and behavior to act more rationally.

Conclusions

Based on the result of this research, it can be concluded that duck business in Tuutu Village, West Tondano Sub-district of Minahasa Regency, is feasible to be developed if seen from analysis value of R / C ratio 1, greater than one. Introduction of technology responded well by duck breeder farmers in Tuutu Village.

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Cattle Production and Efficiency in Pinogaluman of North Bolaang Mongondow Province of North Sulawesi, Indonesia

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Abstarct

Cattle is one of the mainstay livestock and serves as a source of income for the community in the Pinogaluman District. Some farmers develop cattle integrated with rice crops. Integrated cattle farming development show the development carried out under the principles of environmental friendly. Development with the system integration is done by utilizing rice waste as cattle feed and cattle waste as compost. The problem of rice waste has low nutritional quality as the need for feed for cattle. Based on the problem then has been done research, in Pinogaluman District with the aim to know the benefits of cattle farming. This research has been conducted in Pinogaluman District of North Bolaang Mongondow Regency using survey method. Village as the location of research is determined by purposive that is village which have the most of cattle population. The number of respondents as many as 30 farmers has been determined by simple random sampling. Data analysis used is descriptive analysis. The results showed that research area is agricultural development area with rice as the dominant crop. The development of cattle farming depends on the characteristics of farmers. Age of respondent is categorized as productive age and education level is considered low. The number of cattle ranges from 2-6 heads, which is grazed on farmland. The food consumed is wasted rice and wild grasses. Based on the result of this research, it can be concluded that cow farming is feasible to be developed which seen from RC value of greater ratio one.

Keywords: development, cattle, benefits

Introduction

Demand for livestock products tends to increase due to increasing population, community income, and community knowledge about the importance of animal protein consumption of livestock. On the other hand, the increasing needs of livestock products can not be offset by its availability (Rahmawaty and Budianto, 2011; Buharman, 2011; Utomo and Widjaja, 2012) especially for beef. According to Sibagariang et al. (2010) that the contribution of beef 24% of total national meat consumption.

Cattle is one of the mainstay livestock and serves as a source of income in the community Pinogaluman District. Some farmers raising cattle integrated with rice crops. The Walia and Kaur (2013) studies showed that integrated farms were less risk, efficient, gave benefits to farmers and impacts on environmental health. Integrated farming is the right choice because of the limited ability of agricultural resources (Wulandari, 2014). Unified farming according to Wahyuni (2015) is an alternative effort in order to improve the efficiency of cattle business on farmland. Integrated cattle breeding development demonstrates environmentally friendly development. According to Munandar et al. (2015) that a Farming System Integration is an alternative to climate change mitigation. Development with the system integration is done by utilizing rice straw as cattle feed and cattle waste as compost. The problem of rice straw has a low nutritional quality in meeting the needs of feed for cattle. Based on these problems then conducted research in Pinogaluman District with the aim to know the benefits of cattle farming.

Materials and Methods

The material this research is cattle, feed, labour. Cattle are based on cattle ownership by each respondent. Feed is based on forage consumed in the form of rice straw, corn straw and natural grass. This research was conducted in Pinogaluman District of North Bolaang Mongondow Regency using survey method. Village samples as the location of research was determined purposively with cattle population 2902 heads. The number of respondents as many as 30 farmers was determined by simple random sampling. Data analysis used was descriptive analysis and RC ratio analysis.

Results and Discussion

The results showed that the research area was agricultural area with rice plant was the dominant plant. The development of cattle farming depents on the characteristics of farmers. Respondent's age ranged from 25 to 65 years old, and 90% (27 respondents) were under 65 years old so most of the respondents were categorized as productive age. According to Suprianto (2016) that the productive age indicates that farmers are expected to be able to perform their activities without the constraints of decreasing physical ability as the ages continue. The education level of respondent for elementary school was 53.33% (16 respondents), junior high school 40.00% (12 respondents) and high school 6.67% (2 respondents). This condition shows that education level in research area was still low. The number of family members 2-5 people, this condition affect the ratio of consumption and workers. The more family members the higher the respondent's income to be allocated as consumption expenditure.

The number of cattle reared per farmer ranges from 2-6 with the total of 76 cows reared on agricultural lands. The feed consumed was rice straw, corn straw and natural grass that grows wild (field grass). Total forage feed consumed by 1 cattle daily is 20.7 kg, consisting of 10.5 kg of rice straw, 5.4 kg corn straw and 4.8 kg of field grass. Rice straw was the feed that the respondents rely on. Food crop wastes strongly support feeding needs in the North Bolaang Mongondow Regency (Pomolango et al., 2016). However, rice straw has a high fiber content and low energy levels so that the digestibility is low. Feed consumption according to the results of research was considered low so it needs to be pursued the development of quality forage. According to Utomo and Rasminati (2010), the availability of forage is one of the critical factors in the success of cattle farming. Sustainable forage production was an important factor in cattle production systems (Dianita et al., 2014).

However, the improvement of forage feed by Jasmani and Haryanto (2015) needs to be followed up with efforts to increase community interest and expansion of plantation area.

The success of livestock business depends on the revenue of the sale of cattle by farmer. Farmers sold cattle if they need money for purchasing inputs for paddy farming, building houses, paying for school children and other urgent needs. Research by Kalangi et al. (2014) showed that most farmers sold their cattle for cash to fulfill the family needs for food, education, health, and also festivity cost. Revenue in this study was calculated based on the value of cattle during the study. Average farmer revenue was Rp 22,800,000. Production costs consist of fixed cost and variable costs. Fixed costs in the form of rope and machete costs, while variable costs consist of feed costs and labor costs. Fixed cost of Rp 107,500, feed cost Rp 11,541,300 and labor cost Rp 1,837,674 with total cost Rp 13,486,474. Feed purchases are assumed to purchase forage of Rp 600 / kg and labor cost is assumed Rp 12,500 per hour. The average labor allocation per day is 0.4 hours. Profits obtained by farmers of respondents is Rp 9,313,526 with RC ratio 1.69. Based on the RC ratio, it shows that the business managed by the respondent is feasible to be cultivated, such as Satiti et al statement (2017) that the feasibility of cattle business can be seen from its RC value. Cattle are a source of farmers income for Pinogaluman District, so the population and productivity still needs to be improved. Government intervention is needed to encourage the development of cattle farms. Jamilah (2017) argued that the development of cattle proclaimed by the government as a reference in increasing the income of farmers as well as a major driver of regional economic development.

The results showed that cattle waste had not been utilized as organic fertilizer which will certainly have an impact on environmental pollution. Issues developed both nationally and internationally that farms are considered as one of the causes of CO_2 emissions that lead to increased global warming. According Syarifuddin (2012), need to find an effective way to reduce the risk of environmental pollution. The development of cattle using integrated farming system approach is suggested showing an interrelated approach. Organic fertilizer sourced from cow waste can substitute organic fertilizer. But according to Wibowo and Sumanto (2012), the development of integrated cattle farming needs government support.

Conclusions

Based on the result of this research, it can be concluded that cattle business is feasible to be developed which seen from RC value of ratio is bigger one. Government assistance in the development of integrated cattle farms is needed.

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FULL PAPERS

PARALLEL SESSIONS

SUBTHEME: BREEDING AND GENETICS

The Effects of Chicken Type on Egg Production and Egg Quality on Crossbreed Local Chicken with Backyard Maintenance System

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Abstract

A series of studies have been conducted that aim to improve the genetic quality of local chickens to produce superior local layer chickens that have been done since 2008 until now. This study was conducted on the eighth derivative (F8) of crossbreed chicken with backyard maintenance system. Chicken was observed in this study was produced by crossbreeding between local chickens from Aceh and Arab Chicken. Chicken was divided into 2 types, namely; medium and heavy types. Each treatment of chicken types used 100 chicken and the total number of observed chicken was 200 chicken. The evaluation on egg production was done between 6-8 month of age. Each stage of production was evaluated parameter of egg quality which were egg weight, thickness of bark and Haught Unit = HU. The results showed that local laying chicken produced by crossbreeding has a significantly difference on egg production and egg quality. Egg production on heavy type chicken was higher than medium type. In terms of egg quality there was a significantly difference where egg weight, thick shell and HU in heavy type chicken was better than medium type. The conclusions of this study indicated that crossbreeding between local chicken and Arab chicken produced a local laying chicken was better than its origin. This was a result of differences in physical conditions due to the influence of cross-breeding.

Keywords: chicken type, crossbreeding, egg, haught unit

Introduction

Improvement of genetic quality on local chickens through genetic selection and breeding programs is a long-term strategy. Genetic influence is an important factor in determining the quality of local chicken. This program is done strictly to produce superior laying local chickens. The goal of cross breeding programs in local chickens is to increase egg production, immunity and quality to meet consumer needs due to the egg of local chicken has its own distinctive features that have a high number of customers. Cross-breeding in poultry will have the mutual benefit of substituting the nature of the parent and male origin to take advantage of heterozygoteote (Devik and Reddy, 2005).

Currently, the result of crossing between local chickens, Arab and laying chicken has produced derivatives of local chicken for egg production. This chicken has the ability of egg production is much higher than the local chicken. In addition, egg production is also affected by maintenance systems, feed quality and chicken health (Zelleke , 2005: El-Ghar et al., 2010). The local chicken produced by cross breed program has an advantage in the production and quality of eggs, hatchability, shape and weight of life compared to native local chickens. Derivates of local chicken is a hybrid chicken that can be maintained on open and limited area (backyard system) and it has a high egg production. Efforts to improve the genetic quality and ability local chicken for egg production still continue through a strictly breeding program followed by selection on derivatived local chicken.

Nowadays, there are 2 types of deerivated local chickens were maintened: medium and heavy type. Both of chicken types still have variation in the ability of egg production between 177-240 eggs (M. Aman Yaman et al., 2008). It needs to be uniformed for future and also to improve the quality of eggs both internal quality (nutrient content) and external (weight, shape and egg shell thickness).

Materials and methods

The present study used 400 hens resulting from cross breeding between local chicken and Arab chicken, 5-month-old and divided into 2 groups: medium and heavy types. Each type of hen was divided into 4 groups consisting of 25 hens. Each treatment group was maintained in a backyard cage size 5x7 meters. Backyard cage was equipped with egg nesting, feeder and drinker. Hens were fed on a commercial layer feed containing 18% crude protein and EM 2900 Kcal / kg.

Parameter measured

All data on both chickens' types: medium and heavy type was collected after the adaptation period in the backyard cage for 4 weeks. Parameter was evaluated on egg production: feed conversion, egg production, hen-day, mortality, egg weight and egg mass were recorded during 3 months trial. Egg production was recorded daily at the same time and was calculated on a hen-day basis. Total number of eggs collected divided by total number of live chicken per day in each group. Records of the feed intake were taken on monthly basis. Hens were observed twice daily; weight of dead birds was used to adjust for feed consumption. Feed conversion was calculated as the ratio of grams of feed to grams of egg mass. In each group, 25 egg of hens were taken in each month to assess the characteristics of egg quality. Egg mass was calculated as a factor of egg weight and hen-day egg production. Eggs were saved 2-day monthly to measure egg weight. Measurement of egg shell was done by using an auto egg thickness meter and Haught Unit (HU) was measured by using automatic egg analyzer.

Statistical analysis

All collected data were determined by using the SPSS version 16 (SPSS, Cary, NC, USA) statistical analysis program. P value of <0.05 was considered for significant differences among groups and the comparison of means was considered by using Duncan's Multiple Range Test (Steel and Torrie 1984).

Results and Discussion

a. Egg Production

The result of present study showed that there was a high significant effect on crossbreed chickens on body weight, feed consumption, egg production and egg quality due to differences in type of hens (medium and heavy types). One of the advantages of crossbreeding is to produce chickens that have a heavier weight and grow faster than their origin. It was known that body weight of heavy type hens was heavier than that of medium type chickens. The difference in body weight of chicken influenced feed consumption, whereas heavy chicken consumed more than medium type chickens. In accordance with Abdelqader et al. (2007) which stated that the differences in body size and weight will affect feed consumption. In laying hens egg production will be determined by ideal body weight during adult sex and daily feed consumption (Odula et al., 2009). It was known that the main factors that body conformation and body weight of hens was greatly affected on egg production of hen (Miah et al., 2002). Besides that, the amount of feed consumption also affected egg production both on medium and heavy type of crossbreed chicken.

Table 1. Differences in parameter of egg production on crossbreed chickens were maintained in a backyard system

Parameter	Medium Type (age)			Heavy Type (age)		
	6 M	7 M	8 M	6 M	7 M	8 M
Initial Body Weight (gr)	1491.00a	1567.00 b	1670.00c	1612.00a	1745.00b	1812.00c
Feed Consumption (gr/hen)	87.50a	91.20b	101.40c	88.90a	95.60b	112.35c
Mortality (%)	0	0.005	0.005	0	0	0
Hen-day (%)	23.40a	46.80b	63.80c	32.24a	51.12b	69.45c
Total egg production (egg/month/tot al hens)	1380a	2820b	3840c	1920a	3120b	4170c

The number of hens used for each chicken type group was 200 hens.
Means within a row followed by the different superscripts differ significantly.

b. Egg quality

The results also showed that different types of chicken produced by cross-breeding affected the egg quality. In addition, the different types of chickens due to cross-breeding will produce different egg qualities. The results showed that the result of cross breeding between local chickens and Arab chicken affected the egg weight, eggshell thickness and HU of egg. Chickens cross-breed with heavy type has produced better quality eggs compared with medium type.

Table 2. Differences in parameter of egg quality on selected local chickens were maintained in a backyard system

Parameter	Medium Type (age)			Heavy Type (age)		
	6 M	7 M	8 M	6 M	7 M	8 M
Egg weight (gram)	32.12a	36.27ab	39.22b	34.21a	38.11b	42.20c
Egg shell thickness (mm)	0.32	0.33	0.36	0.35	0.38	0.39
Haught Unit	62.42a	65.17ab	66.67b	64.12a	66.67b	69.21c

The number of hens used for each chicken type group was 200 hens.
Means within a row followed by the different superscripts differ significantly.

Yaman et al. (1997; 2000) informed that the size, shape and weight of egg are affected by the condition of reproductive organ of hen. In the selection process, light type of egg chicken is not used for egg production. Medium and heavy type hens will an option for breeders of commercial laying chickens because both types of chicken can produce a high egg production and a good egg quality. A ddifference in body weight of hen affect the size of chicken body and it will affect the condition of the reproductive organ for egg production (M. Aman Yaman et al., 2000 [a]). From the side of egg quality, the results indicated that heavy type of selected local chicken produced a better egg quality than medium type chicken. Heavy-weight chicken eggs produced egg weight; egg shell thickness and HU value were higher than medium-type chicken. According to M. Aman Yaman et al., (1992[b]) and Bain (2005) informed that heavy chickens of laying hen has the ability to produce a high quality of egg but the period of egg production becomes shorter.

Conclusion

It was well known that egg production and egg quality crossbreed chicken was influenced by chicken type. This study indicated that egg production and egg quality of hen produced by cross-breeding between local chicken and Arab chickens which were maintained in a backyard system affected by type of chicken. The heavy type of chicken produced a higher egg production and has abetter egg quality than medium type chicken. This condition was affected by difference in body weight and feed consumption beween both types.

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Comparative Morphometrics Based on Discriminant Analysis in Rooster and Hens Local Chicken from East Kalimantan

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Abstract

The local chicken East Kalimantan (Nunukan chicken cross breed) is one of the chickens crossing from Nunukan chicken and local chicken of East Kalimantan as one of genetic resources of genuine chicken from Borneo which has the potential to be a chicken breeding in Indonesia. This chicken is a native chicken Indonesia that has a different phenotypic diversity of other local chickens. The aim at the study was to compare and study chicken differentiation variables based on the size of rooster and hen's local chickens of based on discriminant analysis approach. Phenotypic characteristics of body size used as the basis of characterization is body weight (BW), Height of Body (HB), Body length (BL), chest circumference (CC), chest width (CW) and shank length (SL). The research was carried out at the House's of Local Chicken Maintenance have Agriculture, Fisheries and Forestry Office of Samarinda City Government, East Kalimantan. The material used 35 local chickens East Kalimantan consists of 21 rooster and 14 hens chicken. Six measured body size variables were body weight, height weight, body length, chest circumference, chest width and shank length. Statistical analysis using descriptive analysis and discriminant analysis with the help of statistical programme computer to find out the differentiation variables between rooster's and hens chickens were observed. The results showed that significant body size variables differed from height of body and shank length except body length, chest circumference, and chest width. The variability of morphometrics of local chickens of East Kalimantan was 64.16%, while the discriminant model formed for body weight into this study on local chickens of East Kalimantan was Y = 0.649 - 0.359HB + 1.144SL.

Keywords : morphometrics, discriminant analysis, local chicken, east kalimantan.

Introduction

Nunukan chicken is a local chicken germplasma in Indonesia that has the potential as poultry producer eggs and meat. Local poultry growing in this area of Kalimantan has a dispersal area in the provinces of East Kalimantan and North Kalimantan. The history of the development of local poultry is on the island of Tarakan North Kalimantan which originated from chicken descendants originated from China brought merchant to Tarakan island through Tawau region in Malaysia than in cultivation and crosslink with local chickens from Kalimantan by local farmers. The development of Nunukan chicken is now not only in Tarakan City, but also developed in Samarinda city, which is cultivated as local chickens either as domesticated livestock at home.

The Productivity of nunukan chicken growing in breeders is still less so the number of local chicken population is still small. Efforts to increase the productivity of nunukan chicken in Samarinda City one of them is by cross-breed with local chicken. Some things that cause low productivity of nunukan chicken, among others, it’s relatively slow compared to other chickens. In addition, the slow growth of fur makes farmers less interested in raising nunukan chicken, the age of three months and 50% of growing chicken nunukan (Wafiatiningsih *et al*., 2005). However, nunukan chicken has productivity potential that can be developed as a double functions chicken that is egg production reaches 182 eggs per year and egg weight reach 47,5 g and structure of body shape above average from other chickens (Alwi *et al*., 2014).

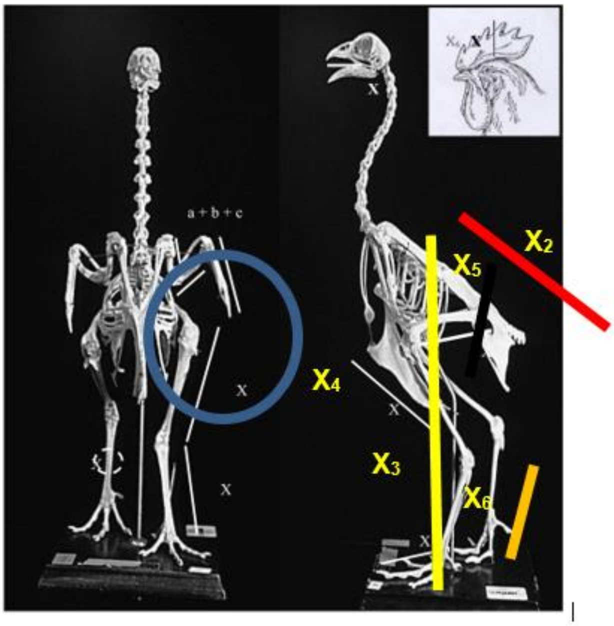
The local hometown of East Kalimantan is the result of a cross between nunukan chicken and chicken growing in East Kalimantan (*Gallus gallus domesticus*). In terms of productivity, local chicken is like the parent chicken nunukan, but with a different morphometric that is like his parents are chicken. The development of a chicken population of these crosses in the city of Samarinda relatively little, this is what causes information related to the productivity of this chicken is still very less. According to Sartika *et al*., (2006) the characteristics of nunukan chicken color consist of brownish red fur with the pattern of Columbian fur is wings and tail of the black tip , has a golden fur plumage, yellow or white claw color, while the fur pattern is dominated by plain color, but there are also striated patterns, associated with the comb, there is a single (single) and pea shape. While the characteristics of crossing nunukan chicken with local chickens to produce characteristics such as brown yellow brown beak color in cocks and hen, while the jagger for hen pink and cock red, hen young beige and yellow cock, for shank color both hen and cock color is yellow.

The results of crossing the two nations make local chickens of East Kalimantan have phenotypic combinations of both parents. The determination of the phenotypic variation in local chickens of East Kalimantan can help to provide information about showing the body's morphology of the livestock. The importance of this phenotypic information can be used as a morphometric variable to give a specification of the specificity of local chickens. This study aims to compare and study the morphometric body of local chickens of East Kalimantan which became variable based on discriminant function. The phenotypic characteristics are based on the morphometric measurements found in the local chickens of East Kalimantan obtained from the research. This can be used as a means or selection criteria in determining the selection process for the development of local chickens of East Kalimantan.

Materials and Methods

The study was conducted at the Local Livestock Development Sector owned by the Department of Agriculture, Fisheries, and Forestry Governance of Samarinda City. The research material used is local chickens of East Kalimantan consisting of male and female amounted to 35 heads. Roosters local chickens used as many as 21 heads and hens are used as many as 14 heads. Chickens that have been measured criteria that the chicken conditions in its infancy have entered the grower period.

The tools used during the study include the term sliding, tape to measure, digital scales, and digital cameras. In addition, it is also used a spread sheet containing information about the data onto research variables that will be observed in the study of body weight, body length (X1) , shoulder height (X2), chest circumference (X3), chest width (X4) and shank length (X5). Figure 1 shows the body parts of the chickens that were measured and observed in the study. The following measures are carried out :



Noted :

X_1 = Body weight	X_3 = Shoulder Height	X_5 = Chest width
X_2 = Body length	X_4 = Chest circumference	X_6 = Shank length

Figure 1. Measurement of morphometric body of Local Chicken East Kalimantan (Sartika, 2013).

Data Analysis

The mean value of both sexes of local chickens of East Kalimantan was tested statistically for the linear discriminant function of Fisher according to Gaspersz (1992) formulated as follows :

$$\text{Y} = a'X = (\overline{X1} - \overline{X2})'SG^{-1}X$$

a = Vector coefficient of weight discriminant function

X = Vector of random variables identified in the discriminant function model

$\overline{X1}$ = Vector of the average value of the random variable of the first group

$\overline{X2}$ = Vector of the average value of the random variable of the second group

SG^{-1} = Inverse composite matrix combined (inverse of SG matrix)

The classification of individuals in the local chicken group observed was based on the Wald-Anderson statistic test, according to gaspers (1992) and Anderson (1984) with the following formula :

$$W = x'SG^{-1}(\overline{X1} - \overline{X2}) - \frac{1}{2}(\overline{X1} + \overline{X2})'^{SG^{-1}}(\overline{X1} - \overline{X2})$$

W = Wald-Anderson statistical test score

X' = Vector of individual random variables

$\overline{X1}$ = Vector of the average value of the random variable of the first group

$\overline{X2}$ = Vector of the average value of the random variable of the second group

SG^{-1} = Inverse composite matrix (inverse of SG matrix)

Criteria for classification of observations based on statistic W are :

1. Allocation X into the first population group if W > 0
2. Allocation of X into second population group if W ≤ 0

Data analysis is assisted by using statistic programme software to facilitate data processing this research.

Results and Discussion

Morphometric comparison of Local Chicken from East Kalimantan

Average and standard deviations based on body size variables observed in local chickens of East Kalimantan are shown in Table 1. Based on local chickens East Kalimantan performance rooster have a larger body than hens, but when viewed on the basis of body weight, the fhens have a greater weight average than the rooster. The coefficient of variation in the size of local varieties of local chickens of East Kalimantan, both rooster and hens, is presented in Table 1, showing that the body weighted is a large diversity compared to body size. The coefficient of diversity is used to know the difference between a diversity of one variable with another variable. Based on body size of roosters, the greatest diversity coefficient was found in chest width (13.27%), while moderate variation was body length (5.85%). In hens, the largest coefficient of diversity is found in the size of the chest circumference (13.55%), while the smallest is in the shank length (3.71%). Based on the coefficient of diversity, it can be shown that the rooster has a variety of morphometrics in the body part. Chest width which shows the weight of the rooster body affected body sizes on the width of the chest. While in hens, chest circumference will affect body weight.

Table 1. Average, standard deviation and diversity coefficient of measurement results of body size variables observed in local chickens of East Kalimantan .

Variable body size	Local chicken of East Kalimantan		
	♂(n =21)	♀ (n = 140)	♂ + ♀
Body weight (g)	1,790.48 ± 481.41 (26.89)	1,847.50 ± 186.75 (10.11)	1,818 ± 334.08 (18.49)
Shoulder height (cm)	30.89 ± 2.82 (9.20)	26.19 ± 1.54 (5.88)	32.60 ± 2.19 (7.54)
Body length (cm)	22.38 ± 1.31 (5.85)	21.83 ± 1.09 (4.98)	22.10 ± 1.19 (5.42)
Chest circumference (cm)	28.38 ± 3.39 (11.94)	27.31 ± 3.70 (13.55)	27.83 ± 3.54 (12.75)
Chest width (cm)	8.61 ± 1.14 (13.27)	8.56 ± 1.07 (12.54)	8.59 ± 1.11 (12.91)
Shank length (cm)	6.28 ± 0.68 (10.82)	7.06 ± 0.26 (3.71)	6.67 ± 0.47 (7.26)

Keterangan : ♂ = rooster, ♀ = hen, n = number of samples, numbers in parantheses denote is the coefficient of diversity in units (%).

Analysis Correlation Local Chicken of East Kalimantan

Results of correlation analysis of the sizes in local chicken of East Kalimantan based on roosters and hens can be seen in table 2 below.

Table 2. Sizes correlation local chicken of East Kalimantan

Variable body size	Local chicken of East Kalimantan	
	Roosters (n= 21)	Hens (n= 14)
Shoulder height	r = 0.436*** R= 19,00	r = 0.592*** R= 35,10
Body length	r = 0.475*** R= 22,60	r = 0.220**** R= 0,00
Chest circumference	r = 0.429*** R= 18,40	r = 0.487*** R= 23,70
Chest width	r = 0.458*** R= 21,00	r = 0.431*** R= 18,60
Shank length	r = 0.247**** R= 6,10	r = 0.239**** R= 5,70

Noted : r = Correlation coefficient; R^2 = Determination coefficient; *****0,06 - 0,199 (very low);; ****0,2 - 0,399 (low); ***0,4 - 0,599 (medium); **0,6 - 0,799 (strong); *0,8 - 1 (very strong)

According to Setianto *et al.*, (2008) that the correlation coefficient is declared low in 0.5 - 0.25. The value of the correlation coefficient is important to the selection to produce the desired production value (Setianto *et al.*, 2008). According to Sartika (2013), more bone growth is regulated by genetic factors in addition to the homogeneous circulation. Results of correlation between local chickens of East Kalimantan roosters and hens variable body trait indicate the existence of variation of correlation value that is medium and low. Based on the results of Table 2, the size of body variables such as shoulder height, body length, chest circumference and chest width included in medium correlation category, only shank length including low correlation. This indicates that the variable shank length can't be used as a selection factor. In hens, body sizes such as chest circumference, shoulder height, and chest width include moderate correlation, while body length and shank length are included in low correlation value. According to Wardono (2014), the estimation of correlation values has a significance of livestock selection that can be done earlier.

According to Kusuma (2002), the chest width and chest circumference indicate the existence of a sufficient room of work part organ - internal organs. The results showed a moderate correlation between body weight in both roosters and hens. The average effect on the weight of the local chickens of East Kalimantan roosters and hens is on the result of a high correlation of shoulder height, chest circumference, and chest width. Variable properties of chicken body height can be used as a chicken weight estimation. According to Pamungkas (2005), the body part is a parameter of growth and correlated positively with body weight. Weight size is an inherited trait, but the performance of an individual can be affected by the surrounding environment. According to Wardono (2014), the selection of chickens can be done at 4 weeks old weight and to gain weight at 12 weeks for good result.

Regression equation Body Size in Local chicken of East Kalimantan

Table 4. Simple regression equation of the Body Size with Body Weight in Roosters and Hens in Local Chicken of East Kalimantan

Sex	Variable body size	Regression equation	noted
Roosters (n = 21)	Shoulder height (SH)	Y = - 489,59 + 73,82SH	tn
	Body length (BL)	Y = -2.118,88 + 174,71BL	tn
	Chest circumference (CC)	Y = 60,05 + 61,03 CC	tn
	Chest width (CW)	Y = 129,46 + 192,93 CW	tn
	Shank length (SL)	Y = 2.889,90 + 175,17 SL	tn
Hens (n = 14)	Shoulder height (SH)	Y = 3.727,54 – 71,80 SH	tn
	Body length (BL)	Y = 1.764,38 + 3,81 BL	tn
	Chest circumference (CC)	Y = 1.175,87 + 24,60 CC	tn
	Chest width (CW)	Y = 1.205,84 + 74, 92 CW	tn
	Shank length (SL)	Y = 3.049,11 + 170,09 SL	tn

Noted : tn = not significant

The result of regression analysis showed that shoulder height, body length, chest circumference, chest width and shank length were similarities in the estimation of body weight local chicken of East Kalimantan. The technique of estimating body weights of local chickens of East Kalimantan in roosters and hens are presented in

Table 4. According to Pamungkas (2005), the chicken has a normal life weight growth started slowly then quickly eventually returns slowly. According to Rajab and Papilaya (2012) variations of the chicken, body size can be caused by the influence of environmental conditions and the climate of the origin of different origin that affect the weight of the body. Estimation of body weight of a livestock will affect the feeding. How much feed gives can be seen from the weight of the livestock. According to Trisnawanto *et al*., (2012). Body weight is an important aspect in livestock because it can be used to determine the needs of animal feed and the need to buy and sell livestock.

Analysis Discriminant between Roosters and Hens in Local Chicken of East Kalimantan

The discriminant function form the results of the analysis on the body variables of local chicken of East Kalimantan can be presented in Table 5 below.

Table 5. Result of analysis discriminant function of variable body size of local chicken of East Kalimantan

Variable body size	Analysis discriminant function		
	Discriminant value	F	Significant value
Shoulder height (X_2)	0.509	31.812	0.000
Shank length (X_5)	0.660	17.029	0.000
Body length (X_1)	0.952	1.656	0.207
Chest circumference (X_3)	0.978	0.744	0.395
Chest width (X_4)	0.131	0.014	0.907

Based on Table 5, It can be seen that two variables of body size local chicken of East Kalimantan resulted from crossing nunukan chicken with local chickens significantly differentiate or discriminate against both sex of roosters and hens such as shoulder height (X_2) and shank length (X_5). Overall, based on the order for variables, the results of the discriminant function analysis are the shoulder height (X_2), shank length (X_5), body length (X_1), chest circumference (X_3), and chest width (X_4). Variable body sizes consisting of five variables of body size, then obtained relationship between variables of body size of body weight variables as a link to determine the productivity of local chickens of East Kalimantan. From the result of discriminant analysis got that correlation values.

Tables 6 and 7 show that body length (X_1), shoulder height (X_2), chest circumference (X_3), chest width (X_4) and shank length (X_5) both roosters and hens are not significantly different and correlation coefficient have value weak.

The morphometric comparison of the local chickens of East Kalimantan shows a low morphometric similarity between the two sex. This is based on the differentiating variables formed from the discriminant function of the two groups of chickens. In addition, also obtained a correlation relationship between the independent variables of body size of the dependent variable of body weight. Correlation values of the relationship between these two variables are very high that is 0.801. While the explanation related to diversity, body size variables resulted in 64.16 percent of the diversity that affects the variable body weight.

Table 6. Confidence interval 95% and correlation between established variables and discriminant function in roosters group Local chicken of East Kalimantan

Variable body size	Confidence interval 95 % (α = 0,05)	Correlation Coefficient
Body length (X_1)	tn	0.475
Shoulder height (X_2)	tn	0.436
Chest circumference (X_3)	tn	0.429
Chest width (X_4)	tn	0.458
Shank length (X_5)	tn	0.247

Noted : tn = not significant

Table 7. Confidence interval 95% and correlation between established variables and discriminant function in hens group Local chicken of East Kalimantan

Variable body size	Confidence interval 95 % (α = 0,05)	Correlation Coefficient
Body length (X_1)	tn	0.220
Shoulder length (X_2)	tn	0.592
Chest circumference (X_3)	tn	0.487
Chest width (X_4)	tn	0.431
Shank length (X_5)	tn	0.239

Noted : tn = not significant

Based on discriminant function can be produced discriminant model obtained from the analysis of the variable body size of a local chicken of East Kalimantan based on the sex of rooster and hen. This discriminant model is used as a reference to determine the discriminant score of the local chicken of East Kalimantan. The discriminant model of the size of the local chicken body of East Kalimantan produces the functions presented in Table 8.

Table 8. Model discriminant body size of local chickens of East Kalimantan

No	Discriminant model in local chicken of East Kalimantan
1	Z = 0,649 – 0,359 shoulder height (X_2) + 1,144 shank length (X_5) + 0,001 body weight

Differences and similarities of phenotypic morphometric body size of local chickens of East Kalimantan from the comparison of both sex due to differences in function and benefit of the chicken for selection purposes (Sartika, 2013). In addition, genetic and environmental factors also have a close relationship, thus affecting the morphometric expression of livestock based on genetic capacity perfectly accompanied by ideal environmental conditions (Sumantri *et al*., 2007). However, with the discriminant model of the body size of the local chicken of East Kalimantan is indirectly assist the process of breeding local livestock. This is in accordance with the opinion of Mariandayani *et al.*, (2013), analysis discriminant phenotypic parameters can also be used to define morphometric parameters that show the national markers and are mentioned as the nation's differentiating variables. According to Sartika (2013), the difference between differentiation factor of body sizes of local chickens of East Kalimantan that influences body weight both in roosters and hens due to differences in the selection process selection process selection process and selection of the elderly chicken origin of East Kalimantan namely nunukan chicken and native chicken.

Conclusion

The coefficient of diversity is used to know the difference between the diversity of one variable with another variable. Based on body size of roosters, the greatest diversity coefficient was found in chest width (13.27%), while moderate variation was body length (5.85%). In hens, the largest coefficient of diversity is found in the size of the chest circumference (13.55%), while the smallest is in the shank length (3.71%). Based on body size that has an influence on the body weight of local chickens of East Kalimantan rooster and hen is on the result of a high correlation of shoulder height, chest circumference, and chest width. Differences in differentiation factors of body size of local chickens of East Kalimantan that affected body weight both in roosters and hens due to differences in the selection process selection process selection process and selection of the orthodontic origin of local chickens of East Kalimantan namely chicken nunukan and native chicken.

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In vitro Embryo Production Using Simmental Cattle (*Bos taurus*) and Brahman Cattle (*Bos indicus*) Frozen Semen

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Abstract

In vitro embryo production is one of embryo biotechnology application to increase the population, productivity, and quality of cattle in Indonesia. The implementation of this method is used to utilize ovary as a source of valuable product oocytes at the slaughterhouse, to produce embryo in vitro. The research aims to know which cattle that had a better developmental capability and study the influence of season to in vitro embryo production. The result indicates that Brahman cattle sperm has better ability than Simmental cattle sperm on in vitro embryo production, embryo cleavage rate, blastocyst formation day 6th, 7th, 8th, and 9th, as well as significant differences (P<0.05). By using Brahman cattle sperm which has better capabilities, in vitro fertilization then conducted in two different seasons, the dry and rainy season. The result indicated that in vitro embryo production by using Brahman cattle sperm is better (P<0.05) conducted at dry season than rainy season.

Keywords: brahman cattle embryo, in vitro embryo production, season

Introduction

In vitro fertilization is one of the applied biotechnology to increase the population and productivity of cattle. *In vitro* fertilization can be used to improve the genetic quality, prevent the diseases spread, also to increase the productivity of dairy and beef cattle. The implementation of this method is used to utilize ovary as a source of valuable product oocytes at the slaughterhouse, to produce embryo *in vitro* (Boediono *et al*. 2000). That can be possible by the aspiration process and ovary maturation, fertilization by spermatozoa, and *in vitro* embryo development (Boediono and Damayanti 1996). The integrated research and development are needed to discover the breed of cattle that has a better ability of embryo development and discover the season influence of cattle reproductive activity which using the sperm from breed that has a better fertilization ability.

Material and Methods

Oocytes Collection. Oocytes from cattle ovary were collected from slaughtered cattle. The ovary was put in media contain Ringer Lactate and antibiotic (*streptomycin* (Sigma Cat.#S1277) 100 mg/L and *penicillin* (Sigma Cat.#4687) 100.000 IU/L) on ±37.5°C, then it was brought to the laboratory. In the laboratory, oocytes were collected by aspiration using 5 ml spoit and 18 G needle syringe. Only grade A and B oocytes with complex cumulus intact that continued to *in vitro* maturation process.

Oocytes Maturation. *In vitro* oocytes maturation was done in drops on *Tissue Culture Medium* 199 (TCM-199; Gibco Cat.#11150-042), supplemented with FCS 10%, *streptomycin* 100 mg/L, *penicillin* 100.000 IU/L, and covered with mineral oil (Sigma Cat.#M.8410). Maturation process was done in group of 40-100 oocytes in 500 µL media. Then it was incubated in the CO_2 incubator with 5% CO_2, temperature 38.5°C, and humidity 90%, with incubation periods 18-24 hours.

***In vitro* Fertilization**. The Simental and Brahman frozen semen were used for the sperm sources. The frozen semen was thawed then washed with *Sperm Washing Solution* medium (SWS, Brackett and Oliphant solution, *Na caffeine benzoate* 0.942 g, and 50µL heparin (Sigma Cat. #D4776), then centrifugated at 1.800 rpm, temperature 38°C, for 5 minutes, this procedure was done twice. The formed supernatant was diluted with *Sperm Diluting Solution* medium (SDS, Brackett dan Oliphant solution 10 mL with 200 mg *Bovine Serum Albumin* (BSA; Sigma Cat. #A8806) 0.3%), so that concentration becomes $12.5 x 10^6$/mL. *In vitro* fertilization was done in 100 µL SDS drop contains spermatozoa and 20-25 oocytes then incubated in the CO_2 incubator. The fertilization was performed for 5 hours, then the medium was changed with CR1*aa* + FCS 10% medium and further cultured for 6-9 days in the CO_2 incubator where the embryo reached the blastocyte stage.

Embryo Culture and Evaluation. The number of embryo was evaluated in day-2 to see the embryo of ≥2 cell cleavage stage, then blastocyte stage number of embryo evaluation was done in day-6, 7, 8, and 9. The embryo that developed in day-6, 7, 8, and 9 were summed to total of embryo blastocyst stage formation. This research continued to see the season influences of *in vitro* embryo production, using Brahman cattle semen which has a better ability, then the *in vitro* fertilization was done in 2 seasons, the dry season and rainy season.

Results and Discussion

***In vitro* embryo production using Simmental and Brahman cattle semen.** Embryo development rate in ≥2 cell cleavage stage has the higher result ($P<0.05$) when using the Brahman semen than Simmental semen. The blastocyte formation rate in day-6, 7, 8, and 9 was significantly different ($P<0.05$) if used Brahman spermatozoa than Simmental‘s.

***In vitro* embryo production using Brahman semen in the dry and rainy seasons.** The season has the influence of Brahman embryo production rate. The embryo production rate of *in vitro* fertilization used Brahman semen on cleavage stage (day-2), blastocyte stage on day-6, 7, and 8, and total blastocyte number shown the significantly different result ($P<0.05$), which the dry season is better than the rainy season, whereas on day-9 showed no significantly different result ($P>0.05$).

Table 1. *In vitro* embryo production using simmental and brahman cattle semen

		Semen Source	
		Simmental	Brahman
Fertilized oocytes		690	752
Cleavage *n*(%±SB)*		317 (45.94±12.28)[a]	485 (64.49±12.27)[b]
Blastocyst *n*(%±SB)**	Day-6	8 (2.52±4.24) [a]	46 (9.48±4.13) [b]
	Day-7	93 (29.34±9.97) [a]	174 (35.88±10.6) [b]
	Day-8	44 (13.88±6.68) [a]	65 (13.40±6.07) [b]
	Day-9	6 (1.89±2.23) [a]	20 (4.12±2.11)[b]
Total of blastocyst *n*(%±SB)**		151 (47.63±3.18)[a]	305 (62.89±8.45) [b]

Noted: The difference superscript in the same row shows the significant different data (P<0.05); *percentage is based on fertilized oocytes; **percentage is based on cleavage stage embryo

Table 2. *In vitro* embryo production on dry and rainy seasons using Brahman cattle semen.

		Dry season	Rainy season
Fertilized oocytes		532	536
Clevage *n*(%±SB)*		361 (67.86±10.94)[a]	140 (26.12±10.20)[b]
Blastocyst *n*(%±SB)**	Day-6	35 (9.70±4.17)[a]	8 (5.71±10.34)[b]
	Day-7	145 (40.17±6.74)[a]	23 (16.43±14.70)[b]
	Day-8	46 (12.74±3.60)[a]	9 (6.43±9.15)[b]
	Day-9	14 (3.88±1.88)[a]	6 (4.29±7.64)[a]
Total of blastocyst *n*(%±SB)**		240 (66.48±6.55)[a]	46 (32.86±9.08)[b]

Noted: The difference superscript in the same row shows the significant different data (P<0.05); *percentage is based on fertilized oocytes; **percentage is based on cleavage stage embryo

The result indicated that Brahman‘s semen has a better ability than Simmental‘s semen in *in vitro* embryo production. It’s because the Brahman cattle have a better adaptability in various environments than the Simmental cattle (Phillips 2001). The difference of fertilization ability also can be caused by the variant breeds of the stud that used to fertilize (Ward *et al*. 2001). The low number of zygotes that cleave can be affected by the failure fertilization that caused by several things such as: incomplete oocyte maturation level (Moore and Trounson 1977), the failed formation of male pronucleus that caused by failure of spermatozoa having condensation in the oocyte cytoplasm (Crozet *et al*. 1995), and the inadequate capacitation process and acrosome reaction (Bearden and Fuquay 2000).

Season determination based on the time of ovarium pickup from the salaughterhouse, so the oocyte is the main factor to evaluate influence of the seasons on the number of embryos formed. The different blastocyte formation rate produce in dry season and rainy season is because of the differences in light intensity. When the rainy season light intensity is low due to high rainfall. That causes the disruption of the hormones regulation in the cattle body that result in decreased quality of oocytes. Ovary steroidogenic activity assessed using serum concentrations of estrogen (E2), obtained results decreased during the dark and the luteal phase of gonadotropin concentrations is also decreased, this is because of the increasing concentrations of melatonin in serum and follicular fluid (Ronnberg 1990).

Conclusion

In vitro embryo production using Brahman cattle (*Bos indicus*) semen has better ability compared Simmental cattle (*Bos taurus*) semen in embryo cleavage rate, blastocyst formation on day 6, 7, 8, and 9, also total blastocyst formation. *In vitro* embryo production using Brahman cattle (*Bos indicus*) semen is better in the dry season than rainy season.

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Reproduction Characteristics of Female Buffalo in Condition of Livestock Farming in North Singkil District, Aceh Singkil Regency

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Abstract

The purpose of this study was to identify the female buffalo reproductive characteristics in North Singkil sub-district of Aceh Singkil district. This research uses survey method in five villages within North Singkil sub-district, namely: Gosong Telaga Utara, Gosong Telaga Timur, Gosong Telaga Selatan, Kampung Baru, and Ketapang Indah. As many respondents as 40 buffalo breeders are selected based on purposive sampling method, with the minimum requirement of breeder keep two productive buffalo which have been given birth twice and breeder have experience more than one year. Data collection is done by interview and discussion techniques. The parameters observed were: (a) the age of the first child; (b) conception period; (c) calving intervals; and (d) service period. The data obtained is processed and calculated averaged and then descended and described descriptively. The results showed that the female buffalo reproductive characteristics in North Singkil sub-district of Aceh Singkil Regency was good enough. The buffaloes have the first childbirth at 3.9 years (47.5 months), conception period is 10.47 months, calving interval is 21.3 months (640 day), and service period is 10.9 months.

Keywords: reproduction, swamp buffalo, calving interval, conception period

Introduction

Aceh Singkil is one of the areas in Aceh Province that has potential for the development of buffalo. This is strongly supported by the existing environmental conditions. Aceh Singkil is one of the coastal areas that have many rivers that can be used as buffalo habitat. Data of ruminant population in Aceh Singkil district in 2015 was 16.176. The population of buffalo in Nort Singkil is 770 (Dinkeswannak, 2015).

Due to the increasing need of animal protein and the existence of government programs to achieve self-sufficiency in meat, the addition of local buffalo population is one way to meet those needs. Efforts to increase the buffalo population in North Singkil sub-district are still experiencing some obstacles such as the lack of documentation of basic data on the reproduction characteristics of buffaloes. Though the data is very important to support the dynamics of the buffalo population and determine the direction of its development in the future. Therefore, this research needs to be done on aspects of female buffalo reproductive characteristics in North Singkil District of Aceh Singkil.

Materials and Methods

The research method used was survey method through direct interview with buffalo owner based on questionnaire. The selection of the location of this study was done purposively (purposive sampling) with consideration of districts that have the largest buffalo populatin in Aceh Singkil district. Parameters observed were: (a) the age of the first have child; (b) conception period; (c) calving intervals; (d) service period. The collected data is analyzed by using frequency table and percentage. The data obtained is processed and calculated averaged and then descended and described descriptively.

Results and Discussion

Table 1 shows the age of the first buffaloes have a child in North Singkil sub-district. The average age of the buffalo have a first child in North Singkil District is 3.96 years or 47.5 months with the lowest age in the village of Gosong Telaga Selatan and Ketapang Indah is 3.8 years.

Tabel 1. The age of the first have a child in buffalo at North Singkil

No.	Vilage	Respondent (n)	Buffalo (head)	The age of the firsth have a child (year)
1	Gosong Telaga Timur	16	61	4,2
2	Gosong Telaga Utara	6	19	4,0
3	Gosong Telaga Selatan	8	29	3,8
4	Ketapang Indah	5	13	3,8
5	Kampung Baru	5	16	4,0
	Total	40	138	19,8
	Avearge			3,96

The age of the first have a child in buffaloes in north Singkil sub-district ranged from 3.96 years, this result is greater than the age of first have child in buffaloes in Malang and Kampar regency is 3.5 (Yendraliza, 2010) whereas in intensive care, the age of the first have child of buffaloes is 24-36 months. According to Chantalakhana (1981), the age of first have child in buffalo in Indonesia ranges from 3.5 to 4.7 years while in the Philippines is 3.6 years (Usri, 1994).

Conception Period

Conception period is the period when there is a conception (fertilization) in the buffalo to give birth (partus). The conception period of buffaloes in North Singkil sub-district is shown in Table 2.

Tabel 2. Conception period of Buffalo in North Singkil

No.	Vilage	Respondent (n)	Buffalo	Conception Period (days)
1	Gosong Telaga Timur	16	61	314,3
2	Gosong Telaga Utara	6	19	314,3
3	Gosong Telaga Selatan	8	29	314,2
4	Ketapang Indah	5	13	314,3
5	Kampung Baru	5	16	314,5
	Total	40	138	1571,6
	Average			314,3

Conception period in buffaloes in North Singkil District is 314.3 days or 10.47 months. Toelihere (2006) state that swamp buffaloes in Indonesia have a conception period between 310-315 days and buffalo in India for 314 days. But this study is different from the conception period of buffalo in Malaysia (331-340 days). Mongkopunya (1980) state that conception period of swamp buffaloes is 336 days. Conception period can be caused by management, feed and environmental climate. The results of this study different from the results of research Suryana (2007) that conception period swamp buffalo in South Kalimantan is 11-12 months while Bhattacharya *et. al*. (1993) state that the conception period of buffaloes is 10.5 months.

Calving Interval

Calving interval buffalo in district of North Singkil of Aceh Singkil Regency is in Table 3. Buffaloes in district of North Singkil have calving interval is 21,3 month (639 days) with range of 2.,2- 22.3 months.

Tabel 3. Calving interval of buffalo in North Singkil

No	Vilage	Respondent (n)	Buffalo (head)	Calving Interval (months)
1	Gosong Telaga Timur	16	61	22,3
2	Gosong Telaga Utara	6	19	20,2
3	Gosong Telaga Selatan	8	29	21,4
4	Ketapang Indah	5	13	22,3
5	Kampung Baru	5	16	20,5
	Total	40	138	106,7
	Average			21,3

According to Lendhanie (2005) calving interval of swamp buffaloes are 20-24 month, but the traditionally maintained swamp buffaloes in South Kalimantan have 18-24 month, while in northern Singkil 21.3 months (639 days).

Service Period

Based on the results of research, buffalo in north Singkil district can be classified as a very fertile buffalo. The age of the first have child was 47,5 months (3.9 years) with service period was 10,9 months, and conception period was 10.4 months, so that the period of empty in just a relatively short time that is only one month.

Tabel 4. Service Period of buffalo in North Singkil

No	Vilage	Respondent (n)	Buffalo (head)	Service period (months)
1	Gosong Telaga Timur	16	61	11,8
2	Gosong Telaga Utara	6	19	9,7
3	Gosong Telaga Selatan	8	29	10,9
4	Ketapang Indah	5	13	11,8
5	Kampung Baru	5	16	10,0
	Total	40	138	54,2
	Average			10,9

The onset of resurfacing symptoms after childbirth, postpartum marriage (postpartum oestus = PPO) and postpartum mating (PPM) are the determinants of the length of the calving interval. The duration of PPO and PPM is influenced by environmental factors. These environmental factors include the adequacy of feed and the health condition of livestock (Hoda, 2008).

Conclusions

Characteristics of female buffalo reproduction in North Singkil Sub-District, Aceh Singkil Regency is good. The age of the first buffaloes have a child at the age of 3.9 years (47.5 months), conception perios is 10.47 months, calving interval 21.3 months, and service period is 10.9 months. To improve the knowledge of breeders about the reproduction of buffaloes in North Singkil subdistrict, Aceh Singkil, the government should provide counseling to buffalo breeders and provide buffalo superior to improve the genetic quality of buffalo in North Singkil.

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Productivity and Reproductivity of Arab and Merawang Chickens and Their Crossbreds

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Abstract

Egg productivity of Indonesian local chickens is still low. Table eggs and hatching eggs productivity can be increased by crossbreeding. Two Indonesian local chicken lines were selected and crossed. This study aimed to compare the productivity between local line and local crossbred and to evaluate the reproductive performance of merawang-arab x merawang-arab (MA-MA), merawang-arab x arab (MA-A), and arab x merawang-arab (A-MA) crossbred. Production traits were feed intake and conversion, hen day production, egg weight, shape index, fertility, embryonic mortality, hatchability, and weight ratio of hatching egg and DOC. All data was subjected to t-test. Feed intake and conversion as well as hen-day production, fertility, embryonic mortality, and hatchability did not significantly differ, but egg weight of MA-MA chicken was significantly greater than MA-A and A-MA. As conclusion, crossbred is better than single line. Merawang-arab crossbred produced heavier eggs and highest weight ratio of egg to hatchling. crossbred merawang-arab (MA) and crossing of merawang-arab x merawang-arab (MA-MA) produced heavier eggs and highest weight ratio of egg to hatchling.

Key words : crossbred, egg production, local chicken, reproduction

Introduction

Indonesian local chickens play important role in providing protein through their meat and egg. However, productivity of Indonesian local chickens for meat and egg producer are still low especially when they are compared to modern chicken hybrids like broilers and layers for breeding and commercial purposes. Therefore, upgrading Indonesian local chicken has to be carried out to promote their productivity.

Shifting the rearing management from traditional to semi intensive and full intensive chicken in feeding and heath as well as breeding program has objective to enhance productivity. Cross breeding technics as a tool in breeding program is commonly applied in improving the genetic quality (Nataamijaya 2010). Arab and merawang chickens are potential local genetic resources. Arab chicken is well known with their higher egg production at 45.62%-50.69% (Suprijatna *et al.* 2006). Meanwhile, merawang chickens have potency to develop both as meat or egg producers.

Darwati *et al*. (2017) has crossed merawang and arab chickens (MA) and its reciprocal (MA). MA chickens produced hatching eggs in average weight of 43.423±4.29 g. Meanwhile, AM chickens results higher average weight of hatching eggs at 52.504±3.050 g. Both crossing are potential to develop as local layer.

This research was carried out to evaluate the egg production and reproduction of merawang-arab x merawang-arab (MA-MA), merawang-arab x arab (MA-A) and arab x merawang-arab (A-MA). These crossings between local layer types were subjected to develop an alternative solution to have good genetic quality of local chickens for producing table eggs as well as hatching eggs. This research aimed to to compare the productivity between local line and local crossbred and to evaluate the reproductive performance of merawang-arab x merawang-arab (MA-MA), merawang-arab x arab (MA-A), and arab x merawang-arab (A-MA) crossbred.

Materials and Methods

Experimental chicken was kept for 6 months observation. Productive performance was observed by comparing between arab and merawang-arab females. Meanwhile, the crossbreds used 14 females and 7 males which were divided into three group of different treatments namely MA-MA, MA-A, and A-MA. Male female ratio was set at 1:2. All groups were 3 times replicated. Each group was kept at pen measuring 2 m x 3 m. Merawang-arab (MA) chickens have an average bodyweight of 2058.0±215.0 g and 1661.0±210.4 g (44 weeks old) for male and female, respectively. Meanwhile, arab chicken has average bodyweight of 1733.0±178.0 g and 1586.3±133.3 g (26 weeks old) for male and female, accordingly. All chickens fed the same mixed ration of 60% commercial feed and 40% rice brand. Water was freely available. Eggs were daily collected to hatch in an incubator.

Traits measured were feed intake and conversion, hen-day production, average egg weight, egg shape index, fertility, embryonic mortality, hatchability, and weight ratio between egg and DOC. Data was subjected to T test (Mattjik and Sumertajaya 2013).

Results and Discussion

During 6 months trial, feed intake and conversion, and hen-day production was the same among the hens (Table 1). Although it was statistically not different, MA hens convert feed much efficient into eggs which was indicated by higher egg production. On the other side, merawang-arab (MA) produced larger eggs than arab (A) hens because of heterocyst effect which exists in crossbreeding. The egg shape index was different, but both were normal and belongs to category AA (USDA 2000). Age of the hens may affect the egg production rate and egg weight.

Different superscript in the same line means significantly different (P<0.05) All reproductive traits were the same except for weight ratio of hatching egg to DOC (Table 2). All crossbreds were very fertile, but higher embryonic mortality resulted in lower hatchability. The higher mortality may be more caused by quality of hatcher machine instead of hatching eggs quality. Weight ratio of hatching egg to DOC of MA-MA was bigger than MA-A and A-MA which was in line with the results of egg weight (Table 1).

Table 1. Production performances of Arab and Merawang-arab hens (means ± sd)

Traits	Arab (A)	Merawang-arab (MA)
Feed Intake (g/chicken/week)	696.89±4.86	676.41±39.40
Feed Conversion	6.32±3.99	3.65±1.07
Hen-day Production (%)	51.98±11.90	62.20±15.87
Egg Weight (g/egg)	39.11±2.88b	45.25±3.57a
Egg Shape Index	0.80±0.03a	0.77±0.03b

Table 2. Reproductive performances of merawang and arab chicken crossbreds (means ± sd)

Traits	MA-MA	MA-A	A-MA
Fertility (%)	98.67±2.09	100.00±0.00	99.12±2.15
Hatchability (%)	79.09±11.48	74.74±10.24	63.87±17.22
Embryo mortality	20.91±11.48	25.26±10.24	36.13±17.22
Weight ratio of hatching egg - DOC	65.02±4.66a	59.67±3.79b	60.39±3.71b

Different superscript in the same line means significantly different (P<0.05)

Egg weight is more determined by bodyweight (Resnawati and Bintang, 2005). This research finding was in line with several reports that merawang-arab (MA) hens produced egg of 43.423±4.29 g (Darwati *et al.* 2017) which is heavier than silver arab hens silver of 42.74 g (Indra *et al.* 2013) and merawang of 40.42±5.85 g (Nuraini *et al.* 2016). MA hens were heavier than arab hens. Therefore, MA hens produced larger egg than arab hens. In combination with bodyweight, a better performance can be achieved by crossing which usually increases the proportion of heterozygote gene (Noor 2004)

Conclusions

Crossbred is better than single line. Merawang-arab crossbred produced heavier eggs and highest weight ratio of egg to hatchling.

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The Performance of Crossbreed Brahman Cross Cattle at PT LJP

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Abstract

Cattle breeding in the beef industry in Indonesia generally use imported Australian heifer Brahman Cross (BX) which is still productive (where previously intended as a need for fattening). The performance data from 299 head of BX cattle with crossbreeding schemes from 2011 to 2016, collected from a private company in Serang, Banten Province of Indonesia and only 71 head used for evaluating non-genetics factors affecting the production and reproduction traits which they have up to second generation (filial 2). A General Linear Model (GLM) was used to analyzed the non-genetic factors (breed, generation, sex, year, parity, and season). The Result showed that type of breed had significant differences ($P<0.05$) for almost all production traits such as birth weight (BW), weaning weight (WW), final weight (W540), and average daily gain (ADG) while year of birth had the same result except for the birth weight (BW). Differences showed in the type of generation and also year of birth interpreted as there are lower performance on ADG recorded for the second generation especially in the year after 2013 . Sex and season only presented significant differences ($P<0.05$) on final weight (W540). The result also showed no significant differences on the reproduction traits. Results indicated that would be best to use Bos Taurus sire (Simmental and Brahman) to be inseminated (cross) with BX since there are no significant diffrences with the Bos Indicus (Brahman), and the female can be used until second generation (filial 2), since there are also no significant differences in all of the reproduction traits.

Keywords: Brahman Cross, Non-Genetic factors, Production traits, Reproduction traits, Cattle breeding

Introduction

Cattle breeding industry business in Indonesia is getting a lot of attention by various parties in the near future, including by the government. The increasing need of beef was not sufficient to be fulfill by domestic livestock business. The beef cattle population in Indonesia has a low increased on each year. Based on DPKH statistical data (2017), the beef cattle population has decreased in the increasing the number from 2013-2016. The beef cattle population in 2013 reached 12 686 239 heads and increased by 16.09% in 2014. Population growth only increased by 4.7% in 2015, 3.79% in 2016, and 3.72% in 2017 where the cattle population reached 16 599 247 heads. Various efforts made by the government to meet the needs such as issuing policies on beef imports, stocker, and finished cattle. According to Susilawati (2015), one of the government's policies in the near future is by bringing about 50 thousand heads of Brahman Cross (BX) dam in order to increase the yield of the breeding business for the availability of beef cattle. BX cattle are generally imported from northern Australia where the environmental conditions are not much different.

The beef cattle industry is now currently faced with Minister of Agriculture Regulation number 49/permentan/pk.440/10/2016 year 2016 article 7 concerning the importation of large ruminant livestock into the territory of Indonesia, where Article 7 states the letter of application of ruminant livestock must include number of dam in it. The ratio that must be fulfilled by the business actor is to have 1 dam versus 5 heads stocker (1:5), where for the cooperative and the farmers group must be fulfilled on 1 dam versus 10 heads (1:10). This regulation enables the business actors such as beef cattle industry to have a breeding part in their business units.

PT Lembu Jantan Perkasa (PT LJP) is a private livestock company engaged in beef cattle fattening business. The company also has a breeding unit as one of its business units. Crossbreeding done by utilizing the genetic resources that was Limousin, Simmental, and Brahman cattle. Brahman Cross (BX) as one of the genetic resources of livestock should be well utilized its existence especially the dam, so it needs to be crossed. The performance evaluation of BX cattle in PT LJP needs to be done to determine the direction of breeding program especially BX cattle forward. For optimal utilization of genetic factors, to produce offspring in accordance with the objectives of the breeding programs then in addition on good selection, the crossbreeding (mating system) must also be appropriate and well planned according to the designed program that has been determined. One of the design is to produce offsprings that have high heterosis effect with optimal performance.

According to Astuti (2004), crossbreed were generally done to increased livestock production, but generally did not improve the reproductive performance and even problems often arise. Its success needs to be supported by an appropriate and well planned program as the environment required by crossbreed cows can be met. Crosses that are not well programmed and uncertain targets will pose a threat to germplasm. Biological potential can be measured based on the ability of production and reproduction of beef cattle, which can not be separated from the environment where the cattle were kept. Therefore, in order to evaluate the production and reproduction performance of BX, it is also necessary to evaluate the performance of the cattle due to the influence of its non-genetic factors.

Beef cattle breeding business conducted by PT LJP were using imported BX (heifer) that was still productive where previously intended as a need for their fattening business. Reproduction evaluation was done before the heifer was inserted into the breeding unit. BX crossbreeding activity by PT LJP has been done by the artificial insemination using Brahman, Limousin, and Simmental. There was no research before on performance evaluation of BX, so it needs to be evaluated as a reference in the breeding program on PT LJP in the future especially. The aim of this study was to evaluate the performance of BX crossbred in production and reproduction traits on PT LJP. This research was expected to be used as a reference of BX crossbreed program on PT LJP in particular. In addition, this study is also expected to provide basic data and information for the development of BX cattle in Indonesia.

Materials and Methods

The research was conducted from March to April 2017. The research location was at PT Lembu Jantan Perkasa (PT LJP), Serang-Pandeglang Highway Km 9.6 Serang, Banten Province. The data collected by the breeding unit from PT LJP since 2009 until 2017. The research procedure was survey, interview and documentation. The performance data were collected from BX crossed by artificial insemination (AI) with Brahman, Simmental, and Limousin where Brahman progeny are known as BB, BS for Simmental, and BL for Limousin.

The identities of newborns and the parents, birth date, breed, generation, calf sex, parity, season were recorded. The variables observed in this study include: birth weight (BW) is calf weighed in the interval 24 hours after birth, weaning weight (WW) and yearling weight (YW) were obtained from calculation of body weight corrected 90 days (WW) and 540 days (YW). Correction factors adopted and adapted based on Beef Improvement Federation (2018) and Gunawan and Jakaria (2011):

WW90 = {[actual weaning weight – birth weight]/actual age] x 90 d} + birth weight

YW540 = {[actual yearling weight – W90]/ (actual age – 90)] x 450 d} + W90

The average daily gain (ADG) for 90 days (ADG1) and 540 days (ADG2) were calculated from the final weights reduced to the initial weight and divided by the maintenance interval.

Reproduction performance collected were service per conception (S/C) and Days Open (DO). Service per conception (S/C) is the number of AI services (number of straws) required to produce a dam pregnancy. The days open is the time span (calculated in days) of the dam after give birth until the individual was mated and pregnant. The season is divided into rainy (October-March) and dry season (April-September).

The collected data was birth (BW), weaning (WW), yearling weight (YW), and average daily gain (ADG) for production traits; and also service per conception (S/C) and Days Open (DO) for the reproduction traits. The number of data collected in the breeding unit was from 1981 head. A total of 299 tail with the lineage to second generation (G2), and only 71 tail that corresponds to the pattern of crossing.

Data were analyzed using General Linear Model (GLM) (Mattjik and Sumertajaya 2013) to find out the influence of nation factor, generation, gender, parity, season, and year of birth. If there is a real difference then it will be continued with multiple comparison test that is Duncan test (Steel and Torrie 1995).

$$Yijklmn = \mu + bi + gj + mk + pl + sm + yn + \varepsilon ijklmn$$

where:

Y = the response of production and reproduction traits

μ = overall mean

b_i = the effect of generation (G1, G2)

g_j = the effect of crossbreed (BB, BS, BL)

m_k = the effect of season (dry, rainy)

p_l = the effect of parity (1,2,3)

s_m = the effect of sex (male, female)
y_n = the effect of year of birth (2011,2012,2013,2014,2015,2016)
$\varepsilon ijklmn$ = random error

Results and Discussion
Production Traits

Birth Weight (BW). Statistical analysis showed that environmental influence had no significant effect (P>0.05) to the birth weight. Birth weight in the first (G1) and second (G2) generation was obtained at 23.80 ± 2.25 and 25.00 ± 2.16 kg. The overall means of BW between BX offspring mated to Bos taurus which are Simmental (BS) and Limousin (BL) obtained at 25.30 ± 1.91 dan 25.20 ± 1.91 kg, where (Bos indicus) Brahman (BB) obtained at 23.10 ± 2.21 kg. Birth weight obtained in this study is higher when compared to Haque *et al*. (2016), which the result of average BX birth weight (Brahman blood 50% crossed with local cattle) was 21.40 ± 0.24 kg with local environmental condition in Bangladesh. According to BIF (2018), calf birth weight is associated with parental weight which can be used as a good indicator to avoid give birth difficulties.

Weaning Weight (WW). Statistical analysis showed that environmental influences had no significant effect (P>0.05) to weaning weight, except for the year of birth. The highest weaning weight was obtained in the 2011 that was 89.60 ± 16.18 kg, and the lightest obtained in the 2014 at 64.90 ± 7.45 kg. Lower weaning weight rate obtained in the 2014 were predicted due to the unconcistency in cattle maintenance on each year and also decreased of heterosis effect and genetic potential generated by second generation (G2) when compared to first generation (G1). According to Noor (2010), the greatest heterosis effect can be obtained if 50% of the parental and filial genes come from one breed and the remaining 50% comes from the second. Field (2013) also stated that, terminal-cross using 2 or 3 breed is a popular cross breeding program by commercial beef cattle industry. This cross-breeding program were used to obtain or utilize the effect of optimal heterosis from the crosses of the mated cattle.

Weaning weights were obtained in this study are also higher when compared to Haque *et al*. (2016), which had the average weight at 3 months BX (25% blood percentage) at 53.53 ± 1.13 kg for males and 51.46 ± 1.60 kg for females with the research on local environmental condition in Bangladesh. According to BIF (2018), weaning weight can be used in evaluating the different potential growth of calves and lactating ability of the dam. Statistical analysis of the environment effect on birth (BW), wean (WW), yearling (YW) weight, and also average daily gain (ADG) were presented in Table 1.

Table 1. The responses of production traits

Factors	N	Production Traits				
		BW (kg)	WW (kg)	YW (kg)	ADG1 (kg/day)	ADG2 (kg/day)
Generation						
G1	44	23.80 ± 2.25	81.90 ± 16.95	302.80 ± 77.09	0.80 ± 0.34	0.50 ± 0.16
G2	27	25.00 ± 2.16	70.20 ± 10.21	194.60 ± 47.31	0.50 ± 0.13	0.20 ± 0.11
Crossbreed						
BB	31	23.10 ± 2.21	73.50 ± 13.02	257.90 ± 61.15 ^{b}	0.60 ± 0.28	0.30 ± 0.17 ^{b}
BS	12	25.30 ± 1.91	77.30 ± 20.34	335.30 ± 59.25 ^{a}	0.70 ± 0.38	0.50 ± 0.11 ^{a}
BL	28	25.20 ± 1.91	81.90 ± 15.71	314.00 ± 93.25 ^{a}	0.70 ± 0.34	0.50 ± 0.16 ^{a}
Sex						
Male	20	24.80 ± 1.85	70.40 ± 8.99	274.50 ± 104.87	0.50 ± 0.12	0.60 ± 0.15 ^{a}
Female	51	24.10 ± 2.41	80.20 ± 16.97	297.90 ± 74.69	0.80 ± 0.34	0.40 ± 0.18 ^{b}
Parity						
1	41	23.90 ± 2.22	72.80 ± 14.2	288.10 ± 87.41	0.60 ± 0.28	0.50 ± 0.2
2	21	25.00 ± 2.16	81.80 ± 13.33	308.60 ± 73.26	0.70 ± 0.28	0.40 ± 0.14
3	6	24.00 ± 3.16	88.50 ± 24.64	291.40 ± 63.48	0.90 ± 0.51	0.50 ± 0.22
Season						
Dry	36	24.30 ± 2.27	73.10 ± 15.09	296.60 ± 84.46	0.60 ± 0.28 ^{b}	0.50 ± 0.18
Rainy	35	24.20 ± 2.32	81.90 ± 15.32	289.90 ± 77.67	0.80 ± 0.33 ^{a}	0.40 ± 0.17
Year						
2011	14	24.90 ± 1.77	89.60 ± 16.18 ^{a}	351.40 ± 46.17 ^{a}	1.00 ± 0.26 ^{a}	0.60 ± 014 ^{a}
2012	15	22.90 ± 1.98	83.80 ± 14.7 ^{a}	305.80 ± 50.32 ^{ab}	0.90 ± 0.27 ^{ab}	0.40 ± 0.13 ^{ab}
2013	4	24.00 ± 4.32	76.50 ± 10.66 ^{a}	316.00 ± 186.20 ^{ab}	0.60 ± 0.11 ^{b}	0.40 ± 0.28 ^{b}
2014	23	23.80 ± 2.12	64.90 ± 7.45 ^{b}	233.70 ± 59.03 ^{c}	0.40 ± 0.10 ^{c}	0.40 ± 0.23 ^{ab}
2015	8	26.30 ± 1.98	75.40 ± 5.13 ^{a}	244.30 ± 54.12 ^{b}	0.50 ± 0.09 ^{bc}	0.40 ± 0.04 ^{b}
2016	4	24.80 ± 1.71	73.50 ± 10.85 ^{a}	-	0.50 ± 0.10 ^{bc}	-

* means in the same coloumn with different superscript differ significantly (P<0.05)
* ADG1= average daily gain 90 days, ADG2= average daily gain 540 days, n= cattle number

Yearling Weight (YW). The 540 days weight was schedualed by the company in order to collect data before the heifer was mated (AI) at the first time. Statistical analysis showed that crossbred had significant effect (P<0.01) to yearling weight (YW). The overall means of YW between BX offspring mated to Simmental (BS) and Limousin

(BL) showed no significant effect (P>0.05), but both significantly difference with Brahman (BB), where as the lowest YW obtained at 257.90 ± 61.15 kg. The highest YW was obtained from BS with average 335.30 ± 59.25 kg. According to BIF (2018), yearling weight (age weight 360 days) or long-year weight (weight of age 452 or 550 days) is an important characteristic to be used in the selection, because it has a high heritability value and a substantial genetic association with the meat quality (retail beef). Yearling weight (YW) corrected at 550 days, should be used for cattle herd which fed with low levels of energy content.

Statistical analysis also showed that the birth year had significant effect (P<0.01) to yearling weight (YW). The highest YW was obtained in the year of 2011 at 351.40 ± 46.17 kg, and the lightest obtained in the 2014 at 233.70 ± 59.03 kg. Lower YW scores obtained in the year 2014 also suspected due to the unconcistency in cattle maintenance on each year and the decreased of heterosis effects and genetic potential generated by the second generation (G2) when compared to the first generation (G1).

Average Daily Gain (ADG). Statistical analysis showed that the birth season had significant effect (P<0.05) to ADG1 value (corrected weaned age at 90 days). The cattle ADG1 that were borned on the rainy season, showed the higher weight at 0.8 ± 0.33 kg/day, compared to those which borned on the dry season at 0.60 ± 0.28 kg/day.

The cattle ADG2 (corrected yearling age at 540 days), also had siginificant effect (P<0.05) by sex influence. The higher ADG2 values were obtained from the male offspring at 0.60 ± 0.15 kg/day, compared to the female at 0.40 ± 0.18 kg/day. Haque *et al*. (2016) also found the same result where ADG of yearling male BX cross were higher than the female (P<0.01). Haque *et al*. (2016) found the average yearling weight (corrected at 365 days) of BX (Brahman's percentage of blood 50%) at 245.13 ± 2.88 kg for males with 610.12 ± 7.11 g/day on ADG, and 213.10 ± 2.29 g/day on ADG with 528.38 ± 5.77 kg for females with local environmental condition in Bangladesh.

The year of birth showed significant effect (P<0.01) on ADG1. The highest ADG1 was resulted from cattle which borned in 2011 with ADG1 were 1.00 ± 0.26 kg/day, this result had significant different with 2013 at 0.60 ± 0.11 kg/day. The lightest ADG1 obtained from cattle which borned in 2014 is 0.40 ± 0.10 kg/day.

The ADG2 (corrected yearling age at 540 days) also showed significant effect (P<0.01) due to the year of birth. The highest ADG2 were obtained from cattle which borned in 2011 at 0.60 ± 0.14 kg/day, not significantly different with 2012 and 2014 birth year. The lightest ADG2 were obtained on 2013 at 0.40 ± 0.28 kg/day which had no significant effect with 2015.

The results obtained indicate that it is better to use the Bos Taurus (Simmental and Limousin) to be inseminated to BX dam since the crossbred effect showed significant effect on yearling weight (YW) and ADG. Noor (2010) also mentioned, that if a superior male (pure seed or inbred with homozygous gene) is crossed with a unrelated female, it can be expected to benefit heterosis of the superior male. In commercial farms, this is a common crossbreed between superior males and outer cross-breed females in a three-breed rotational crossbreeding program. However, the use of inbred females would be extremely impractical, as their performance is lower when compared with outer cross-breed females. Leymaster (2002) also found that, the efficiency of meat production can be optimized by the terminal cross system using a particular sire to complement the characteristics of crossbreed females. Herring (2014) also remind that, heterosis effect is the crossbreed advantages, but breeders must be realized that the parental selection as the foundation of the crossbreed program.

Reproduction Traits

The statistical analysis showed that environment had no significant effect ($P>0.05$) to service per conception (S/C) and Days Open (DO) of the crossbreed. The S/C value for first generation (G1) were 1.30 ± 0.56 and 1.50 ± 0.76 for the second generation (G2). The S/C value for BB, BS and BL are respectively 1.20 ± 0.46, 1.40 ± 0.67, and 1.60 ± 0.74. The DO showed no significant difference ($P> 0.05$) which for G1 were 109.9 ± 34.69 days and 125.6 ± 25.95 days for G2. The DO for the BB, BS and BL were respectively 118.50 ± 34.57, 106.00 ± 20.56, and 115.40 ± 33.11 days. Statistical analysis of the environmental effect on service per conception (S/C) and Days Open (DO) of crossbreed of BX cattle at PT LJP is presented in Table 2.

Table 2. The responses of reproduction traits

Factors	**n(S/C)**	**S/C**	**n(DO)**	**DO**
Generation				
G1	44	1.30 ± 0.56	34	109.90 ± 34.69
G2	26	1.50 ± 0.76	20	125.60 ± 25.95
Crossbreed				
BB	30	1.20 ± 0.46	24	118.50 ± 34.57
BS	12	1.40 ± 0.67	6	106.00 ± 20.56
BL	28	1.60 ± 0.74	24	115.40 ± 33.11
Parity				
1	36	1.40 ± 0.77	23	125.30 ± 29.71
2	22	1.40 ± 0.50	20	111.40 ± 33.38
3	7	1.10 ± 0.38	6	105.50 ± 41.06
Season				
Dry	35	1.30 ± 0.68	23	118.90 ± 36.69
Rainy	35	1.40 ± 0.60	31	113.40 ± 29.19
Year				
2011	14	1.50 ± 0.65	9	95.20 ± 20.90
2012	15	1.20 ± 0.41	13	115.00 ± 36.70
2013	4	2.00 ± 1.41	3	104.30 ± 66.61
2014	22	1.20 ± 0.50	16	133.80 ± 21.45
2015	8	1.80 ± 0.71	7	118.00 ± 36.71
2016	4	1.30 ± 0.50	3	109.00 ± 7.00

* means in the same coloumn with different superscript differ significantly ($P<0.05$); n= cattle numbers

Service per conception (S/C) is the number of artificial insemination (AI) services (number of straws) required to produce a pregnant dam. The S/C value were obtained in this study showed good results which are below 1.7. The S/C still become normal when it is still at range from 1.6-2.0, lower value from range indicated that the female fertility rate in the herd is high (Feradis 2010). Atabany *et al*. (2011) mentioned that the days open (DO) is the time span (calculated in days) of the dam that just give birth until the individual were mated again and pregnant. Days open have an influence on the diversity of milk production, where an increase value in days open, resulted decreased milk production estimates. Soeharsono *et al*. (2010), also reported low reproductive performance of BXand BX cross with local cattle offspring that S/C value was 1.9, and the average DO were at 151 days.

Conclusions

The results indicated that it would be best to use Bos Taurus sire (Simmental and Limousin) to be inseminated (cross) with BX dam since there are higher performance compared to the Bos Indicus (Brahman) on the production traits (YW and ADG). The female can still be used until at second generation (G2), since there are also no significant differences in all of the reproduction traits (S/C and DO).

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Reproduction Performance of Ongole Crossed Heifer during Estrus Phase Stimulated Using Low Dose of Pregnant Mare Serum Gonadotrophin

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Abstract

Superovulation using PMSG prior to mating of the small ruminants have been proven to provide a better uterus environment during pregnancy. But there is a challenge using the PMSG in large ruminants especially heifer as monotocus animal. The objective of this study is to describe the effect of different low dose of PMSG to the ovarian dynamic and the alteration of micromorphology of ovary and reproduction tract of Ongole crossbreed (PO) heifer during estrus. Nine PO heifers were divide into three groups of different PMSG dose (in IU/Kg BW) which are 0 (as control), 0.5, and 1.0 respectively. The ovarian dynamics were observed daily by realtime USG and the administration of PMSG was done at early second follicular wave. At day-0 (estrus), blood were sampled for estradiol-17 β (E2) level measurement and all the reproduction tract were collected and continued with hystological preparation procedures. The number of dominant follicle (DF) formation was highest (P<0.05) at the third group 1.0, as well as the DF diameter size. The E2 level were found significantly different between three groups (P<0.05) with the highest level was reached by the third group followed by rest goup respectively as well as all micromorphological parameters of ovary and uterus (P<0.05). In summary, administration of 0.5 IU/Kg BW PMSG could succesfully control the number of DF formation so that could reduce the possibility of multiple calving. In the future, this methode possibly used in monotocus animals as a part of intrauterine programming procedure.

Keywords: PMSG, stimulation, ovarian dynamic, dominant follicle, PO heifer

Introduction

Reproductions in farm animals become one of important key factors in optimizing animal production. The intrauterine programming concept was developed since last two decades as an approach to improve reproduction and production through the improvement of intrauterine condition and environment during pregnancy (Fowden and Forhead 2004). This approach was proven to provide a better uterine environment during pregnancy and give a possibility to deliver better newborn animals in various aspects. Various studies showed that superovulation using follicle stimulating hormones (FSH) and PMSG prior to mating is widely applied in small farm animals as main method in utilizing intrauterine programming. This method was proved to be successful in increasing production performances in ewe (Manalu *et al.* 1998, Frimawaty & Manalu 1999, Adriani *et al.* 2007, Andriyanto and Manalu 2012), goat (Andriyanto & Manalu 2012), and pig (Mege *et al.* 2007). The intrauterine programming through gonadotropin injection prior to mating becomes a challenging technology in monotocus animals especially bovine as major large ruminant for meat and milk production. Pregnant Mare Serum Gonadotrophin (PMSG) is usually administrated for embryo production purposes so that it will interfere with bovine pregnancy physiology (as monotocus animal) if applied using normal dose gonadotropin for intrauterine programming. We used the low dose of PMSG to study the reproductive performance and the possibility to be used as a main method for intrauterine programming in bovine.

Materials and Methods

Nine Ongole crossbred (PO) heifers at age arround 18-24 months were selected for body condition scoring of 2.5-3 (in 5 scales) and reproduction status was evaluated by realtime USG continued with the acclimation within 30 days. The heifers were divided into three groups of dose of PMSG injection, i.e., 0 (as a control), 0.5, and 1.0 IU/kg BW, respectively. The estrus cycles of the experimental heifers were synchronized by using two injection of Prostaglandin (PG) $F_{2\alpha}$ guided with realtime USG. The PMSG was administrated at early second follicular wave and continued with $PGF_{2\alpha}$ 48 hours later. All ovarian dynamic parameters were documented daily until preovulatory stage (estrus day). At day-0 (estrus), 5 mL of blood samples were drawn from jugular vein and placed in EDTA-coated tubes and centrifuged immediately at 4000rpm for 20 minutes. The plasma were collected and frozen until measurement of E2. At the same day, all reproduction tracts were collected and fixed using Bouin for ovary and BNF for the rest organ for 24 hours for Haematoxyllin-eosin (HE) staining procedures. All quantitative micromorphological parameters were observed and recorded. The result of all parameters of the research were analyzed using ANOVA and continued with Duncan test using Statistical Analysis System (SAS) 1.6 version.

Results and Discussions

The results of the experiment showed that low dose of PMSG injection (0.5 IU/kg BW) could control the formation of DF. Heifers injected with the highest dose of PMSG (1.0 IU/kg BW) had the highest number and diameters of DF. However, the increased number of DF will open the chances of multiple calving. The lower dose of PMSG injection (0.5 IU/kg BW) did not significantly increase the DF number and diameter compared to control heifers without PMSG injection. However, even though there was no significant increase in the DF number and diameter, heifers injected with PMSG at a dose of 0.5 IU/kg BW had significantly higher plasma E2 concentrations (P<0.05) compared to control heifers without PMSG injection. Increased dose of PMSG injections from 0.5 to 1.0 IU/kg BW significantly increased plasma E2 concentrations (P<0.05) (Table 1) even though there was no significant increase in the diameter of dominant follicle, the thickness of granulosa cell layer and the density of granulosa cell. The increased plasma estradiol concentrations in heifers injected with PMSG at a dose of 0.5 IU/kg BW were associated with the increased number of granulosa cells as was indicated by the increased granulosa cell densities (Table 1).

Table 1. The number and diameters of dominant follicle (as preovulatory follicle), granulosa cells characteristic parameters, and plasma estradiol concentrations during estrus in heifers injected with various doses of PMSG

Parameters	Dose of PMSG injection (IU/kg BW)		
	0	0.5	1.0
Number of DF formated	1.00 ± 0^{a}	1.33 ± 0.47^{a}	3.00 ± 0^{b}
Diameter size of DF (mm)	13.67 ± 1.18^{a}	10.48 ± 1.02^{ab}	14.01 ± 3.54^{b}
Granulosa Cell Layer (GCL) thickness (µm)	20.94 ± 0.87^{a}	28.57 ± 3.71^{ab}	33.59 ± 6.05^{b}
Granulosa Cell (GC) density (cell/100 µm^2)	65.53 ± 6.24^{a}	83.80 ± 2.09^{b}	83.20 ± 0.60^{b}
Plasma estradiol concentration (pg/mL)	130.17 ± 13.91^{a}	181.55 ± 22.05^{b}	278 ± 10.63^{c}

Different superscripts in the same line indicate a significant difference (P<0.05)

The plasma estradiol (E2) concentration during estrus is the most important factor in controlling estrus behavior. High plasma E2 concentration will increase estrus expression so that could improve the ovarian dynamic and the success of pregnancy (Rodrigues *et al.* 2018). Another parameter indicates that plasma E2 concentrations have relationship with the quantitative micromorphological characteristic of the preovulatory follicle. Injection of heifers with PMSG at a dose of 0.5 IU/kg BW significantly increased the density of granulosa cells (GC) and plasma estradiol concentrations (P<0.05). However, increased dose of PMSG injection from 0.5 to 1.0 IU/kg BW significantly increased the number of DF and plasma estradiol concentrations. These results showed a similar pattern of increase in plasma estradiol concentrations with the density of granulosa cells. However, in the higher dose of PMSG injection, the number of dominant follicles and the concentrations of estradiol in the plasma have similar patterns. Therefore, in the lower dose of PMSG injection, estrogen synthesis and secretions by the similar number of dominant follicles can be increased by increasing the density of granulosa cells without increasing the number of dominant follicle. Plasma estradiol concentration was reported to have higher relationship with granulosa cell thickness and density (Dieleman *et al.* 1983, Sangha *et al.* 2012).

Increased doses of PMSG injection from 0.5 to 1.0 IU/kg BW did not significantly increased all micromorphological characteristics of uterine horn measured. Stratum functionale of endometrium of control heifers without PMSG injection were similar to those injected with 0.5 IU/kg BW (P>0.05). The number of uterine gland cross section per lobe and the diameters of the uterine gland showed significant increases in heifers injected with PMSG compared to control heifers without PMSG injection (P<0.05).

Table 2. Quantitative micromorphological parameters of endometrium during estrus in heifers injected with various doses of PMSG

Parameters	Dose of PMSG injection (IU/kg BW)		
	0	0.5	1.0
Stratum functionale of endometrium (µm)	2001.74 ± 422.54^{a}	2603.72 ± 129.66^{ab}	3091.06 ± 429.97^{b}
Number of uterine gland cross section per lobe	222.943 ± 63.42^{a}	396.61 ± 104.96^{b}	400.67 ± 14.44^{b}
Gland diameter (µm)	26.46 ± 6.76^{a}	36.40 ± 0.67^{b}	38.66 ± 2.29^{b}
Gap inter-uterine gland distance (µm)	33.65 ± 3.54^{a}	14.38 ± 1.21^{b}	13.48 ± 3.49^{b}

Different superscripts in the same line indicate a significant difference (P<0.05)

However, the distance of gap between inter-uterine glands showed significant decreased in heifers injected with PMSG compared to control heifers without PMSG injection (Table 2). The results found in this experiment showed that the density of uterine gland and glands diameters had similar pattern in heifers injected with PMSG at a dose of 0.5 IU/kg BW. These findings indicate that more active endometrium glands are associated with higher concentrations of estradiol during estrus. The increased estradiol synthesis and secretion will improve proliferation stage of uterus gland during luteal or early pregnancy stage by increasing secretion of uterine histotroph (Benbia *et al.* 2017; Spencer *et al.* 2008).

Conclusion

This study showed that the low dose of PMSG injection can be used to increase estrogen synthesis and secretions without increasing number of dominant follicles to improve intrauterine programming in bovine.

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Identification of TGBR2 Gene Polymorphism Associated with Fatty Acid Traits in Indonesian Sheep

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Abstract

Transforming Growth Factor Beta Receptor 2 (TGBR2) gene is proposed as candidate gene which play important roles in fatty acid composition. The aim of this study was to analyse the polymorphism of TGBR2 gene with fatty acid composition. A total of 47 sheep were used in this study. Identification of genes polymorphism and associations of TGBR2 was performed using PCR-RFLP method and GLM analysis. The results showed that the TGBR2 gene are polymorphic. Three genotypes (GG, AG and AA) were successfully amplified for SNP TGBR2 gene. The g.5112179A>G of TGBR2 gene was generally significantly associated ($P<0.05$) with saturated fatty acids (SFA) including pentadeconoic acid (C15:0), as well as monounsaturated fatty acids (MUFA) namely myristoleic acid (C14:1) and pollyunsaturated fatty acids (PUFA) namely linolenic acid (C18:3n6). It could be concluded that the combined selection for the TGBR2 G allele is a good strategy to increase the unsaturated fatty acid (MUFA and PUFA).

*Keywords***:** fatty acid, genetic marker, polymorphism, association, sheep

Introduction

Meat produced by ruminants is generally related to higher levels of saturated fatty acids (SFA), which are widely correlated with several disease such as the development of heart disease, stroke, diabetes, and obesity (Biesalski, 2005). High consumption of SFA causes the liver to produce high of Low Density Lipoprotein (LDL) cholesterol associated with the incidence of heart disease and raising cholesterol levels in the blood causing thrombosis (Muller et al, 2003). In contrast, moderate to high proporsion of consumption of unsaturated fatty acid especially monounsaturated fatty acids (MUFA) are associated with a decrease in serum cholesterol, consequently reducing the risk of heart diseases and strokes (Hoffmann et al, 2014). Fatty acids are complex traits, with several factors affecting their composition, such as sex, diet, age, and genetics (Wood et al, 2008). Consequently molecular breeding seems to be a promising way to produce sheeps with high unsaturated fatty acid (MUFA and PUFA).

One selection criteria that can be used is molecular-based selection through the identification candidate gene related to fatty acid composition. TGFBR2 One type of regulator gene is TGFBR-2 which encodes the family members of protein kinase ie serine and threonin and subfamily of TGFB receptors which speculate important roles for fatty acid composition. The TGFBR2 gene consists of seven exons and six introns, and encodes the human II TGF-b receptor (70/80 kDa). These receptors belong to the serine-threonine family of cell surface receptor kinases, which regulate several cellular processes, including proliferation, cell cycle capture, apoptosis, differentiation and formation of extracellular matrix (Disabella et al, 2006). TGFBR2 mapped at rs193644594 in sheeps located within (g.5112179A>G). This TGFBR2 gene is considered a positional and functional candidate gene for fatty acid metabolism. The TGFBR2 gene is the first gene studied in sheep against the influence of fatty acid content but has previously been reported in humans and mice (Lee et al, 2013; Disabella et al, 2006) However, there was no study investigating the polymorphism of TGBR2 with fatty acid composition in sheep especially in Indonesian sheep. Functional and positional studies suggested that these genes could be important candidate gene for fatty acid composition. Therefore, the objective of this study was to examine whether the effects of the TGBR2 polymorphisms on fatty acid compositionin sheep.

Materials and Methods

Animals and fatty acid composition analysis

Fourty seven Indonesian sheeps consisting mostly javanese fat tailed sheep (JFT) were used in this study. The sheep were caged in group and were given ad libitum fattening feed. Samples were taken from loin tissue and were collected from the rams with body weight between 25-30 kg and age between 10-12 months. Five-hundred loin were taken approximatelly for faty acid (FA) analysis and 30 mg loin for DNA extraction. Fatty acid composition was determined for each sample using the extraction method according to Folch *et al.,* (1957). The FA composition was quantified using gas chromatography (GC-2010 GC-2010 Plus-Shimadzu AOAC 2001 autoinjector). The fatness traits were expressed as a proporsion of the total FAs included fat content, saturated fatty acid (SFA), monounsaturated fatty acid (MUFA) and polyunsaturated fatty acid (PUFA).

PCR-RFLP Amplification

A SNP of TGBR2 (g.5112179A>G) gene was selected for this association study. These primers (:5'-CAGAGATAAGGCAGTTTGGC-3'and5'-GCAAAAGTACTCAGG ACAGC-3')' were designed to amplify a 488-bp. Amplification of TGBR2 gene fragments were conducted using polymerase chain reactions (PCR). The PCR reaction conditions were 95°C for 5 min, 35 cycles of 95°C for 10 s, 55°C for 20 s, 72°C for 30 s, and an extension at 72°C for 5 min The genotyping was performed by PCR-RFLP method. The PCR product was digested by using the restriction enzymes of *Taq*1 for TGBR2.

Assosiation Study

Association of TGBR2 gene related to fatty acid composition were performed using SAS ver 9.2 (SAS Institute Inc., Cary, USA). The effects of genotype sheep were assessed by the fixed effect model using PROC GLM. Least square mean values for the loci genotypes were compared by t-test and P-values were adjusted by the Tukey-Kramer correction (Kayan *et al.*, 2011).

$$\mathrm{Y}ijk = \mu + \mathrm{genotype}i + \mathrm{e}ij$$

Where :

Y_{ijk}	= fatty acid composition
μ	= the population mean
$genotipe_i$	= the fixed effect of i-th genotype (i = 1, 2, and 3)
e_{ij}	= the residual error

Results and Discussion

Polymorphism of TGBR2 Gene

A SNP was genotyped in TGBR2 (g.5112179A>G) was confirmed by PCR-RFLP. The DNA restriction fragments obtained for g.5112179A>G of TGBR2 polymorphism were: 303, 153, and 32 bp for the GG genotype; and 456, 303, 153, and 32 bp for the AG genotype; and 456 and 32 bp for the AA genotype (Figure 1). The identified SNP confirmed in exon might play important role in transcription process (Gunawan *et al.*, 2011) and probably leading to change in mRNA synthesis, maturation, degradation, transportation, splicing or translation (Iida & Akashi, 2000).

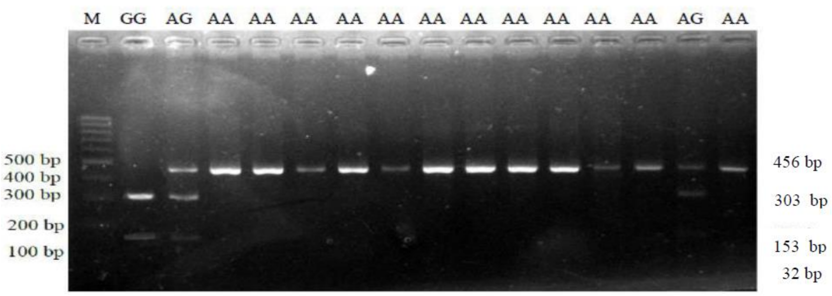

Fig: 1 Genotyping result TGFBR2 gene

Association Study of TGBR2 Gene Polymorphism Fatty Acids Composition

The g.5112179A>G of TGBR2 gene was generally significantly associated ($P<0.05$) with saturated fatty acids (SFA) including pentadeconoic acid (C15:0), as well as monounsaturated fatty acids (MUFA) namely myristoleic acid (C14:1) and pollyunsaturated fatty acids (PUFA) namely linolenic acid (C18:3n6) (Table 1).

Table 4 Genotype and association analysis of TGFBR2 gene

Traits	Genotype		
	AA (n=38)	AG (n=8)	GG (n=1)
Fat content (%)	6.02 ± 3.67	4.44 ± 4.71	2.69 ± 0.00
SFA (%)	37.40 ± 6.38	39.06 ± 6.52	40.88 ± 0.00
Capric Acid (C10:0)	0.10 ± 0.05	0.07 ± 0.02	0.07 ± 0.00
Lauric Acid (C12:0)	0.46 ± 0.63	0.57 ± 0.71	1.70 ± 0.00
Myristic Acid (C14:0)	3.44 ± 2.21	2.39 ± 0.94	6.58 ± 0.00
Pentadecanoic Acid (C15:0)	0.51 ± 0.13a	0.48 ± 0.15a	0.03 ± 0.00b
Palmitic Acid (C16:0)	18.67 ± 2.99	18.16 ± 1.64	20.35 ± 0.00
Heptadecanoic Acid (C17:0)	1.12 ± 0.38	0.95 ± 0.20	0.64 ± 0.00
Stearic Acid (C18:0)	12.92 ± 4.80	16.45 ± 6.50	11.35 ± 0.00
Arachidic Acid (C20:0)	0.08 ± 0.05	0.11 ± 0.05	0.07 ± 0.00
Behenic Acid (C22:0)	0.02 ± 0.03	0.03 ± 0.02	0.03 ± 0.00
UFA (%)	33.33 ± 4.27	31.17 ± 4.54	34.75 ± 0.00
MUFA	30.23 ± 5.04	28.06 ± 4.86	29.54 ± 0.00
Myristoleic Acid (C14:1)	0.14 ± 0.07ab	0.09 ± 0.06b	0.26 ± 0.00a
Palmitoleic Acid (C16:1)	1.69 ± 0.37	1.42 ± 0.35	1.83 ± 0.00
Oleic acid (C18:1n9c)	27.87 ± 4.57	26.17 ± 4.55	27.05 ± 0.00
PUFA	3.10 ± 1.49	3.10 ± 1.03	5.21 ± 0.00
Linoleic Acid (C18:2n6c)	2.21 ± 0.97	2.22 ± 0.71	3.95 ± 0.00
Gamma-linoleic acid (C18:3n6)	0.002±0.006b	0.004±0.01b	0.02 ± 0.00a
Cis 11, 14-Eicosedienoic Acid (C20:2)	0.04 ± 0.02	0.04 ± 0.01	0.06 ± 0.00
Arachidonic Acid (C20:4n6)	0.29 ± 0.24	0.45 ± 0.35	0.78 ± 0.00
Fatty Acid Total (%)	70.86 ± 6.13	70.32 ± 5.28	75.92 ± 0.00

Sheep with homozygous GG genotype were associated with higher unsaturated fatty acids [myristoleic acid (C14:1) and linolenic acid (C18:3n6)] and lower saturated fatty acid [pentadeconoic acid (C15:0)] (Table 1). Saturated fatty acids (SFA) are fatty acids that have an adverse effect on health, one of which is related to the effects of cholesterol metabolism and some diseases (Ulbrich et al, 1991). This study showed that the TGFBR2 gene polymorphism is associated with myristoleic (C14:1) and linolenic (18:3n6). Myristoleic is a monounsaturated fatty acid that can have a positive effect on the body. The presence of myristoleic acid (C14:1) can be used as an indicator of diagnosis in patients with long chain fatty acid oxidation (Onkenhout et al, 1995). Linolenic acid (18:3n6) is a polyunsaturated fatty acid (PUFA) and is also an omega-6 fatty acid. These fatty acid are present in breast milk and some grain oils and are usually used as dietary supplements. Linolenic acid (18:3n6) can increase lipid metabolism, prevent disease metabolism and prevent inflammation (Park et al, 2014). TGFBR2 has the potential to serve as a genetic marker in the selection of sheep with high levels of unsaturated fatty acids.

Conclusion

Associations of TGFBR2 gene polymorphisms with fatty acids composition have been described for the first time in Indonesian sheeps, providing evidence that TGFBR2 might be an important candidate gene for fatty acids composition. However, this study has to be validated in other sheep populations. The TGFBR2 gene has the potential to serve as a genetic marker in selection with high levels of unsaturated fatty acids and low levels of saturated fatty acids.

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The Body Weight, Growth and Heterosis of Kampung Chicken and Crossbreeding with Laying and Broiler Chicken

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Abstract

Native chicken is still a poultry commodity that becomes an option for the rural community, because it is easy to manage, does not require much capital and special place. However, farming system is mostly still done extensively (free ranged) so it is easy to exposed by disease. Another weakness is low productivity, so its development is slow. Therefore, it is necessary to increase the productivity of chickens through crossbreeding program. This study aims to determine the performance of chicken and cross breeding results with laying hens and broilers. A total of 3 roosters and 15 hens of kampung chickens, 3 roosters and 10 hens of layer chickens, and 3 roosters of broiler chickens were crossed mating. The mating was conducted with artificial insemination. The variables observed were body weight, growth and heretability. Data were analyzed with General Linear Model (GLM). Data on body weight and growth were analyzed by sex and different nations.. The results showed that the performance of chicken and crossbreeding with laying and broiler chickens had significant effect (P <0,05) on body weight, and growth based on breed and different sex.

Keywords : Perform, Crossbreeding, Kampung Chicken, Broiler, Layer.

Introduction

Native chickens in Indonesia have the potential to be developed as meat or egg type because they has a high diversity (Pagala et al 2017, 2015, 2012). Indonesian native chickens spread throughout country with phenotypic characteristics that are generally not much different and have a significant role in the development of livestock in Indonesia. Native chicken is still a poultry commodity that becomes an option for the rural community, because it is easy to manage, does not require much capital and special place. However, farming system is mostly still done extensively (free ranged) so it is easy to exposed by disease. Another weakness is low productivity, so its development is slow. On the other hand, demand for chicken products continues to increase. Therefore, it is necessary to increase the productivity of chickens through crossbreeding program. Molecular selection of local chickens or previous chickens has been carried out against genes affecting chicken performance such as the Mx, TLR4, cGH gene (Pagala *et al* 2017; 2015; 2013; Ulupi and Pagala, 2014; Ulupi *et al*., 2013; Ko *et al*., 2002).

Crosses in chickens can increase the heretability of some of the properties of chickens in the offspring derived from crosses for several generations, so it is expected to improve performance and production. Cross breeding in chicken is done with the aim of increasing the production of meat and eggs. If the expected goal is to increase chicken production through weight gain, then this chicken can be mated with a chicken that has rapid growth of body weight such as broiler or chicken with big posture and body structure like bangkok strains or pelung chicken, and if the expected goal is an increase in egg production, this chicken can be mated with a chicken that has high egg production such as layer chicken or arab chicken.

Materials and Methods

The tool used in this research is hatching machine, 1 ml size Tuberculin Syringe, sperm storage tube, scissors, and tissue paper. The chicken used is 3 roosters of kampung chickens and 15 hens of kampung chickens, 3 roosters of layer chicken and 10 laying hens, and 3 roosters of broiler chicken. This research was conducted by crossing, rooster of kampung chicken with layer chicken hens called as AKP (*Ayam Kampung Petelur*), broiler rooster crossed with kampung chickens hens called as ABK *(Ayam Broiler Kampung*), then rooster of layer chickens are crossed with kampung chicken hens called as APK (*Ayam Petelur Kampung*), as controls were mated kampung chicken hens and roosters called as AKK (*Ayam Kampung Kampung*).

The mate is set by a ratio of 1 rooster : 3-5 hens. Each chicken strain consists of 2-3 roosters and 10-15 hens. The eggs produced by each hen from each of the crosses are collected and given an identity for later hatching. The period of collecting hatching eggs were 7 days. Chickens from cross breed are grouped by mating group. Chicken fed twice a day (in the morning and evening) by ad libitum feed and drinking water. While the feed is given based on the nutritional needs of broiler from DOC to slaughtered age. Parameters observed in this study were body weight, and weight gain until 8 weeks, and heterosis value. Data were analyzed with General Linear Model (GLM). Data on body weight, heterosis and growth were analyzed by sex and different strains.

Results and Discussion

Based on the analysis of variance showed that kampung chicken eggs and cross breeding results with laying hens and broiler significantly ($P < 0.05$) on chicken body weight based on different strain and sex (Table 1). The average body weight of ABK chicken for 10 weeks is higher than the AKK, APK and AKP. According to Zainal et al. (2012), chickens that have a far genetic relationship can occur positive heterosis. Crosses with same strain of local chickens produce lighter body weight compared with their parents. According to Banjarnahor et al (2014), animal livestock with close family relationships have little chance of increasing heterosis in their crosses.

Tabel 1. Chicken Body Weight (gram)

Age (Weeks)	Sex	Crossing Treatment				Average
		AKK	ABK	AKP	APK	
1	♂	52,45	55,66	73,94	52,33	$58,43^a$
	♀	49,70	54,34	71,91	49,92	$56,09^b$
	Average	$50,97^c$	$54,94^b$	$73,01^a$	$51,40^c$	57,34
2	♂	85,44	95,16	110,42	87,29	$93,78^a$
	♀	74,35	91,01	104,00	85,78	$87,45^b$
	Average	$79,47^d$	$92,89^b$	$107,48^a$	$86,71^c$	90,82
3	♂	118,79	158,20	158,63	131,52	$138,32^a$
	♀	103,32	151,24	147,47	128,34	$128,28^b$
	Average	$110,46^c$	$154,40^a$	$153,52^a$	$130,29^b$	133,63
4	♂	160,48	230,82	218,48	186,17	$193,01^a$
	♀	139,79	223,15	197,15	174,24	$175,71^b$
	Average	$149,34^d$	$226,64^a$	$208,70^b$	$181,55^c$	184,92
5	♂	215,88	316,38	283,25	251,18	$257,70^a$
	♀	184,70	306,54	253,79	237,40	$234,08^b$
	Average	$199,09^d$	$311,01^a$	$269,75^b$	$245,85^c$	246,66
6	♂	276,02	410,04	365,82	327,41	$333,45^a$
	♀	238,74	399,61	321,02	313,08	$302,98^b$
	Average	$255,95^d$	$404,35^a$	$345,29^b$	$321,86^c$	319,21
7	♂	347,33	511,91	463,62	421,11	$423,58^a$
	♀	302,38	500,20	406,16	396,23	$382,72^b$
	Average	$323,12^d$	$505,52^a$	$437,28^b$	$411,48^c$	404,48
8	♂	432,85	621,01	565,79	518,78	$520,64^a$
	♀	376,24	604,44	500,80	491,40	$472,08^b$
	Average	$402,37^d$	$611,97^a$	$536,00^b$	$508,18^c$	497,95
9	♂	528,57	743,20	674,07	619,42	$624,30^a$
	♀	461,58	722,40	597,16	588,34	$568,03^b$
	Average	$492,50^d$	$731,85^a$	$638,82^b$	$607,39^c$	598,00
10	♂	627,98	878,64	789,08	726,46	$734,48^a$
	♀	559,42	851,74	703,08	689,50	$673,26^b$
	Average	$591,06^d$	$863,97^a$	$749,67^b$	$712,15^c$	705,87

Different superscript in the same line means significantly different ($P<0.05$)

In general, the body weight of male is heavier than the female. This is because the male chicken has higher growth hormone than the female, in chickens this hormone is controlled by the cGH gene (Pagala *et al.*, 2015). According Hapsari (2015), the body weight of a female chicken is higher than the female because the male have testosterone hormone as an androgen steroid that regulates growth. The high secretion of androgens in males is caused by the high secretion of testosterone produced by the testes, so the rate of growth of the rooster is higher.

In Table 2 it can be seen that the chickens obtained from the crosses have highest heterosis average and the lowest was the ABK (male 35.37% and 49.88% female), AKP (male 31.70% and female 34.04%) and (male 13.99% and females 23.20%). This allegedly because there are individual effects of direct genetic effect, maternal, and paternal effect and individual heterosis.

Tabel 2. Heterosis Value (%)

Age (Weeks)	Crossing Treatment					
	ABK		AKP		APK	
	♂	♀	♂	♀	♂	♀
1	5,53	8,07	39,43	36,22	0,81	-0,22
2	11,50	22,02	28,13	33,50	-0,10	12,46
3	32,63	41,92	32,33	35,66	12,54	22,44
4	43,69	58,93	35,91	41,20	16,56	24,86
5	44,61	65,59	31,42	37,41	17,67	28,66
6	48,36	67,38	32,36	34,46	18,46	31,30
7	47,38	65,42	33,48	34,32	21,24	31,14
8	43,47	60,66	30,71	33,11	19,85	30,61
9	40,61	56,51	27,53	29,37	17,19	27,46
10	39,91	52,25	25,65	25,68	15,68	23,25
Average	$35,77^{b}$	$49,88^{a}$	$31,70^{bc}$	$34,09^{b}$	$13,99^{d}$	$23,20^{cd}$
SD	15,08	20,08	4,07	4,26	7,56	9,99

Different superscript in the same line means significantly different (P<0.05)

The heterosis value of kampung chicken with cross result with broiler is higher than layer chicken. This is because broilers have the advantage of having very fast growth and development rates which quite high expressed by the gene of cGH (Pagala et al, 2015) compared to the results of crosses among local chickens and layers. According to Zainal et al. (2012), chickens that have a far genetic relationship can occur positive heterosis. Crosses with same strain of local chickens produce lighter body weight compared with their parents. According to Banjarnahor et al (2014), animal livestock with close family relationships have little chance of increasing heterosis in their crosses.

Tabel 3. Weekly Body Weight Growth (g/week)

Sex	Crossing Treatment			
	AKK	ABK	AKP	APK
♂	$60,18\pm1,06^{f}$	$84,96\pm1,58^{a}$	$74,99\pm2,61^{c}$	$69,98\pm1,09^{d}$
♀	$53,27\pm1,34^{g}$	$82,36\pm1,41^{b}$	$66,44\pm1,95^{e}$	$66,34\pm0,65^{e}$
Average	$56,46\pm3,69^{d}$	$83,54\pm1,96^{a}$	$71,08\pm4,92^{b}$	$68,57\pm2,03^{c}$

Different superscript in the same line means significantly different (P<0.05)

Based on analysis of variance shows crossbreeding of kampung chicken with laying and broiler chicken have significantly (P <0,05) effect on chicken weekly body weight growth. The average growth rate during 10 weeks observation for male was 84.96 g and 82.36 g for female, while AKP was 74.99 g in males and 66.44 g on females chicken, and for APK the rate was 69.98 g in males and 66.34 g in females, while for AKK were obtained 60.18 g for males and 53.30 g for females, and statistically has not shown any significant difference.

Conclusions

The performance of crossed kampung chickens with broiler and layer hens produce better body weight and growth rate compared to crosses of fellow kampung chickens.

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Rapid Selection at Fattening Farm for Sheep Genetic Improvement

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Abstract

In the last decade, sheep fattening business has been growing rapidly, as the business is easier, cheaper, profitable and quick yield. However, if this business is not balanced by a breeding program, the stock for fattening business will be decreased both in quantity and quality, as excellent lambs will be slaughtered. The growth performance of local sheep still vary, farmers in sheep fattening still received 20-30% of bad finished lambs. Variation of growth performance can indicate that selection need to be done. There should be elite flock can found with excellent average of daily gain (ADG), in the fattening commercial farms. It is good if the selection in more rapid, easier and cheaper can be implemented. By screening ADG of sheep in commercial farms before and after fattening program, the elite flock can be gained phenotypically. The objectives of this study were to (i) measure ADG of sheep in a commercial fattening farm, (ii) to select the sheep by calculating selection differential, selection intensity and to select the sheep and calculate genetic response. It was found that from through rapid selection in a commercial farm, elite flock of sheep can be found with excellent growth more than 200 g/head/day with at different selection intensity. It is concluded that genetic response can be calculated through this method for breeding improvement of sheep growth performance.

Keywords: local sheep, rapid selection, commercial farm, breeding improvement.

Introduction

In the last decade, sheep fattening business has been growing rapidly, as the business is easier, cheaper, profitable and quick yield. However, if this business is not balanced by a breeding business, the stock for fattening business will be decreased both in quantity and quality, as best lambs will be slaughtered than being produced by fattening farms. The quality of growth performance of local sheep still vary, farmers in sheep fattening still received more than 20% of unwell finished lambs. However, Yamin, *et al* (2012) showed that there was 2% of elite flock found with the average of daily gain (ADG) of 250 g/head/day, in the fattening commercial farms.

At present, sheep fattening program produce in female lamb sheep, as unbalanced sex ratio born, cheaper price of female lambs. It is therefore good to do study the rapid selection again in current status of commercial fattening sheep business. For the future, it is good if the selection results of elite flock (extremely good) will be bred to produce excellent quality of lambs for further commercial sheep farm. By screening ADG of sheep in commercial farms before and after fattening program, the elite flock can be gained phenotypically. The elite flocks can be then bought from the commercial farms and used in sheep breeding farms or company or government research institution.

Genetic improvement of sheep growth is reasonable to implement, because the heritability of growth traits in sheep is medium ($h^2 = 0.3$). This trait will be inherited and so the average of growth will be increased at certain time. This breeding program is sustainable in the case of preserving local sheep breed, but when we have upgraded the local sheep to be fast-growing sheep and stable, we have crossbreed the flock with other better sheep breed to increase quality of local sheep.

The objectives of this study were to (i) to measure ADG of sheep in a commercial fattening farm, and (ii) to select the sheep and evaluate genetic response.

Materials and Methods

Fifty six (56) heads of female lambs (I_0) of local sheep from Central Java as fattening lambs in Tawakal Farm, Caringin Bogor, were used in this study. Sheep were fed with commercial fattening ration formulated by the company. Protein and energy level given to the sheep were 14% and 70% respectively. To weigh sheep before and after fattening a digital scale maximum capacity of 100 kg was used. Sheep ear tags were put on their ears for sheep identification.

The selection stages were conducted by calculating the parameters as follows:

- ADG (average daily gain), measured for 19 days of observation.
- Standard deviation (SD) and Coefficient of Variation (CoV)
- Selection Differential
- Selection Intensity, and
- Genetic progress

The formula of the parameters are:

1. ADG

$$\text{ADG} = \frac{BW_4 - BW_1}{Age \times 1000}$$

Note:
ADG : Average Daily Gain (g)
BW_4 : Final weight (kg) at 19 days of observation
BW_1 : Start Weight (kg)
Age : Difference day between finish weight and start weight

2. Selection Differential

    SD (Selection Differential) = *Individual Weight – Average Population Weight*

3. Selection Intensity (I)

    $I = \frac{SD}{Sdev}$

    Note:
    SI : Selection Intensity
    SD : Selection Differential
    Sdev : Standard Deviation

4. Genetic Response

$$\Delta G = h^2 \times SD$$

    Note
    ΔG : Genetic Response
    h^2 : heritability
    SD : Selection Differential

Results and Discussion

The mean, standard deviation and coefficient of variation of sheep ADG during experiment were presented in Table 1. The mean ADG of the sheep population in the flock was very good above the average ADG of final products from fattening farm, i.e 143.61 g/h/d. The standard deviation of ADG in the flock available was quite large, 57.20 g/h/d and it contributed to CoV of the ADG was 39.83 %, which was more than 20%, a maximum CoV allowed. However, this means that selection to the sheep population is definitely still needed to improve growth performance of the sheep. In fattening farm, the lambs grown need to be selected regularly.

Table 1. Average Daily Gain (ADG) of experimental sheep

Parameters	BW_1 (kg)	BW_4 (kg)	ADG (g/h/d)
Mean	16.33	19.06	143.61
SD	2.55	3.12	57.20
CoV	15.64	16.35	39.83

Furthermore, the SD was calculated by subtracting individual weight by the average population weight (results were not shown in this section). Then, selection intensity (I) was calculated by dividing the SD by STD. The I was divided into the one between 0.1-1 and more than and same with 1, this accounted to sheep flock having ADG lower and higher than 200 g/h/day. It was found that when the I was lower, more number of selected sheep were gained (25 heads), on the contrary it was only 9 heads at higher SI. Average ADG in these two groups were 192.21±33.77 g/h/d and 228.07±25.65 g/h/d, respectively (Table 2).

Table 2. Number and ADG means of selected sheep at different selection intensity (I)

Selection Intensity (I)	N	Number of selected sheep (head)	ADG Means (g/h/d)
≥0.1	56	25	192.21±33.77
≥1	56	9	228.07±25.65

To make clear description of the results, Figure 1 shows the difference of ADG before and after rapid selection.

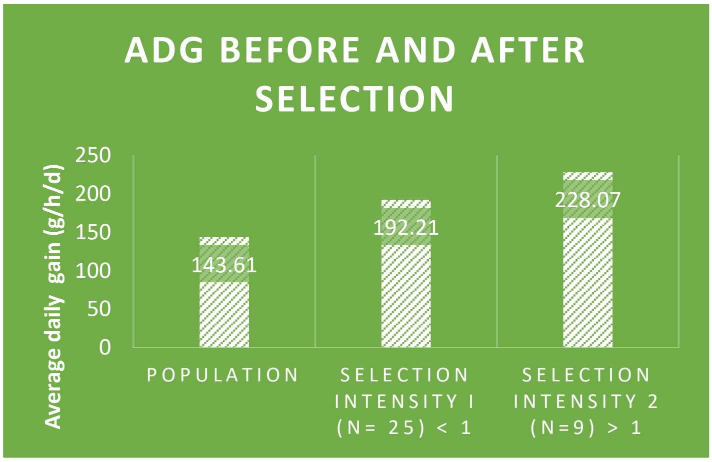

Figure 1. ADG before selection 141.61 g/h/d (n=56) and after different selection intensity (0.1-1 and >=1) with n=25 and 9 heds; ADG 192.21 and 228.07 g/h/d/, respectively).

Final step of rapid selection was calculated genetic respond by divided heritability and SD. As expected, genetic response was higher at stronger I and lower at weaker I, respectively 25.34 g and 14.58 g (Table 3). The large genetic progress found in this study propose a smaller environment effect in the Tawakal Farms. These result indicated that local sheep from Central Java can improve genetically using a conventional selection method

Selection Intensity	n	Selected sheep head	%	Selection Differential Means (g)	Genetic Response (g)
≥0.1	56	25	44.64	48.60	14.58
≥1	56	9	16.07	84.46	25.34

The advantage of this method is cheap and easy by collaboration with sheep fattening business commercial farm. The breeding business can be implemented in the fattening farm, as it can be estimated the program can be profitable as the price of selected sheep should be inexpensive, because the elite flocks are from its own farm. It can also be developed in a commercial breeding farms with profitable and sustainable because good quality of elite flocks, reasonable price in relation to fattening results price but higher selling price of lambs products.

Conclusions

The rapid selection was reliable to conduct in a commercial farm. Elite flock can be found in the selection from the commercial farms that still have large standard deviation. The selection was to be effective and efficient as it was a conventional selection, commercial fattening farms, inexpensive price and continuous breeding stocks for a sustainable sheep genetic improvement program.

Acknoledgement

Appreciations is given to the owner, manager and team of PT. Tawakal Farm, Fattening Farm for the help and facilitation to run this research. Both students Imam and Reza for routine sheep weigh during the experiment, great thank you very much for you participation.

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FULL PAPERS
POSTER SESSIONS
SUBTHEME: ANIMAL LOGISTICS

Perception of Frozen Beef from Bussiness Consumers at Bogor

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Abstract

This research project was designed to examine the perceptions of business consumers toward the purchase and usage of frozen beef products. The data was collected using a questionnaire which is conducted to investigate the public perception of frozen beef. The data required for the study was collected from 50 business of supermarket, hotel, restaurant, and catering at Bogor and by a face-to-face conversation questionnaire method using well-structured schedule. The determination of respondents are using balanced sample allocation method through sample fraction per cluster approach. Survey was conducted in January to April 2018 in Bogor. Analysis data was conducted by descriptive analysis. Respondents from this study were 50 businesses consumers of frozen beef. Number of respondents are as follows: restaurant 24, catering 4, hotel 4 and supermarket 18. Business consumer perception of frozen beef was divided into several aspects such as nutrition and health, quality, social culture, religion, hygiene and economy. The results showed that as many as 74% of respondents agreed that frozen beef has good nutrition, 58% respondents strongly agree if frozen beef is not harmful to health, and 66% of respondents agree that frozen beef is hygienic, and 86% halal. The other reason for the selection of frozen meat was cheap prices with 84%. The conclusion of this research was business consumers in Bogor to buy frozen beef had good perception of frozen meat in terms of quality, nutrition, health, low price and longer shelf life.

Introduction

Indonesia's food consumption patterns have changed considerably in recent decades. Meat has become a more important component of the Indonesian diet over this period. Based on data of national meat consumption, beef consumption is the third largest per capita after purebred chicken and domestic poultry. The average beef consumption of Indonesians from 1993 to 2014 is 0.704-2.36 kg/capita/year. However, annual per capita meat consumption in Indonesia is still low, even compared with near neighbours. Therefore, Indonesian government made the policies to increase meat consumption become 20 kg/capita/year by encouraging domestic beef prodution especially beef from NTT and importing. Since Indonesia is an archipelago country, the distribution chain and provision of meat systems become the main factor to achieve the govenment’s goal. Indonesian society in general prefers freshly slaughtered hot meat and is marketed in warm conditions at room temperature. In food safety, warm meat sold and marketed in room temperature will be very vulnerable and has a very short shelf life. In addition to physical quality, chemistry and microbiology cannot be guaranteed.

The need for beef in Indonesia still cannot be fulfilled from within the country so the government makes policy to supply the need from abroad. Fulfillment of beef from abroad is usually done through two ways of importing cattle and frozen beef. This study was aimed to identify the characteristics and perceptions of business consumers on frozen beef and analyze the relationship between perceptions and characteristics of frozen beef business consumers in Bogor region.

Materials and Methods

Survey was conducted in January to April 2018 in Bogor. Respondents from this study were 50 businesses consumers of frozen beef. Number of respondents are as follows: restaurant 24, catering 4, hotel 4 and supermarket 18. It has fulfilled the statistic rule that the minimum sample for the research is 30 samples (Silalahi 2012). Respondents were chosen by non probability sampling using purposive sampling technique. Primary data obtained with questionnaire through direct face-to-face interviews with respondents ie business owners or store managers. The analysis used in this research is descriptive analysis to describe perception, characteristic (business type, business time span, monthly income and beef consumption per month) and purchasing decision process. The buying decision process is based on Kotler (2005). Data are displayed in the form of frequency, average, percentage, and score average. The relationship between perceptions and characteristics of business consumers analyzed using correlational test Rank Spearman (Silalahi 2012).

Results and Discussion

Characteristics of Frozen beef's consumers

Consumers who consume frozen beef are divided into two major categories: businesses that sell frozen beef in the form of raw materials and businesses that sell in the form of processed beef. The majority of respondents are businesses that buy frozen beef to be processed into cooking with a percentage of 64%, consisting of 48% restaurant, 8% catering business and 8% hotel. Consumers of frozen beef business in the Bogor area is a type of business that buys frozen beef to be reprocessed with the amount of meat consumption of 51-200 kg and more than 1000 kg per month, revenues ranging from Rp 5000,000-50,000,000 and the length of time the business is less from 5 years. The majority of respondents bought frozen beef at suppliers with a percentage of 58% and 42% of respondents bought frozen beef in traditional markets. A total of 54% make a direct purchase and 46% of respondents make reservations to buy the required beef.

Consumers bought frozen beef that is longer shelf life and meat is always available in the market with the attributes most considered in buying frozen beef is quality and price. The respondent's source of information about frozen beef is a personal experience of consumers. The party that determines the final decision of the purchase is the business owner. Respondents bought frozen beef at suppliers and traditional markets with daily purchase frequency. Purchase of frozen beef is done directly with cash payment. Respondents decided to continue to buy frozen beef.

Consumer's perception of frozen beef

Consumer perceptions viewed from the aspect of product quality measured using a variable that states that frozen beef has good physical and organoleptic quality, and processed with hygiene. This is based on research Dewi (2012) which states that freezing cause a little affection on the physical properties of meat that include tenderness, cooking shrinkage, pH and water holding capacity of beef. The taste and smell of frozen beef also did not change (James C and James S 2008). The majority of Indonesians are Muslim, so the issue of halal and thayyib food is important. According to research Fajrin E (2016), consumers in Bogor city have a good understanding of halal and thayyib meat products.

Business consumer perception of frozen beef was divided into several aspects such as nutrition and health, quality, social culture, religion, hygiene and economy. The results showed that as many as 74% of respondents agreed that frozen beef has good nutrition, 58% respondents strongly agree if frozen beef is not harmful to health, and 66% of respondents agree that frozen beef is hygienic, and 86% halal. The other reason for the selection of frozen meat was cheap prices with 84%. The most common attributes taken by consumers are quality with percentage of 66%, price with percentage 48% and 40% of respondents choose meat part while others choose other attributes such as meat origin (local or import), hygiene, freshness and meat packaging. The result of perception of business consumers towards frozen beef is described in Table 1.

According to Sumarwan (2014) consumer perceptions of a product can be influenced by individual factors such as consumer characteristics. There are 4 characteristics of consumer that measured relation with perception of frozen meat. The characteristics are business type based on frozen beef sales, monthly income, monthly meat consumption and business time frame. The result of Rank Spearman correlation test shows that the business type variables have correlation coefficient value of -0.224 which means the relation with the perception level is very weak, opposite and not significant ($p > 0.05$). The income variable has a correlation coefficient value of 0.190 which means its relationship with the perception level is very weak, unidirectional and not significant ($p > 0.05$). So it can be seen that the variable income per month does not affect the level of consumer perceptions of frozen beef. The amount of beef consumption per month has a significant relationship ($p < 0.05$) and in line with the level of consumer perception toward frozen beef. This shows a significant relationship between the amount of beef consumption per month with the level of consumer perception

Table 9. Average perception score of respondents to frozen beef

No	Aspects		Variable	Average score
1.	Nutritional value and health	Nutritional value	Frozen beef has a good nutritional content	2.80
			The freezing process does not reduce the nutritional content of beef	2.38
		Health	Frozen beef is good for consumption	3.54
			Consuming frozen beef is not harmful to health	3.54
	Average of aspect's score			3.07
2.	Product quality	Physical quality	Frozen beef has good quality	2.94
			Freezing does not change the quality of beef	2.74
			Frozen beef has a good level of elasticity	2.94
			Frozen beef has a good fiber texture	2.96
			Frozen beef when tendered	3.04
			Frozen beef slightly decreased after being processed	2.50
			Frozen beef has less fat	2.48
		Organoleptic	The frozen beef has a good taste	2.82
			Frozen beef has a distinctive aroma of meat	2.86
			The appearance of frozen beef looks good and interesting	2.84
		Cleanliness	Frozen beef is processed clean and hygienic	3.06
			Meats stored at freezing temperatures are more hygienic	3.08
	Average of aspect's score			2.86
3.	Product handling		Frozen beef has been stored for a long time	2.70
			Frozen beef is not easy to rot	3.30
			Frozen beef is more easily stored and handled	3.06
	Average of aspect's score			3.02
4.	Religion	-	The frozen beef is perfectly halal	2.70
			Frozen beef comes from healthy and good cows.	3.30
	Average of aspect's score			3.00
5.	Price	-	Frozen beef prices are more affordable	3.32
	Average of aspect's score			3.32
	Average of final score			3.05

Conclusions

Business consumers in Bogor have a good perception of frozen beef. Product quality is the aspect with the lowest score of 2.86 and the highest score is the price with a score of 3.32. Characteristics of consumers who have a significant relationship to the level of consumer perceptions of frozen beef is the consumption of meat per month, with a positive correlation coefficient value of 0.379

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FULL PAPERS

POSTER SESSIONS

SUBTHEME: ANIMAL MANAGEMENT AND PRODUCTION

Frame Size Development of Brahman, Madura and Ongole Cross Cattle in Growing Phase

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Abstract

A study was conducted to evaluate the patterns of growth and development of some breeds of Zebu cattle (Bos indicus) based on the linear size of body frame in the growth phase using a method of digital image. This study used 240 cattle consisting of Peranakan Ongole (PO/Ongole crossbred), Madura, Pasundan and Brahman cattle, with an individual lifespan from birth to before weaning, from weaning to mature sex, and mature sex to mature body. The morphometric measurements observed were cervicalis vertebrae, thoraxic vertebrae, lumbar vertebrae, sacral vertebrae, scapulla, humerus, radius ulna, metacarpus, femur, tibia fibula, metatarsus, body length, body height, chest depth and hip height. The results showed that cattle breed and age range had an effect on body frame sizes including vertebrae, forelimbs, hind limbs and body frame size in general. The body frame of Brahman cattle was relatively larger than PO cattle, PO cattle bigger than Madura cattle. Thuse, Brahman is potential beef cattle compared to PO and Madura cattle.

Keyword: Brahman, frame size, Madura cattle, Ongole crossbred

Introduction

Morphometric measure related to the aspects of growth and development as well as body proportion is crucial to determine the development strategy of livestock, standardization of livestock, enclosure standard of local livestock, and other essential aspects of production. Growth and development and morphometric measurement provide a method to predict body weight based on linear measure and body width using digital technique of measurement. According to Hakim (2016), morphometric measurement with a method of digital image has advantages compared with manual measurement, because it can: (1) reduce the risk of livestock stress during measurement, (2) minimize the risk of an aggressive cattle attracting a researcher, (3) be done in the cattle shelter more quickly because the handling does not take a long time, and (4) provide very accurate measurement results.

This concept will predict body weight based on the digital photos of livestock and will help farmers and consumers to estimate weight of a cattle in traditional livestock markets online shopping system. According to Utomo (2015), the body size of cattle can be used to see cattle performance since it depicts the growth of bones and weight gain. The analysis of digital image could quickly analyze the results with high accuracy. According to Putra *et al* (2016), this method providing safety for researcher and animal, accurate data, minimizing stress on livestock. The software ImageJ is free and easy to use.

Material and Method

This study used 80 heads of PO cattle, 80 heads of Madura and Pasundan cattle, and 80 heads of Brahman cattle, with a total of 240 heads of cattle base on age ranges: 1) birth to before weaning; 2) weaning to sex mature; and 3) sex and body mature.

The morphometric measurement adopted from Schmidt-Nielsen (1984), and WAVA (2012), with parameters i.e., *cervicalis vertebrae, thoraxic vertebrae, lumbar vertebrae, sacral vertebrae, scapulla, humerus, radius ulna, metacarpus, femur, tibia fibula, metatarsus,* body length, body height, chest depth and hip height, total length, distance between legs, body width, and total width. The parameters were analyzed using statistical program of SAS.

Results and Discussion

Data obtained from the study are presented in Table 1. In line with the increasing age of the cattle, the average cluster size of the spine increases in length averagely 7.17 cm. The significant increase in the size of spine cluster occurred in thoracic spine for both the pre-weaning age range (PS) and after weaning (LS) and after weaning (LS) and mature sex (DK), namely 12.97 and 11, 58 cm. The increase in the size of the thoracic spine allowed the protection of heart and lungs in the chest cavity area.

The results showed that influence of cattle breed on the spinal measures was generally not significant ($p > 0.05$). The influence of cattle breeds might be obvious on certain age. Brahman cattle in the category of PS age had longer sizes of cervical spine, thoracic, lumbar and sacral ($p < 0.05$) on the average of 6.46 and 7.33 cm compared to the spinal sizes of PO and Madura cattle. In the category of LS age, Brahman also had a longer size of cervicalis spine by 4.62 cm ($p < 0.05$) compared to Madura cattle. Base on mature sex, there was no difference in the size of spinal frame in the three cattle breeds. According to Hammond (1961) and Hakim (2016), cattle breed difference may cause diversity of body frame sizes.

Table 1. Morphometric characteristics of body axis

Variable	Age	Breed			Age Average
		Brahman	PO	Madura	
Cervicalis vertebrae	DK	26.14±1.36	28.33±1.21	27.23±1.72	27.23±0.83
	LS	24.41±1.21a	25.14±1.21a	19.79±1.72b	23.11±0.81
	PS	20.68±1.21a	16.89±2.57ab	14.93±1.92b	17.50±0.92
	Breed Average	23.74±0.73	23.45±0.77	20.65±1.03	
Thoracic vertebrae	DK	53.74±1.87	53.18±1.68	54.47±2.37	53.80±1.15
	LS	42.97±1.68	40.04±1.68	43.67±2.37	42.22±1.12
	PS	36.75±1.68a	26.18±2.16b	24.83±2.65b	29.25±1.27
	Breed Average	44.49±1.00	39.80±1.07	41.00±1.42	
Lumbar vertebrae	DK	30.06±1.03	31.59±0.92	31.07±1.30	30.91±0.63
	LS	24.84±0.92	26.26±0.92	24.66±1.30	25.25±0.62
	PS	21.85±0.92a	16.22±1.19b	16.70±1.46b	18.26±0.70
	Breed Average	25.58±0.55	24.69±0.59	24.14±0.78	
Sacral vertebrae	DK	25.56±0.95	27.48±0.85	25.54±1.21	26.19±0.59
	LS	20.92±0.85	21.49±0.85	19.68±1.21	20.70±0.57
	PS	19,90±0.85a	14.04±1.10b	13.42±1.35b	15.79±0.65
	Breed Average	22.13±0.51	21.00±0.54	19.55±0.73	

Data in Table 2 revealed that the increasing age of the cattle cause the growth cluster size of the forelimb bones with an average length of 5.82 cm. The relatively high growth of bone size in the bone type of radius-ulna in the age range of LS-DK was 7.76 cm. The effect of breed was not significant on the measures of forelimb bones.

The influence of breed was obvious in the specification of a certain age. Pre-weaning age of Brahman cattle had a longer size ($p < 0.05$) bone types of *scapula*, *humerus*, and *radius-ulna* on the average of 12.00, 9.04 and 4.18 cm compared to PO cattle and Madura cattle. In the category of LS age, Brahman cattle had a longer size of humerus bone ($p < 0.05$) compared to PO cattle and Madura cattle with a difference of 4.07 and 3.64 cm. In the age category of mature sex, Brahman cattle had bigger bone sizes of *scapula*, *humerus*, and *metacarpus* ($p < 0.05$) compared to the other two cattle, while the radius-ulna bone in PO cattle was bigger than the other two cattle. This is because one of the functions of frame/bone is the location where muscle tissue is stuck, so Brahman cattle produce more meat directed to the type of beef cattle. According to Hikmawaty et al. (2014), differences in the cattle size were probably due to genetics, location of origin, raising and mating systems.

The types of bone size data included *femur*, *tibia-fibula*, and *metatarsal*. The results of each characteristics of hind limbs for each type of bone, age category, and cattle breed are as follow 1) *Femur*: Brahman, 31.42±0.71; PO 29.33±0.76, Madura

26.34±1.01. 2) *Tibia-fibula;* Brahman 42.09±0.85; PO 39.86±0.90; Madura 33.17±1.20. 3) *Metatartsal;* Brahman 30.80±0.59, PO 29.71±0.63; 28.60±0.83. The increased age of the cattle, increase the size of hind limb bones on the average length of 6.38 cm. The relatively high growth of bone size occurred in *tibia-fibula* based on age were 8.85 and 8.59 cm respectively. Breeds and age had no effect on hind limbs size and showed a relatively similar pattern. Different age resulted in significant difference ($p<0.05$) of *femur*, *tibia-fibula*, and *metatarsal.* of which Brahman cattle was higher than PO and Madura cattle. In LS age, only *tibia-fibula*, the bone size of *tibia-fibula* in Brahman cattle was longer than PO and Madura cattle. In DK age, data of *femur* and *tibia-fibula* showed that Brahman cattle had bigger bones size than the other two breeds. This indicated that Brahman cattle produce more meat than PO and Madura cattle.

Table 2. Morphometric characteristics of thoracic limb

Variable	Age	Breed			Age Average
		Brahman	PO	Madura	
Scapulla	DK	49.55±1.29a	47.32±1.16a	41.93±1.64b	42.27±0.80
	LS	37.41±1.16	36.52±1.16	35.17±1.64	36.36±0.77
	PS	36.36±1.16a	23.15±1.50b	24.36±1.83b	27.96±0.88
	Breed Average	41.11±0.70	35.66±0.74	33.82±0.98	
Humerus	DK	39.70±1.09a	35.33±0.98b	34.74±1.38b	36.59±0.67
	LS	32.31±0.98a	28.24±0.98b	28.67±1.38b	29.74±0.65
	PS	29.65±0.98a	20.51±1.26b	20.61±1.54b	23.59±0.74
	Breed Average	33.89±0.59	28.03±0.62	28.00±0.83	
Radius-Ulna	DK	36.37±1.24b	40.13±1.11a	32.41±1.57c	36.31±0.76
	LS	27.68±1.11	30.36±1.11	27.62±1.57	28.55±0.74
	PS	25.26±1.11a	22.39±1.43ab	21.08±1.76b	22.91±0.84
	Breed Average	29.77±0.67	30.96±0.71	27.04±0.94	
Metacarpus	DK	28.02±0.97a	25.65±0.87ab	22.80±1.23b	25.49±0.60
	LS	22.83±0.87	21.48±0.87	20.10±1.23	21.47±0.58
	PS	20.87±0.87	19.23±1.12	19.05±1.37	19.72±0.66
	Breed Average	23.91±0.52	22.12±0.55	20.65±0.74	

Based on common sizes (cm) of body length, body height, chest depth and hip height, the results revealed that;1) Body length: Brahman 108.70±1.74; PO 95.97±1.85; Madura 89.50±2.47, 2) Body Height: Brahman 109.66±1.59, PO 101.96±1.69; Madura 96.58±2.25; 3) Chest Depth: Brahman 47.95±0.90, PO 45.81±0.96; Madura 44.62±1.28; 4) Hip Height: Brahman 112.80±1.72, PO 105.88±1.83, Madura 102.20±2.43. Increasing age of the cattle, increased the average the size of its length. The increased dimension in body length was quite proportional in both age ranges, namely PS-LS and LS-DK respectively 24.81 and 26.14 cm. The massive addition of body length in both time spans indicated that the ongoing phase of accelerated growth in male cattle started from pre-weaning growth phase. In contrast, female cattle started the acceleration phase after weaning.

According to Field (2007), liveweight at body maturity or sexual maturity could be used as indicator of cattle frame size type. The frame size of cattle was divided into three frame sizes, namely (a) small frame (below 117.22 cm), (b) medium frame (117.22 to 123.88 cm), and (c) large frame (above 123.88 cm). Body height increase showed a proportional increase in both age ranges (pre-weaning - weaning and weaning-mature sex). The average body height increase in every phase range was 21.31 cm (21-22 cm), both in body height and hip height. Mature sex data of height showed that Brahman and PO cattle belonged to moderate body frame, while Madura cattle included in small body frame. According to Ferdowsi *et al* (2012), different frame size was due to the different gene and cross breeding. According to Hakim (2016), cattle with a large body frame have a growth rate higher than cattle with a medium and small body frame.

Increase in cattle age was followed by the addition of the size of chest depth by 12.17 cm at each age range of the cattle. In the category of PS age, Brahman had the highest scores in body length, height, hip height, and chest dept ($p < 0.05$) compared to PO and Madura cattle. In the category of LS age, the three cattle breeds were similiar, while in the category DK age, the body length or height of Brahman cattle had larger dimension than and PO and Madura cattle. Setiadi and Diwyanto (1997), stated that large body size of cattle was associated with the age and raising system applied.

Conclusion

Based on morphometric characteristics including body axis, thoraxic limb, pelvic limb and commom size of local cattle breeds during three phases of growing period, Brahman cattle had larger body frame than PO breed cattle, whereas, PO cattle had bigger body frame than Madura cattle. Analisys technique using digital image revealed that Brahman is the most productive beef cattle with higher meat production as compared to PO and Madura cattle.

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FULL PAPERS

POSTER SESSIONS

SUBTHEME : ANIMAL WELFARE, HEALTH AND DISEASE PREVENTION

In Vitro Studies: Potential Use of *Dyospiros kaky* as an Anti-Cholesterol Agent

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Abstract

Indonesia is special country rich with many herbal plant to maintenance people and animal health. Persimmon Fruit (Dyospiros kaky) combined with other herbal have a good potency to decrease cholesterol in blood. High blood cholesterol can make stroke cases, a dangerous disease. Stroke is caused by a blockage of cholesterol in the blood vessels. Antioxidants and polyphenol in Persimmon Fruit able to lower blood lipid and fiber helps regulate blood pressure. The purpose of this study to determine the affectivity of formulation stoke care: Dyospiros kaky 50%, Apium grafeolens 20%, Guazuma ulmifolia 20% and Hibiscus sabdariffa 10%. The study used in vitro method. Cholesterol blood liquid made with isotonic liquid, Calsium and yellow egg similar as cholesterol content in blood 200 mg/dl. Formula stroke care used 20 mg/dl, 40 mg/dl and 60 mg/dl. Method MU/INST/4 (GC) used to analysis cholesterol at Centre of Agro-Based Industry, Bogor. The result of this study showed that cholesterol level decrease from 200 ml/dl to 102 mg/100 g at dose 20 mg/dl, 64.5 mg/100 gram at dose 40 mg/dl and 94.2 mg/100 gram at dose 60 mg/dl. The best dose to decrease blood cholesterol is 40 mg/dl to decrease stroke case. This study indicated that Dyospiros kaky potential to treat stroke.

Keywords: Dyospiros kaky, cholesterol, MU/INST/4 (GC) method, in vitro studies, potential

Introduction

Indonesia is an extraordinarily rich country of natural materials. Natural materials have excellent prospects in the field of health and beauty. The use of chemicals in the field of health and beauty has negative impacts. Natural materials that can be used include fruit, leaves, tubers, wood, fish, and animals. These natural ingredients are also called herbs. Fruit that has excellent potential for health is Persimmon fruit (*Dyospiros kaki*).

Nutritional composition of Persimmon fruit are water (92.93%), vitamin C (11.85 mg/100 gram), tannin (881.2 mg/liter), vitamin B1 (4864.23 mg/kg), vitamin B2 (85.87 mg/kg), carbohydrate (5.73%), protein (9.24%), fat (0.85%), alcohol (0%), mineral (0.48%) consisted of Al (0 mg/l), Cu (0.48 mg/l), Ca (154.25 mg/l), Fe (3.18 mg/l), Mg (149.87 mg/l), Zn (1.75 mg/l), Ni (0.24 mg/l), Cd (0 mg/l), Pb (1.37 mg/l), and Cr (0.25 mg/l) (Widyani and Hermawan, 2016). Persimmon fruit contains astir oil, tannins, amylin, fructose, flavonoid, vitamin C, Fe, Cu, and Phosphor (Widyani et al., 2016). *Dyospira kaki* fermentation is rich in *Bacillus sp* (1.05 x 10^3 cfu/ml) which is useful as antibiotic and organic antifungal. The contents of pathogenic bacteria such as *E coli* and *Staph aureus* were negative (Widyani et al., 2017).

Life style changes in the global era produce various types of diseases. Fast food such as burger, fried chicken, beef steak, and soft drink have a great potential to cause disease because high cholesterol, lipid, and sugar. Around 70% of blood cholesterol originates from endogenous synthesis in the liver, and only 30% are obtained from food consumed. If intake of cholesterol from fast food and changes in life style are very high, these conditions will cause atherosclerosis that consequently will cause hypertension and blockage of blood vessels in the brain, heart, and feet. Blockage of blood vessel in the brain will cause a stroke, blockage of blood vessel in the heart will cause cardiovascular disease, and blockage of blood vessel in the feet will cause pain, crams, numb, and gangrene (Garnadi, 2012). Plasma cholesterol concentration above 240 mg/dl may cause atherosclerosis and normal level of cholesterol is 200 mg/dl (Roskoski, 1996).

Chicken meat is a cheap food. Industry of broiler chicken increases from year to year because chicken meat is very liked by the community. Innovations in chicken livestock has undergone a great development such as a probiotic chicken, organic chicken that have better nutritive values compared to conventional broiler chicken with hormone injection or antibiotic administration. In the future, cholesterol-free chicken can be produced as a new innovation. Therefore, a few steps are required to realize the production of cholesterol-free chicken.

The first step in this scheme is *in vitro* study. This research designed a new innovation by using a natural resource to decrease cholesterol in the blood. Antioxidant and polyphenol in Persimmon fruit are able to lower blood lipid concentrations and fiber content will help regulate blood pressure. The hypothesis of this research is that Persimmon fruit combine with the other herbals have a good potency to decrease cholesterol concentrations in the blood. The purpose of this study was to determine the effectivity of stroke care formulation in decreasing blood cholesterol concentration.

Materials and Methods

Composition of Stroke Care formulation: *Dyospiros kaki* (50%), *Apium grafeolens* (20%), *Guazuma ulmifolia* (20%), and *Hibiscus sabdariffa* (10%).

In vitro studies used composition of blood cholesterol (200 mg/dl), isotonic liquid (100 ml), and yellow egg (5 grams).

Methods to proximate analysis of water SNI 01-2891-1992, 5.1; ash SNI 01-2891-1992, 6.1; protein SNI 01-2891-1992, 7.1; fat SNI 01-2891-1992, 8.2 and carbohydrate IK 5.4.5. Method for measuring cholesterol was MU/INS/4 (GC). Analysis was done at Analytical and Calibration Laboratories, Center for Agro-based Industry. Bogor.

Results and Discussion

Result showed that stroke care formulation contains nutrients shown in Table 1. Carbohydrate concentration of stroke care formulation was high i.e., 74.7%. The high carbohydrate concentration of this formulation is contributed by the component of formulation that are all plants which rich in Carbon (C). *Dyospiros kaki* (kesemek fruid) is a fruit. *Apium grafeolens* (seledri) is a leaf. *Guazuma ulmifolia* (jati belanda) is a leaf. *Hibiscus sabdarifa* (rosella) is a flower. *Dyospiros kaki* contains probiotic *Bacillus sp* (Widyani *et al.*, 2017). Apium grafeolens contains vitamin A, vitamin B1, vitamin B2, vitamin B3, vitamin B5, vitamin B6, vitamin C, vitamin E, and vitamin K (http://manfaatbuahdaun.blogspot.com/2014). *Guazuma ulmifolia* contains carbohydrate, fatty acid, steroid, astir oil, glycoside, and tannin (https://walafiat.org). *Hibiscus sabdarifa* contains protein, niacin, riboflavin, Fe, Ca, vitamin A, and vitamin C (https://caratanam.com/bunga-rosella).

Table 1. Proximate analysis of stroke care formulation

Parameters	Composition
Water (%)	10.8
Ash (%)	8.88
Protein (%)	8.67
Fat (%)	1.44
Carbohydrate (%)	74.7

Result showed that cholesterol concentrations in *in vitro* study can be seen in Table 2. Cholesterol concentration in control used in this study was 200 mg/100 gram. The used of stroke care formulation at a dose of 20 mg/dl could decrease cholesterol concentration to 102 mg/100 gram (decreased by 49%). The used of stroke care formulation at a dose of 40 mg/dl could decrease cholesterol concentration to 64.5 mg/100 gram (decreased by 67%). The used of stroke care formulation at a dose of 60 mg/dl could decrease cholesterol concentration to 94.2 mg/100 gram (decreased by 53%).

Table 2. Cholesterol concentrations in *in vitro* studies

Stroke Care Formula (mg/dl)	Cholesterol (mg/100 gram)	Level of Decrease (%)
20	102	49%
40	64.5	67%
60	94.2	53%

The result of Amin (2015) showed that each concentration of the methanol extract of fruit parijoto had anti-cholesterol activity *in vitro*. The best anti-cholesterol activity was shown at a concentration of 150 ppm with the ability to lower cholesterol by 30.396% compared to control cholesterol solution. Parijoto fruit contains flavonoid, tannins, and saponins which is known in previous studies to have anti-cholesterol effect.

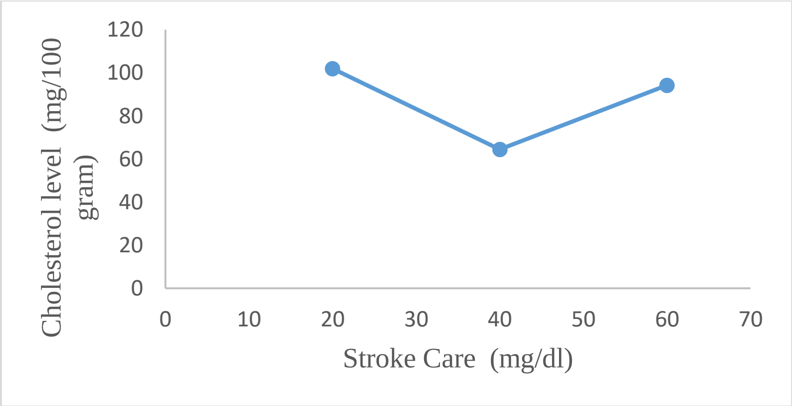

Figure 1. Cholesterol concentrations in *in vitro* study

Flavonoid can erode cholesterol deposited in the coronary vein walls that have calcification (Baraas, 1993), can reduce triglyceride by inhibiting the enzyme 3-hydroxy 3-methylglutaryl-coenzyme A reductase (HMG-Co A reductase) (Sekhon, 2012). Tannin can reduce the accumulation of cholesterol in the blood by accelerating the discharge and excretion of cholesterol through the feces (Rahayu, 2005). Saponin decreases cholesterol concentration by binding to cholesterol (Smith and Adanlawo, 2013).

The study of Wonkeuk Kim et al. (1996) showed that *Bacillus* sp. strain CK 11-4, which produces a strongly fibrinolysis enzyme, was screened from Chungkook-Jang, a traditional Korean fermented-soybean sauce. The fibrinolytic enzyme (CK) was purified from supernatant of *Bacillus* sp. strain CK 11-4 culture broth and showed thermophiles, hydrophilic, and strong fibrinolysis activities. *Bacillus* spp. produces a variety of extracellular and intracellular proteases. *Bacillus* sp. strain CK 11-4 produces a strongly fibrinolytic enzyme.

Fibrinolytic enzyme prevents the formation of plaque in the blood vessel. Fibrinolysis is the natural process that is required by the body (human and animal) to prevent blood clotting that covers the course of blood. This fact indicated that *Bacillus sp* on *Dyospiros kaki* has a great potential to be used in the stroke case, the disease from new life style of generation now. This fact also gives a hope to make nutrition for chicken that is free cholesterol to be used as a herbal formulation in the future.

Nutrition contained in the other herbals such as seledri (*Avium grafeolens*), jati belanda (*Guazuma ulmifolia*), and rosella (*Hibiscus sabdarifa*) supported the activity of *Bacillus sp* on *Dyospiros kaki*.

Dyospiros kaki

Avium graveolens

Guazuma ulmifolia

Hibiscus sabdarifa

Figure 2. Materials used in the stroke care formulation

Conclusions

The result of this study showed that cholesterol level decreased from 200 mg/dl to 102 mg/100 gram at dose 20 mg/dl, 64.5 mg/100 gram at dose 40 mg/dl, and 94.2 mg/100 gram at dose 60 mg/dl. The best dose to decrease blood cholesterol was 40 mg/dl. This study indicated that *Dyospiros kaki* has an activity as an anti-cholesterol agent.

Acknowledgement

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FULL PAPERS
POSTER SESSIONS
SUBTHEME : ANIMAL ENVIRONMENT

Characteristic of Habitat "Manguni (Owls)"

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Abstract

This research was conducted to get information about the type and utilization of habitats manguni (Owls). Data collected from the special place where manguni birds used to perform the daily activities. Vegetation analysis was done to determine the utilization of vegetation by manguni as a place to rest , sleep or nesting. Data were then analyzed descriptively. Manguni must satisfy all of needs from its enviroment. At the very least it needs to be able to find catchable prey, water to drink and a safe place to roost or shelter from bad weather.In order to breed, it will also need a suitable nest site and enough prey around to feed not only itself but its brood as well. Manguni are able to occupy all kinds of habitats, ranging from tundra, deserts and grasslands to marshes, swamps, woods and luxuriant rainforests, and from lowland areas to mountains and islands but the majority live in woodlands or forest edges.Manguni lives in very open countryside withscatterred trees, mostly near human settlements. It hunts over open fields,interspersed with stands of trees, bushes, depressions, river valleys and marshes

Keywords : characteristic, habitat, manguni

Introduction

Owls (owl) are birds from the order of Strigiformes which includes approximately 222 known species, and spread throughout Antarctica, mostly Greenland, and some remote islands. A total of 26 species are found in Southeast Asia and 13 of them are in Indonesia.

Like most wildlife in their natural habitat, owls are not often seen. Owls are classified as octurnal and solitary animals, tend to avoid humans whenever possible. Eqquiped with the special wing feathers allow them to fly without sound, and catching prey is easier.

There are ten species of endemic owl Sulawesi recorded : Ninos ios, Ninox japonica, Ninox ostharacea, Ninox punctulata, Otus collari, Otus manadensia, Otus mendemi, Otus siaoensis, Tyto inexpectata, dan Tyto rosenbergii. Three species of them, *Ninos ios* (Minahasa ridge), *Otus collari* (plaque Sangihe) and *Otus siaoensis* (Celepuk Siau), are endemic to North Sulawesi (Coates & Bishop, 2000)

In general, North Sulawesi's owls is called in local name by the Minahasa tribe as Manguni or Tototosik (Figure 1.). Manguni is trusted and believed by the Minahasa community, as a birdsacred. Manguni comes from the word *Mauni* which means *observing*. For the ancestors of the Minahasa, manguni is precious and given a special place in the hearts of Minahasa's ancestors as a giver or news to them through the sound or singing.

Figure 1. Manguni bird

The sound sang by Manguni is not all understood by humans. At the present time, the elders Minahasa no longer teach the bird sound to new generations because of fear about being misused. On the other hand, this will cause the young generation will not care even forget the culture of the ancestors of manguni which is the local wisdom of North Sulawesi, especially Minahasa

Manguni has to meet all the needs from its environment, such as prey that can be hooded , the availabilty of drinking water, and a safe place for avoiding from bad weather. Each species has different habitats. In order for Manguni to breed Manguni require a suitable nest and prey to feed her offspring and themself. The most important thing in owl lifecycle is to defend its territory.

Based on the background put forward above, we have conducted a study entitled "Characteristics of Habitat Bird Manguni (Owls) aiming to obtain information about the type and habitat utilization by manguni birds (Angell, 2015).

Materials & Methods

This research was conducted in Sonder and Tompaso Minahasa District of North Sulawesi. The tool used in this research is binocular, camera, GPS (Global Positioning System) , and stationery. Data collected from the special place where manguni birds used to perform the daily activities. Vegetation analysis was done to determine the utilization of vegetation by manguni as a place to rest , sleep or nesting. Data were then analyzed descriptively.

Results and Discussion

IUCN (International Union for Conservatiom of Nature and Natural Resources) has assessed Manguni (Otus manadensis) in the Red List Category and Critreria of Least Concern (IUCN, 2016). Manguni could be found in damp forests, in areas with many woody trees and plantation areas , lowlands to an altitude of approximately 2500m. The most suitable bird habitats are forests such as pine woods. Owls nest in the forest, but hunting is performed on open land adjacent to the forest.

Hunting techniques depend on the type of prey. Manguni birds have hunting areas far from where they perch during the daytime. Several species of prey animals are rats, insects, and small birds. They can be struck in the air, sometimes pounced on trees or bushes (Mikholla, 2015)

Unlike other bird species, Manguni uses forest vegetation not for feed but for rest, shelter and breed. Manguni develops nest in holes of trees, usually using the nest that being abandoned by woodpecker (Sangster et al, 2013). Some types of trees found in the study site and used for nesting are bamboo trees, nira tree, and ferns.

In general, all species of Manguni can occupy all types of habitats. Starting from the tundra, wetlands, grasslands, forests, and rainforest. Approximately 78 % Manguni live in the lowlands to the mountains in the forest or forest edge (Figure 2). Approximately 20% of all bird species living in semi-open habitat between trees and shrubs, and most of them are able to adapt to places that human also settle. (Figure 3). Some owls even live with the humans in the forest (Taylor, 2012).

Figure 2. Habitat of Manguni

Figure 3. Habitat of Manguni close to human settlements

Conclusion

Manguni lives in semi open habitat between trees such as bamboo trees, nira trees, fern type plants, and scattered shrubs and some of them could adapt to near human settlements.

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FULL PAPERS
POSTER SESSIONS
SUBTHEME : BREEDING AND GENETICS

Inbreeding of Murrah Buffalo in Tanjung Garbus Village, Deli Serdang Distric, North Sumatera Province

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Abstract

Small farmer in Tanjung Garbus Village is one of farmer that has been maintaining Murrah buffalo from first introduce to Indonesian country until now, their mating system happened from population first introduce and so long time overlap from generation to next generation. The purposed of this research was to calculated inbreeding coefficient and inbreeding rate of Murrah buffalo. Data and pedigree information were collected from 19 buffalo's (7 males and 12 females). The research was conducted from one small farmer in Tanjung Garbus Village, Deli Serdang District, North Sumatera Province. The inbreeding coefficient was calculated using of pedigree analysis and inbreeding rate per generation based on the population structure. The calculation result of inbreeding coefficient was 0.0625 while the inbreeding rate was 1.96% per generation. Significant inbreeding depression wasn't found because the farmer was rotated bull per generation.

Keywords: Murrah buffalo, inbreeding coefficient, inbreeding rate.

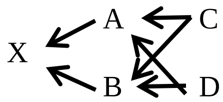
Introduction

Murrah Buffalo is one buffalo that can breed well in North Sumatra. Murrah buffalo imported from India during the Dutch colonial period brought by the plantation workers and developed in the area of North Sumatra. However, to date no specific information has been obtained in what year exactly the Murrah buffalo was imported from India. The Dutch brought Murrah buffalo from India aimed to meet the needs of Dutch colonial dairy consumption in Indonesia. Since the Dutch colonial era until now Murrah buffalo can adapt and reproduce well in the region of North Sumatra. The area of North Sumatra which is the location of Murrah buffalo maintenance currently covers Deli Serdang, Medan and North Tapanuli District.

Animal farms in Deli Serdang District is one of the breeders who keep and breed Murrah buffalo from generation to generation from the beginning of the Buffalo brought by the Dutch colonial until now. The owner of the ranch is named Bal Bir Singh which is the third generation that nurtures and breeds Murrah buffalo from the Singh family. The current population of Murrah buffaloes on the farm is 140 tails consisting of 14 male and 126 females. Information obtained from past ranchers buffalo population maintained by the family Sing to reach 500 heads. The decrease of livestock population is caused by several factors such as unavailability of land for livestock maintenance, milk marketing constrains, the decreased of interest of the next generation breeders for livestock breeding and poor quality of breed due to the possibility of inbreeding. One of the factors of decline in livestock population is the quality of livestock seeds that are not good due to the possibility of inbreeding. The inbreeding event is very likely to occur in the farms because of information from breeders that inter-mating comes from the descendants of the early population of buffalo Murrah imported from India. Signs of inbreeding buffaloes have been found as horns stretching downward, bule color (albinoid), caudal tails and blue eyes (Talib et al. 2011; Talib et al., 2013). Information from breeders to date has not been done such as bringing males or frozen sperm from India so that the rotation of males can be done to avoid inbreeding.

Materials and Methods

The study was conducted from April to May 2018. Data were obtained from community farms in Tanjung Garbus Village, Pagar Merbau Sub-district, Deli Serdang District, North Sumatra Province. The data used is the genealogy record of calf buffalo Murrah born in 2018 as many as 19 heads consists of 7 male and 12 female . The data is then made a genealogical diagram in the arrow diagram to determine a common ancestor based on Warwick et al. (1990) as follows:



Pics 1. Genealogy chart of arrow shapes

The inbreeding coefficient of an individual is calculated by determining n, where n is the number of individuals in the groove (the individual noticed excluding) consisting of the common ancestor of an elderly inbreeding parent. Calculation of inbreeding coefficient value calculated based on Allendorf & Luikart (2008):

$$F = \sum \left[\left(\frac{1}{2}\right)^{n+1} \ (1 + F_{CA}) \right]$$

Information :

F = Inbreeding coefficient value
n = Number of lines in the groove
FCA = Coefficient of common ancestor

The calculation of the inbreeding rate is calculated by referring to Wiener (1994) as follows:

$$\text{Rate of Inbreeding} = \frac{1}{8\ \mathrm{Nm}} + \frac{1}{8\ \mathrm{Nf}}$$

Results and Discussion

Value of Inbreeding Coefficient

The total population of Murrah buffalo in community farms of Tanjung Garbus Village, Pagar Merbau District, Deli Serdang Regency in 2018 as many as 164 heads. The details of the population of buffalo Murrah are presented in Table 1.

The breeder establishes buffalo identity by naming each buffalo on the farm. Recording of buffalo data refers to the identity of each animal's name.

The result of the analysis from the pedigree diagram of pedigree records data from 19 calves born in 2018 then obtained only one buffalo Murrah inbred with the identity of livestock called Bolli. Inbred buffalo has been found in buffaloes maintained in communities with inbreeding rates between 10 - 30% (Talib et al. 2011; Talib et al 2013). The value of the inbreeding coefficient obtained on Bolli buffalo is 0.0625 or 6.25% (Table 1). Sayed et al. (2012) states that the value of inbreeding coefficients in Egyptian buffalo between 0.029 - 0.202%. Filho et al. (2015) stated that the value of the inbreeding coefficient of Gyr's dairy cattle was 2.82%. When compared with the results obtained is still higher. Cervantes (2007) stated that the inbreeding coefficient value = 0 belongs to the non-inbreeding category, the inbreeding coefficient between 0 - 6.25% low category, the inbreeding coefficient between 6.25 - 12.5% medium category and the inbreeding coefficient of more than 12, 5% high category. According to Noor & Seminar (2009) any increase in inbreeding coefficient of 5% resulted in a very significant decrease in production, increasing mortality and increasing frequency of disability. When referring to Cervantes (2007), the value of inbreeding coefficient obtained is included in the low category. This is because breeders rotate males by purchasing males from other Murrah buffalo breeders on every single generation so indreeding can be avoided by farmers. According to Talib et al. (2014) random mating by maintaining diversity in populations such as bringing in new males in these populations can minimize inbreeding rates.

Table 1. Inbreeding Coefficient of Murrah Buffalo at Community Breeder in Tanjung Garbus Village

Number	Buffalo Identity	Sex	Inbreeding Coefficient
1	Pida	♀	-
2	Aceh	♀	-
3	Wiro	♂	-
4	Moti	♀	-
5	Menggi	♂	-
6	Loi	♀	-
7	Bolli	♀	0,0625
8	Bintang	♂	-
9	Rakes	♂	-
10	Jago	♀	-
11	Mayang	♀	-
12	Mio	♀	-
13	Santi	♂	-
14	Nisan	♀	-
15	Mawar	♀	-
16	Jablay	♂	-
17	Buti	♂	-
18	Niko	♀	-
19	Buntung	♀	-

Inbreeding Rate

The results showed that the rate of inbreeding in Murrah buffalo population in Tanjung Garbus Village, Pagar Merbau Sub-district was 1.96% per generation (Table 2). Rusfidra et al. (2012) reported the rate of inbreeding at local ducks in Tilatang Kamang sub district , Agam Regency by 0.04% per generation. The rate of inbreeding obtained at community farm in Tanjung Garbus Village is greater than 1% per generation. Praharani et al. (2009) states that any 1% increase of inbreeding rates per generation can have an impact on production decline and performance in livestock. A livestock population can survive if the rate of inbreeding per generation is smaller or equal to 1% (Salamena et al., 2007). Efforts can be made to reduce the rate of inbreeding in the Murrah buffalo population in Tanjung Garbus Village by increasing the number of males and increasing population effectiveness (Sevinga et al., 2004).

Table 2. Value of Inbreeding Rate per Generation at Tanjung Garbus Village

Sex and Inbreeding Rate	Location
	Community breeder in Tanjung Garbus Village
Male	7
Female	68
Inbreeding Rate (%)	1,96

Conclusions

The value of inbreeding coefficient obtained, including in the low category of 6.25%. The value of inbreeding rate obtained is 1.96%. Efforts can be made to reduce the value of coefficients and inbreeding rates by bringing new males into the population.

Acknowledgement

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FULL PAPERS

POSTER SESSIONS
SUBTHEME: ANIMAL AGRIBUSINESS, SOCIAL ECONOMICS AND POLICY IN ANIMAL PRODUCTION

Small ruminants production performance under different water availability in Egypt

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Abstract

Climate change, especially changes in rainfall, has profound effects on pasture production. However, the relationship between the variation in pasture on one hand and livestock production and farm economic on the other hand are not clearly quantified in Egypt. The north western coastal zone of Egypt (NWCZ) is characterized by availability of different water sources with varied distribution between regions. This study is undertaken to generate baseline information on sheep and goat production systems , to asses' small ruminant reproductive and economic performances , to determine the influence of socio-economic factors on sheep and goats profitability and to identify small ruminants' production constraints under different water availability using a structured questionnaire in four regions located in NWCZ .The studied area consisted of the following regions : (i) the irrigated region (IR) in the East, (40-60 km to Alexandria), (ii) the rain fed regions (RR) in the West, Dabaa(DA) , Mat rough (MT) and Sidi Barani (SB) (140–430 km to Alexandria) . The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2015. The main results revealed that Bedouins head average age was estimated as 44.6±3.8 years old, 58% of them had experience in keeping livestock of more than 10 years, 67% of them had household sizes of 4-10 persons. The majority of the respondents (52%) had basic education. Only 28% of respondents in DA region identified themselves as full-time farmers, derived that household income from the sale of crops and and/or animals only. The contribution of livestock to household income ranges from 50.34 % to 74.3%. Sheep contribute up to 74.56 % of the net cash income derived from livestock production in the DA region. .The lowest sheep productivity and the largest increase in production costs occurred in DA which, in turn, was reflected in the profitability of sheep production. On the other hand, sheep production in the IR is the most profitable among the other three regions. However, respondents indicated that high cost of input, insufficient veterinary services and feed shortage were major constraints to small ruminants 'production. There is also a significant positive correlation between experience of the household head and sheep profitability in the study area. The findings of the study indicate that farmers in the NCZE are in need of financial and technical support in order to increase their income. It was recommended that appropriate extension

services be put in place to enhance the knowledge of farmers on improved husbandry practices.

Keywords: Small ruminant's profitability, production constraints and household source of income under different water availability.

Introduction

The effects of climate change, especially in rainfall, on pasture production and hence on livestock production have been widely reported (Burton& Peoples 2008; MAF 2008; Li *et al.* 2011).Large variation in pasture production across years and zones can be buffered through management adaptations, thus the variation in livestock production can be smaller than that of pasture production. However, the smaller variation in animal production achieved through management adaptations may not necessarily lead to a smaller variation in farm profitability (Gray*et al.* ,2008).On the other hand, differences in farmer and farm household characteristics often result in management variations which affect the financial outcomes of farm activities, notwithstanding that they share a similar resource base and production systems (Ford and Shonkwiler, 1994). Livestock and specifically small ruminants contribute to the development of areas where others activities are not possible (Al Baqain and Valle Zárate, 2011). In Egypt, small ruminant and camel constitute the most valuable activities in the northern coastal zone due to their resistance to dry conditions. Therefore, this study aims to identify the socio-economic characteristics of the households in the studied area and to determine the effect of these socioeconomic factors on sheep production performance under different water availability

Material and methods

Study area

In general, the north western coastal zone of Egypt (NWCZ) is characterized by availability of different water sources with varied distribution between regions .The studied area consisted of the following regions : (i) the irrigated region Borg-Elarab(IR) in the East, (40-60 km to Alexandria), (ii) the rain fed regions (RR) in the West, Dabaa(DA),Matrough(MT) and Sidi Barani(SB) (140–430 km to Alexandria) .The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2010 (rainfall data obtained from Aboul-Naga *et al*., 2008; Ahmed ,Kamel, 2011). Small ruminants, with different production systems, represent the main activity in NWCZ and the main source for family income. The main breed of sheep in Egypt is Barki, which has shown great adaptability to the harsh environmental conditions of the area.

Data collection

A field survey was implemented in 2015 (from April to end of October) for 100 flock owners distributed all over the study area. A list of all sheep keepers in each region of the study area was obtained from officials of the Ministry of Agriculture. Sheep keepers with less than 10 adult sheep were excluded from the list. Three villages were randomly selected from each of the four purposively selected regions, resulting in a total of 12 villages. Systematic random sampling was used to select sheep keepers for interviewing from the list of sheep keepers compiled from each village. Before conducting the full scale survey, a pre-test was undertaken with 4 farmers, and adjustments in the questionnaire were made accordingly. A structured questionnaire was designed to obtain information from respondents regarding socio-economic profiles, total variable costs, annual revenues, net income and animal productivity.

Economic performance of sheep production

The economic performance of sheep production was evaluated on the basis of net income referring to the sheep species only, irrespective of whether the flock composition of household was mixed of sheep and goats. All monetary values of inputs and outputs are given in Egyptian pound (LE) with the exchange rate of 1 USD = 18 LE at the time of the study (year 2016). The total variablecostsand the total annual revenues were calculated on a yearly and per head basis. Income was derived from the sale of lambs, and culled cows. The farm gate price for a unit of each product was used for the calculation of home consumption. The variable costs included were feed (purchased feed and fees for stubble grazing), veterinary service and hired labor costs. Information on veterinary costs (based on charges for treatment and vaccination of animals by the veterinarian) was given directly by the farmers.

Statistical analysis. The general linear model (SAS, 2004) was used for analyzing the data. Average annual profit per ewe was used as a dependent variable. The fixed effects in the model included location of flock, flock size, farm size, family size, education level, age of household head, household experience, employment and all possible two-way interactions with flock location.

Results and discussion

Household socio-economic characteristics

The average age of household head is 44.6±3.8 years old,44% of them have medium age between 31 to 40 years (Table 1).Khalil *et al*.,(2013) reported that the average farmer`s age in the north western coastal zone of Egypt is around 51 years old which is higher than the current results. The study showed that 58% of the respondents had experience in keeping livestock of more than 10 years while 42% had less than 10 years of experience .Households experience across the four regions was significantly different. It was also observed that 13% of the respondents had household sizes of 1-3 persons, 32% had 4-6 persons, 35% had 7-10 persons and 20% had more than 10 persons, respectively. The high proportion of family size in IR is relevant for subsistent agriculture given that such agricultural system requires extensive family labor to carry out farming activities. Metawi (2015) showed that the average family size was 7.8 and 5.7 person under rain fed and irrigated farming systems of north coastal zone of Egypt, respectively. There were an average of 3.1±0.03 males and 2.2±0.04 females from which 2.0±1.0 participation in agriculture activities. The majority of the respondents (52%) had basic education, 11% had tertiary education and 37% had no formal education. Education is relevant if farmers are to access and apply livestock technology appropriately (Marinda *et al*., 2006).

However, the data suggest a high illiteracy rate (37%) among households across the four regions. Given the high illiteracy rates in the study area, farmers are forced to rely heavily on traditional methods of livestock rearing. Only 28% of respondents in DA region identified themselves as full-time farmers, derived that household income from the sale of crops and and/or animals only.

Table1.Socio-economic characteristics of respondents

Parameter	Region								
	IR [1]		**DA** [2]		**MT** [2]		**SB** [2]		**mean**
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	%
Age									
31-40	6	24	12	48	11	44	15	60	44
41-55	14	56	9	36	10	40	6	24	39
>55	5	20	4	16	4	16	4	16	17
Average	48.2±5.7		39.3±2.1		46.4±9.9		44.6±13.4		44.6±3.8
Experience									
< 10	8	32	16	64	12	48	6	24	42
≥10	17	68	9	36	13	52	19	76	58
Education									
No formal	11	47	9	36	10	40	7	28	37
Basic	12	48	12	48	12	48	16	64	52
Tertiary	2	8	4	16	3	12	2	8	11
Total	50	100	50	100	50	100	50	100	
Household size(person)									
1-3	6	12	8	16	8	16	4	8	13
4-6	12	24	18	36	12	24	22	44	32
7-10	24	48	12	24	22	44	12	24	35
>10	8	16	12	24	8	16	12	24	20
average	5.9±4.3		5.4±3.4		4.7±3.3		5.2±3.1		5.3±.5
Female	2.6±2.5		2.4±2.3		2.0±1.3		1.8±2.1		2.2±0.4
Male	3.2±2.4		3.0±1.8		2,8±1.5		3.4±1.7		3.1±0.3
F. labor	3.2±2.6		0.8±1.4		1.9±1.7		2.1±2.4		2.0±1.
Employ.									
In farm	76 %		28 %		40 %		60 %		51±21.3
Off-farm	24 %		72 %		60 %		40 %		49±.21.2

[1]Irrigated region(IR) Borg-Elarab; [2] The average annual rainfall was 209 mm for (SB) Sidi-Barani , 150 mm for (MT)Marsa-Matruh , and 108 mm for (DA) Dabaa, during the years 2005-2010 , Employ(Employment), F.(family)

Table 2 showed that the lowest sheep productivity and the largest increase in production costs occurred in DA which, in turn, was reflected in the profitability of sheep production. On the other hand, sheep production in the IR is the most profitable among the other three regions. Total variable costs across the four regions were significantly different. The variations in the dependence in each region on rangelands is the main reason of the variability of feed costs in the three rain fed regions .However, feed expenses for the flock in IR are the lowest. Full dependence on green fodder and crop residues resources and a minimum amount of supplemental feeding are the major reasons for this low feeding cost. The households in DA region have a permanent base and move seasonally to take advantage of agro-pastoral and urban areas. Due to the high movement, and longer grazing in this region, the health and labor costs are much higher than those in the other regions. In SB and MT regions, animal movement is restricted to certain distances around the farm base.

Table 2. Profitability of Sheep production under climate variability of Egypt

Item	Region			
	IR[1]	DA[2]	MT[2]	SB[2]
Grazing performance: 1- Grazing period (month): Natural ranges	-	1.25	1.8	2.3
Green fodder and crop residual(month)	8	1	2.5	3.5
2- Supplementary feeding: During grazing (kg/head/day)	-	0.5	0.25	-
Out grazing (kg/head/day)	0.5	1.25	0.75	1
Feed(LE)	298.33	513.21	446.91	390.95
Labor(LE)	114.05	38.41	25.35	29.73
Veterinary(LE)	15.55	18.96	8.48	14.36
Total cost(LE)	427.93	570.6	480.74	435.04
Productivity(Kg)	27.57^{a} ± 0.65	19.19$^{\mathbf{b}}$± 0.95	28.25$^{\mathbf{a}}$± 0.48	29.70$^{\mathbf{a}}$ ± 0.37
Net income(LE)	656.83^{a}±202.8	159.078^{d}±87.1	468.47^{c}±128	564.7^{b}±74.8

[1] Irrigated region; [2]The average annual rainfall was 209 mm for SB , 150 mm for MT and 108 mm for DA, during the years 2005-2010. Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), Sd=standard deviation

Source of household Income

Table(3)Across the four regions, the contribution of livestock to household income ranges from 50.34 % to 74.3%.Sheep contribute up to 74.56 % of the net cash income derived from livestock production in the DA region.

Table 3. Household source of Income under climate change of Egypt

Types	Region			
	IR[1]	DA[2]	MT[2]	SB[2]
1-Agriculture %	49.746	25.720	49.71	33.99
Fruits	0.28	80.93	64.79	20.83
Crops	54.73	19.07	35.41	79.20
Vegetables	45.01	0	0	0
2-Livestock production%	50.253	74.279	50.289	66.00
Sheep	54.47	74.56	72.50	58.24
Goat	5.77	24.93	11.07	13.3
Camel	0.46	0.50	1.10	28.33
Cows	30.82	0	5.37	0.47
Buffaloes	8.35	0	0	0

[1] Irrigated region; [2]The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2010 .The cropping system in the irrigated region is based on green fodder (mainly Egyptian clover in winter or maize in summer), cereal (mainly wheat in winter) and vegetables in summer. The production system in the rain fed regions is characterized by varied agricultural activities including raising small ruminant's flocks, beside cultivation of barley and little of wheat, and some fruits as Olives and Figs.

Factors affecting profitability of sheep enterprises

Table 4 indicated that only location, household experience, occupation, family size and farm size had a significant (P<0.05) impact on sheep profitability. On the other hand, farmer's age, education and livestock holding had no effect on the profitability of sheep production. Age and experience are often interrelated; given that experience is accumulated over time, older farmers have a greater farming experience. They are thought to be more likely to manage a farm better and to achieve healthy financial results. Contrary to this expectation, age and farming experience were found to be insignificant (Gloy *et al*. 2002 a; McBride and El-Osta 2002). A larger household is assumed to overcome labor constraints and provide economical labor input. Household size has been described as the most important source for family labor (Ngongoni *et al* 2006). However, this factor was proved insignificant in Fernandez-Cornejo *et al*. (2005). The study suggests that involvement in off-farm economic activities may potentially compete with on-farm involvement. Thus, this factor is expected to have a negative correlation with sheep profitability. However, off –farm employment was found to be insignificant in the work of McBride and El-Osta (2002).A higher education level is suggested to have a positive impact on economic performance. However, in the present study, education was found to be an insignificant factor in relation to sheep profitability.

Table 4. Socio economic factors effecting on ewe profitability

Traits	Ewe profitability LSM ±SE	Pr>F
Location [1] :		
Borg Arab	656.83^{a}±202.8	
Dabaa	159.078 ^{d}±87.1	.0001
Matruh	468.47 ^{c}±128.0	
Sidi Barani	564.70 ^{b}±74.8	
Education:		
illiterate	486.76±250.3	
Basic	461.16±205.9	0.3615
Tertiary	396.50±259.2	
Experience:		
≤10	301.41 ^{b} ±173.2	
>10	586.97 ^{a}±250.3	0.0001
Family size:		
1 - 3	439.77 ^{c} ±236.48	
3 – 7	431.33 ^{b} ±226.11	0.001
7-10	624.88 ^{a} ±131.61	
> 10	539.54±417.67	
Farm size:		
1-20	432.06 ^{c} ±252.03	
21-50	479.48 ^{b} ±190.23	0.0001
51-100	488.9^{b}±72.04	
>100	638.09 ^{a} ±180.5	
Flock size:		
1-50	463.01 ±248.12	
51-100	450.56 ±226.11	0.2276
> 100	481.25 ±197.09	
Age:		
1	474.47±235.7	
2	436.12±209.85	0.445
3	465.03±248.63	
Employment	501.54^{a} ± 204.74	0.0014
	420.81 ^{b}±246.78	

[1] Irrigated region; [2]The average annual rainfall was 284 mm for Sidi Barani , 150 mm for Matruh and 76 mm for Dabaa (DA), during the years 2010-2012 .Within the same row, means with different superscripts are significantly different at 5% the level of significance (rejection of null-hypothesis), SD=standard deviation

Small ruminant production constrain.

Table 5 show that the most important constraints to small ruminants keeping In NWCZ were feed shortage during the dry season, followed by high price of input, veterinary problem and low price for selling live animals in both DA and MT Districts. In these areas where there are few rainy months with limited rain fall of erratic nature feed production for small ruminants is inadequate. On the other hand, the allocation of more land for crop production resulted in availability of crop residues as alternative feed, particularly in the IR district. Consequently, feed shortage is ranked third (3rd) in SB district and ranked fourth (4th) in IR district. However, insufficient veterinary services have been widely reported as a major constraint to small ruminant production in the tropics (e.g., Dossa *et al.*, 2007, Fakoya and Oloruntoba, 2009, Oladeji and Oyesola, 2008, Faizal Adams 2015).

Table 5. Ranking major small ruminant's production constrains under different water availability.

Constraints	Region			
	IR[1]	DA[2]	MT[2]	SB[2]
Marketing problem	3	4	4	2
Veterinary	2	2	3	1
High input costs	1	3	2	4
Feed shortage	4	1	1	3

[1] Irrigated region; [2]The average annual rainfall was 209 mm for SB, 150 mm for MT and 108 mm for DA, during the years 2005-2015. . (1- Essential, 2-High Priority, 3- Medium Priority, 4-Low Priority)

Conclusions

According to our survey of the four regions, our findings support that livestock, particularly sheep, are of considerable economic importance in NWCZ and it plays an important role for the livelihood of rural household. So, emphasis should be given by researchers and decision makers to improve sheep reproductive performance. Profitability of sheep production in rain-fed regions is affected by the presence of the proper strategies to decrease animal feeding costs. There is also a significant positive correlation between experience of the household head and sheep profitability in the study area. A greater attention should be paid to enhancing the households' skills in modern techniques for sheep production

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Development of Duck Farming Environmentally Friendly in Regency of Minahasa, North Sulawesi Province, Indonesia

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Abstract

The potential of duck farming in Regency of Minahasa is sufficient. The government is trying to increase the duck population so that various programs have been proclaimed in this area. Improvement of ducks is also attempted by farmers in this area who are integrated with rice crops. This area of research, especially in the coastal of Tondano Lake is a rice plant development area. The problem of duck farming in Minahasa Regency is generally traditional. The purpose of this study is to determine the extent of duck farming development in Minahasa Regency. This research is conducted by using survey method, with case study approach method. The sample location is the coastal area of Tondano Lake. Duck farmers as respondents are farmers who cultivate ducks, with an integration system. Number of respondents are 10 duck farmers. Data analysis was done by using descriptive analysis, that is giving detailed description about rice duck integration. The results showed that ducks during the day were grazed in the rice fields. Duck ownership of the lowest 50 heads and most are 300 heads. Duck breed prices tend to increase so difficult to reach by farmers. Farmers rather difficult to buy breed (DOD) and the price of about Rp 12500 per head so that the production process is not continuous. Feed prices tend to increase, expensive concentrate prices that are difficult to reach by small farmers. Corn price of Rp 3.000 / liter while concentrate Rp 10.000 / kg. Farmers maintain laying ducks, in which case eggs are a source of their income. Ducks start laying eggs at the age of 5.5-6 months, meaning that if farmers buy DOD they need big capital to feed. Based on the results of the research shows that integrated duck farming provides positive benefits for farmers.

Keywords: integration, duck, rice, local feed

Introduction

Duck breeding in North Sulawesi was one of poultry that is widely cultivated and become a business by farmers and has long been known by farmers although not as popular as chicken livestock. On the other hand the demand for products from ducks, both meat and eggs from year to year increase. Duck is one of the commodities that have potential and strategic role in the supply of animal protein (Perwati et al, 2016), and the price is cheaper (Sa'diyah et al, 2016) than the source of animal protein from other livestock, such as beef.

Duck farming was mostly done by farmers in paddy fields, especially in Minahasa Regency. The potential of duck farming in Regency of Minahasa is sufficient. The government is trying to increase the duck population so that various programs have been proclaimed in this area. Ducks like other livestock, acting as a source of income, open up employment opportunities and source animal protein from both meat and eggs. Based on some research results indicate that duck business can become the support of society around paddy field. This means that income opportunities for farmers in improving their welfare can be obtained from duck farming. The opportunity for duck development is quite large, this is due to the availability of the market for duck meat and eggs. Ducks contribute to the total income of farmers is quite adequate which amounted to 20.65% a year according to research results Rohaeni and Rina (2009). The allocation of labor is only 11.35% of the total family labor supply in a year.

Improvement of ducks were also attempted by farmers in this area who are integrated with rice crops. This area of research, especially in the coastal Tondano lake is a rice plant development area. The problem of duck farming in Minahasa Regency is generally traditional, and according to (Diputra et al, 2018) to predict the profit is difficult to be done by farmers. The purpose of this research was to know how far the development of duck livestock farming in Regency of Minahasa.

Materials and Methods

The research material was breed duck, duck and feed. Duck breeds (DOD) was the source of purchasing duck breeds, price and number of breeds. Ducks were the ownership of laying ducks by farmers. Feed was the type and amount of feed consumed by ducks. This research was conducted by using survey method, with case study approach method. The sample location was the coastal area of Lake Tondano. Farmers of duck farmers as respondents are farmers who cultivate duck farms in an integrated manner. Number of respondents as much as 10 farmers duck farmers. The data analysis was descriptive that gives detailed description about integration of rice duck farming and RC ratio analysis.

Results and Discussion

The results showed that more ducks were cultivated during the day or grazed to rice fields. Nevertheless, ducks according to Budi et al (2015) have resistance to disease and this is the advantage compared to other poultry. According to Matitaputty and Suryana (2014) that local duck has a very good adaptability to the duck development environment and in its new environment. The ownership of ducks was the lowest 50 tail and the most was 300 tail with MA (Mojosari Alabio) duck type. Research from Erlina (2013) shows that 80 percent of alabio duck ownership was below 500 heads, so it is considered not well developed. The price of breeds that tend to increase so difficult to reach by farmers. Farmers rather difficult to buy breed (DOD) and the price of about Rp 12500 per DOD so that the production process was not continuous. The labor allocated for duck farming is an average of 1,175 hours per day per farmer. The acceptance of duck farming is obtained from the sale of eggs and ducks were not productive. Acceptance and production costs of duck farming according to the research results can be seen in Table 1.

Table 1. Average of Revenue, Production Costs and Profits of Duck Farming (Per Period Per Respondent)

No.	Description	Amount (Rp/Periode/Respondent)	Percentage (%)
1.	Revenue :		
	a. Sales of eggs	64.584.000	85,72
	b. Sales of not productive duck	10.752.000	14,28
	Total of Revenue	75.336.000	100,00
2.	Cost of Production :		
	a. Depreciation the cage	294.000	0,82
	b. Medicine / vaccine	215.000	0,59
	c. Labor	7.031.250	19,56
	d. Feed	25422250	79,03
	Total of Production cost	32.962.500	100,00
3.	Profit	42.373.500	
4.	R/C		2,29

Feed prices tend to increase, the price of concentrate was quite expensive so difficult to reach by small farmers. Corn price of Rp 3.000 / liter while concentrate Rp 10.000 / kg. Farmers cultivate laying ducks, in which case eggs are a source of their income. Ducks start laying eggs at the age of 5.5-6 months, meaning that if farmers buy DOD they need big capital to feed. Duck pengging according to research results Satrio et al (2015) began laying at the age of 22 weeks.

The data in Table 1 shows that the revenue of duck farming amounted to Rp75.336.000 with the source of revenue 85.72 percent of duck egg sales and 14.28 percent obtained from the sale of duck rejects. Production costs incurred by farmers were the cost of cages depretiation, the cost of medicines / vaccines, labor and feed costs. The largest cost is the feed cost of 79.03 percent followed by labor costs (19.56 percent). The RC ratio is higher than Lastinawati (2016), which has RC ratio of 1.42.

The results showed that the average revenue per farmer per period from rice farming managed by the farmers of respondents as much as Rp 10.125.000 with production costs of Rp 3.492.000 and profitability obtained Rp 6.633.000 and RC ratio 2.89. This condition indicates that duck farming which is integrated with rice plant will give higher profit. Feed costs can be reduced because ducks consume the remains of rice during harvest. The results of Budi et al (2015) showed that 1466 ducks will produce a profit of Rp 11,200,000 per month with a profitability of 35.15%. The indication of duck productivity in the research area can still be improved. Duck productivity can be improved through improved feed, management and breeding program (Hidayati, et al., 2016).

Conclusions

Based on the results of the study showed that the RC value ratio obtained by duck farming as much as 2.29. If the duck farming is integrated with rice crops then the benefits gained positive with RC is greater for farmers.

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Prospect of Environment Beef Cattle Development in Regency of North Bolaang Mongondow, North Sulawesi Province, Indonesia

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Abstract

Beef cattle is one of the mainstay livestock in North Bolaang Mongondow Regency. Beef cattle by the local government will be used as the leading livestock for the increase in income of the community and government. This shows that the North Bolaang Mongondow government continues to increase the population of beef cattle. The government launched the program by introducing beef cattle in this area. The problems faced by the people of North Bolaang Mongondow in recent years include the conversion of the land from the agricultural land into residential land. On the other hand, the level of fertility of agricultural land tends to decrease. This is because agricultural land is used continuously without proper application of soil management technology. Development of environmentally friendly beef cattle farm is a development with the concept of LEISA (Low External Input Sustainability Agriculture). The aim was to know the prospect of environmentally friendly beef cattle development. This research has been conducted in North Bolaang Mongondow Regency by using survey method. The location of the research is determined by purposive sampling i.e. West Bolangitan, East Bolangitan and Bintauna districts which develop the beef cattle. Data analysis were descriptive and proximate analysis. The results showed that the development of beef cattle has a prospect seen from the area, the number of people, the population of beef cattle, the potential of resources and the productivity of food crops. the maximum potential of land resources under the coconut trees (PMSL) for North Bolaang Mongondow Regency is 20,088.16 UT. In conclusion, the development of beef cattle farm has a future prospect and based on the potential of existing land, the real population can still be increased up to 1.37 times.

Keywords: Beef cattle, food crops, technology, prospects

Introduction

Livestock by Mulyo et al (2012), is a place where cattle can grow and develop from breeding, cultivation to fattening. The livestock development program is linked to the reorientation of agricultural policy (Ikbal, 2015) and is operationally realized by starting with the establishment of an agribusiness area (Satiti et al, 2017).

Cattle is one of the mainstay livestock in North Bolaang Mongondow Regency. Cattle as an important component in a farming system managed by the community. According to Martan (2012), cattle is a renewable natural resource and has the potential to be developed to produce economic dynamics. Cattle farms according to Jamilah (2017), became an integral part of the daily life of rural communities. Cattle by the local government will be used as the leading livestock for the increase in income of the community and government. This shows that the North Bolaang Mongondow government continues to increase the population of cattle. The government launched the program by introducing cattle in this area. The problems faced by the people of North Bolaang Mongondow in recent years include the conversion of land so that agricultural land is made into residential areas. On the other hand, the level of fertility of agricultural land tends to decrease. This is because agricultural land is used continuously without proper application of soil management technology.

Development of environmentally friendly cattle farm is a development with the concept of LEISA (Low External Input Sustainability Agriculture). The development of cattle farming is very important in supporting the development of food crop agriculture. This phenomenon shows that the productivity of cattle in North Bolaang Mongondow needs to be improved. Input land should be used optimally, because the reduced fertile land is a challenge that must be faced by farmers. The development of cattle in the research area was conducted simultaneously with the development of the agricultural sector. The indication that the management of agriculture and livestock of cattle is done with an integrated concept, and the concept of management is less risky. Such management is carried out so that business efficiency can be achieved. Livestock from cattle efficiently managed according to Walia and Kaur (2013) can provide benefits and produce environmental health. Based on background and problems, the research in North Bolaang Mongondow Utara was done with the aim to know the prospect of development of environmentally friendly beef cattle.

Materials and Methods

The research material is cattle population, livestock development potential and index of carrying capacity. The population of cattle is the tendency to increase the ownership of beef cattle. The potential of livestock development in question is the potential for effective development based on the maximum potential land resources. The carrying capacity index is the potential availability of feed resources with increasing cattle population. This research was conducted in North Bolaang Mongondow Regency by using survey method. The location of the research is determined by purposive sampling that is the district of West Bolangitang, East Bolangitang and Bintauna which do the development of beef cattle. Data analysis is descriptive and proximate analysis.

Results and Discussion

Main commodity farms in Bolaang Mongondow Utara are beef cattle. The data show that cattle have increased by 6.93% from 2014 to 2015. The increase in livestock population was supported by the government's attention with the development of the livestock. The government program in the future is the introduction of 5000 head of cattle. This program should be followed by optimizing the potential of existing land. Cattle farming in this case is one of the reliable sub sectors in the increase of people's income and the fulfillment of animal protein nutrition.

The resource potential in North Bolaang Mongondow Regency is seen from the land supporting resources. Land carrying capacity was seen from the potential for the development of effective livestock and the carrying capacity index. The potential for livestock development was effectively analyzed using the analysis of the maximum potential of land resources (PMSL), as shown in Table 1.

The data in Table 1 shows the maximum potential of land resources under the coconut trees (PMSL) for North Bolaang Mongondow Regency is 20,088.16 UT. This means that based on land resources in North Bolaang Mongondow can still accommodate the population of cattle for the value of the PMSL. Efforts to optimize the land under coconut can be done to support the development of agriculture in the future as proposed by Mulyani et al (2011). Based on the maximum potential of land resources then analyzed the index of carrying capacity (IDD) in the study area, as in Table 2.

Table 1. Results of Analysis of PMSL North Bolaang Mongondow Regency, District of East Bolangitang, Bintauna and West Bolangitang

Coefficient/ Variables	North Bolaang Mongondow Regency	East Bolangitang District	Bintauna District	West Bolangitang Dsitrict[1)]
A	0,80	0,80	0,80	0,80
LG	15.683,95	2.456,79	2.237,00	3.668,00
B	0,50	0,50	0,50	0,50
PR	1.460,20	2.310,03	2.743,72	3.504,48
C	1,20	1,20	1,20	1,20
R	200,00	31,64	37,58	48,00
PMSL	20.088,16	3.158,42	3.206,55	4.744,24

Note : PMSL (Maximum potential in units of cattle (AU) based on land resources); A (The coefficient is calculated based on the ratio of ruminasia livestock population in animal units (AU) to the area of arable land (Ha); LG (Area of coconut in Regency / District studied (Ha); B (Coefficient calculated as natural grassland capacity); PR (Area of grassland (Ha)); C(The coefficient calculated as the capacity of the swamp (Ha)); R (Area of swamp (Ha)). Source : Salendu et al (2017)

The data in Table 2 shows that based on IDD value, the carrying capacity of the land in North Bolaang Mongondow Regency is quite high, meaning that the maximum potential of land resources is still greater than the need for feed. The value of IDD for Bolaang Mongondow Utara District is 1.37, it means that based on the available land potential, the real population can still be increased up to 1.37 times. The land under the coconut tree in North Bolaang Mongondow can still be optimized as a source of forage feed. Introduction was done by utilizing high quality forage. Improvement of quality feed for cattle according to Rahmawati and Budianto (2011), will be useful to shorten the cattle fattening time. Improvement in productivity of cattle must be encouraged by prioritizing the improvement of feed through the utilization of local resources (Muis, 2015). Result of proximate analysis (Baristand Manado, 2017), corn straw sourced from East Bolangitang District for Dry Material 52,65%, Crude Protein 2,21%, Fat 1,88%, Crude Fiber 14,95%, Ash Content 6,14 % and Carbohydrates 42.42%. Corn straw from Bintauna District for Dry Material 79,30%, Crude Protein 5,33%, Fat 5,37%, Crude Fiber 38,38%, Ash Content 8,64% and Carbohydrate 62,98%.

Table 2. Results of Analysis of IDD North Bolaang Mongondow Regency, District of East Bolangitang Bintauna and West Bolangitang

Coefficient/ Variables	North Bolaang Mongondow Regency	East Bolangitang District	Bintauna District	West Bolangitang Dsitrict
PMSL	20.088,16	3.158,42	3.206,55	4.744,24
K	1,14	1,14	1,14	1,14
POPRIL	12.847,00	614,00	2.390,00	2.044,00
TK(kXPOPRIL)	14.645,58	699,96	2.724,60	2.330,16
IDD	1,37	4,51	1,18	2,04

Note : IDD (Carrying capacity); TK (Total requirement of feed); K (Constant requirement of dry matter digested (BKC) by one animal unit)

Conclusions

Based on the result of the research, it was concluded that the development of cattle farming has a future prospect and based on the potential of existing land, the real population in North Bolaang Mongondow Regency can still be increased up to 1.37 times.

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Empowerment for Duck Farmer Group in Tuutu Villages West Tondano District Minahasa Regency North Sulawesi Province, Indonesia

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Abstarct

The main program of duck farmer groups in the Village Tuutu Tondano Western District of Minahasa Regency is the development of duck and food crops (paddy and corn). Types of duck are many maintained that duck MA (Mojosari-Alabio). Duck egg production is low, due to system maintenance moving to follow changes in the existing paddy harvest time around the lake Tondano. The problem of group members is that they have no understanding and knowledge about intensive maintenance system and integrated with food crops. The purpose of this study is to know the benefits of raising ducks and identify development problems faced by farmers. This research is conducted by using survey method, and location is determined purposively, that is farmer have paddy field integrated with duck. Respondents were 32 people determined census and the data were analyzed descriptively. The results showed that the group of farmers of duck breeder not use feed according to feed formulation, only follow suggestion or instruction based on experience of other group. Duck breeding system is partly semi-intensive with the number of ducks that are still lacking and have not calculated the profit-loss. Based on the results of this study can be concluded that through empowerment of farmers groups have produced quality feed, can apply hatching technology well, and can increase the egg production.

Keywords: empowerment, farmer groups, duck

Introduction

The West Tondano district is located in Minahasa Regency inhabited by a number of communities. The livelihoods of the residents in West Tondano district vary such as the Civil Servant (ASN), private or entrepreneurs, laborers, farmers or even unemployed. Tuutu Village is a part of West Tondano district, Minahasa Regency of North Sulawesi Province, with the second largest urban area reaching 3,158 km^2, and livestock farmers' livelihoods reach 41% (Minahasa BPS, 2017).

Duck farms developed by farmers breeders, because it is easy to breed and not susceptible to disease (Supriyadi, 2009). Duck breeding experience in Tuutu villages West Tondano district has been going on for generations, because it is supported by the location of residence in the surrounding area of Lake Tondano.

Farmers who are members of a group of farmers generally reside around the inlet of Lake Tondano. Duck breeding business (Manila ducklings/Muscovy ducks, Javanese ducks, Mojosari ducks, Alabio ducks) run by the farmers come from within their own region (bought in the market, and some are from Java). The current problem cope by the farmers is the traditional cage/housing system because of the shifting cultivation following the changes of weather and of rice harvesting time around Lake Tondano. This is due to lack of understanding of intensive farming systems and lack of knowledge about food making or processing by members of the breeder group.

Feed is the key to success of a poultry farm business, especially ducks. The cost of feed is the largest component of total maintenance cost (Noviyanto et al, 2016; Sinaga et al, 2013). Members of the duck breeder group have tried from traditional feed such as snails from the lake (*biak / renga*: popular for Minahasa people) and corn, to concentrate bought from Poultri shop but not last long because according to duck breeder the concentrate is too expensive. This keeps breeders using traditional feed and or bringing the ducks feed around the land that have finished harvesting the rice.

The problem of group members is lack of understanding and knowledge of maintenance intensive systems coupled with integrated food crops. The purpose of this study is to know the benefits of raising ducks and identify cultivation problems faced by farmers.

Materi and Methods

The research was conducted by using survey method, and the location was determined by purposive that has the largest population of duck livestock. The 32 respondents were determined by census that all group members were actively involved in the activities of several groups of duck breeders in Tuutu village. Data were collected based on interviews using questionnaires and analyzed descriptively.

Empowering of duck breeder groups in Tuutu Village, West Tondano district to overcome some problems, had been done with 2 (two) methods that are counseling and training. Counseling was done to change the behavior of group members in a better direction. After counseling the group members were given training. The training was the practice of applying feed management such as mixing rations demonstration and how to calculate the profit of duck breeding business intensively.

Results and Discussion

The Benefits of Duck Farming for Duck Farmers in Tuutu Village, West Tondano District

Farmers who are members of the Tougela farmer group in Tuutu 100% run duck breeding business as a source of basic income. In other words, duck breeding has been able to meet the daily needs by selling eggs and ducks, so ducks become the focus of business. While members of other groups (Masawa-Sawangan group, Esa Toroan Waya group and Toubeke group), besides as farmers also work as laborers, builders, drivers and motorcycle taxis.

Duck farming is believed providing great benefits for farmers in Tuutu Village. When feeding difficulties occurred (snails in the lake were reduced), farmers immediately sold all ducks. Only 20% of farmers prepared the sale of ducks to buy

DOD. The 30% of farmers used the sale of ducks to renovate / build houses, another 50% for children's education, other business capital, and consumptive purposes.

Source and Type of Duck Feed in Tuutu Village, West Tondano District

The availability of feed in the form of waste such as water hyacinth and snails found in the lake, rice bran waste in rice fields is a potential for the development of ducks in Tuutu Village, West Tondano District. In addition, maize and concentrate are also additional feed for duck farmers whose acquisition must be purchased. Snails as a protein source and rice bran as an energy source are considered sufficient to meet the nutrients of feed for ducks. In accordance with Nugraeni et al. (2014) that feed given to duck must at least meet the two elements of feed sources, ie energy and protein sources.

In 2010, one of the head of farmers group had a report on the test results of 3 samples of feed ingredients (leaves of water hyacinth, shell and snail meat), however it has not been applied for feeding to ducks until now. Currently, the farmers provide snails feed in the form of raw materials without being processed and never give hyacinth in duck ration, so when there is a virus attacking snails, ducks that feed the snail's will be affected by decreased egg productivity, poisoning even to death.

Mixing Rations Application

Duck breeder farmers feed the ducks based on advice or guidance by other group’s experience, without noticing the feed formulation. Duck breeders in Tuutu have long used concentrate for 0-2 weeks old ducks. However, they did not know if the concentrate is a mixture of some feed ingredients, so sometimes the concentrate is still mixed up with corn or rice bran. In addition, they did not understand how much protein and energy ducks need. Concentrate use is limited only to starter duck cattle because of the price is relatively expensive. Through counseling, breeders can find out that they can also mix concentrate feed from the ingredients around them such as corn, rice bran and fish flour. Fish flour is used instead of snails which are rarely found in certain periods of time.

According to Heryanto (2013), the farmer group's active efforts to improve their knowledge-based, skills and attitudes through the learning process are characterized by various learning activities such as attending counseling sessions, discussion groups, agricultural training and agricultural demonstrations. In this research, demonstration of feed mixing did not use the snail flour because until the day of demonstration, the number of snails in the lake was very minimal, so the preparation of ration for starter duck period was derived from 40% of corn, 30% of fine bran and 30% of fish flour. The ration can meet the nutritional needs of starter duck because it contains ± 20.24% protein. The amount of feed used by farmers in Tuutu Village, West Tondano district for 100 DOQs for 2 weeks is 60 kg concentrate. If the price of concentrate feed is Rp 10 000, - / kg then the cost required to buy the feed is Rp 600 000, -. While the cost of feed if mixed by the breeder is only Rp 234 000, -. The cost of course would be cheaper if using snails, and utilize corn and rice bran from self-production.

Identification of Problems of Duck Breeding Business Development

Duck breeders understand that ducks are very resistant to disease attacks so ducks cage/house is not important to note. Similarly for vaccinations, vitamin and treatment are never performed. Some of the issues that can be identified on duck breeding include:

The Quality of Human Resources. Farmer education will determine the success of livestock business. Education was one of the factors that could improve productivity, since it could improve the managerial capacity of farmers. Education level is important in determining farmers' capacity in under- information on duck production or other aspects. Data on education level of duck breeder group members in Tuutu village are 62% senior high school, 23% junior high school and 15% for elementary school. The low quality of human resources will affect the productivity of livestock business, so that human resources are an important element in the development of livestock.

The Capital. The maintenance of ducks is not always in the same location, although the land is available. This is because the time of feeding follows the weather and rice harvesting system of farmers around Tondano lake. Paddy harvest waste from rice fields become the choice for the group of masawa-sawangan by placing or accompanying ducks to the place of completion of rice harvest to look for animal feed. Ducks are brought or driven to paddy field (belonging to other people) between villages, sub-districts and even between districts, if the weather and snail catch/prawn in Tondano lake have problems. Adult duck (> 3 months) is released freely into post harvest fields), while ducklings (<3 months) are stuck in cage with plastic sheeting without roof. This is done by farmers because of lack of capital to buy finished feed (concentrate). While for the group of breeders Tougela will still survive to give snails to duck livestock because to put ducks from fields to fields desperately need extra time.

Coaching / mentoring. Based on interviews, it has found that there was no coaching sessions from the relevant agencies regarding the quality of breed used, proper maintenance procedures, feed quality and appropriate feeding methods, and good business systems and financial analysis. Nevertheless, there was one group that got the 1st winner of business management of duck breeder group in North Sulawesi Province level. According to Dolinska & D'Aquino (2016), farmers' group learning and innovation can empower engaging farmers as agents of change in agricultural practice.

Hatching technology. The application of hatching technology using hatching machine has not been fully implemented by farmers because 25% of them still believe that incubated ducks as a better grower. Besides the electricity requires a cost, it also takes extra time for hatching with the machine. This is in line with the thoughts of Indraningsih (2011) and Akudugu et al. (2012), that there is a tendency of farmers to reduce production costs, in other words, the economic motive becoming a consideration of farmers in adopting a technology.

Innovation. Farmers who receive innovation through counseling did not immediately apply it if they have not seen the changes that occurred. They will apply innovation if they have seen a change in the group leader that can benefit the duck breeding business. They did not like the possible risks that can harm their business. There was one chairman who is always be a pioneer of the implementation of innovation. Innovation power in overcoming or treating dairy cattle or poisoning allegedly due to feed is also still low, so the breeder will sell all his livestock if he saw ducks breeders / other groups experiencing death. It is about the acceptance of innovation as proposed by Rogers (2003) that the innovation decision process is a mental process since a person first starts to recognize an innovation, shapes attitudes toward that innovation, takes the decision to adopt or reject, implement new ideas, and make confirmations of the decision. This process consists of a series of individual choices and actions over time or a system of evaluation of new ideas and decides to practice innovation or reject them.

Conclusions

Based on the research results it can be concluded that through empowerment of breeders groups have produced a quality and economical feed and can apply hatching technology. There are 5 problems identified that can hinder the development of duck, that are low quality of human resources, lack of capital, lack of coaching from related agency, lack of application of hatching technology, and lack of innovation.

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Pig Farming System and Development in the pinapalangkow Village Suluun Tareran District Minahasa Regency, North Sulawesi, Indonesia

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Abstract

Pig is one of the livestock commodities, which is relied upon, by some Pinapalangkow villagers as their source of income. This pig farm has a market prospect since the people of North Sulawesi province are potential consumers. This is because viewed from most people can consume pig products. Pig farming is well known and consumed by the village community because of its distinctive characteristics, and is easily sold due to high demand. The problem is whether pig farming is profitable, and whether its development is environmentally friendly. The purpose of the research was to identify the problem of pig farming and how far the empowerment was done. The research method used was survey method with case study approach. Determination of location and farmer of sample by purposive sampling that was farmer who joined in group. The results showed that farmers who develop pig farms were not continuous because of the constraints of feed prices, which are increasingly expensive. The output price also tends to decrease so that farmers are difficult to market pigs. The high price of feed followed by the decline in output prices causes pig farming was not continue. Management of pig farming was done with the cage around the residence (beside the kitchen) and near the fish pond. Pig manure was channeled into fish ponds and the fish consume pig waste. This has an impact on environmental pollution (water and air) as well as disturbing human health (including fish consumers). On the other hand, the production and marketing of pigs becomes an obstacle that causes pig farming is not continue. Based on the result, it can be concluded that pig farming is profitable with RC ratio is bigger one but not environmentally friendly so it needs empowerment for farmers.

Keywords: Pigs, development, environment

Introduction

Sustainable agriculture is a must that needs to be done in development. The concept of sustainable agriculture system (SPB) became a global issue emerged in the eighties, but based on several evidences, agriculture as a production system was also a polluter. Livestock is also claimed to be a polluter that causes an increase in greenhouse gas emissions.

Livestock in North Sulawesi in general as a producer of animal protein food of high nutritional value to improve the quality of human resources. Livestock development in this case has good prospects in the future. This is because now demand for livestock products continues to increase, along with increasing population, income and public awareness to consume high nutritious food.

Pigs are one of the livestock commodities that some Pinapalangkow villagers depend on as their source of income. This pig business has a market prospect considering that the people of North Sulawesi province are potential consumers. This is because viewed from most people can consume pig products. The predominantly Christian North Sulawesi community led to a high demand for pork. The indication of pig business in North Sulawesi has a very encouraging market potential. This is because pigs have beneficial traits and abilities, and as one potential effort to develop (Aku et al., 2013). According to the Ministry of Agriculture (2012), pigs and / or processed products are quite potential as national export commodities. The market of pigs commodities is still widely open to various countries such as Singapore and Hong Kong. The advantage of pigs compared to chickens is the volume of imports can be said to be zero (Ministry of Agriculture, 2012).

The business of pigs has been known and highly relied upon by the people of this village because of its properties and easy to sell because of the high demand. Pigs have rapid growth, can be sold at the age of 8-9 months with a weight of 100 kg weight of life. In addition, pigs also have prolific properties (many breeding piglets) and good ration efficiency. The problem was whether the pig business is profitable and maintenance management was not yet environmentally friendly. The objective of the study was to identify the problem of pig farming and how far the empowerment was done.

Materials and Methods

The material of this research include the number of pigs owned by the group, the introduced technology that was biogas reactor made to accommodate four cubes of pig manure. The research method used was survey method with case study approach. Determination of location and farmer of sample by purposive sampling that was farmer who belongs as member of group. The sample groups for empowerment were two groups and each group consists of 4 (four) active members in the group. Farmer institutions still need attention. The group approach was done with the aim of enlarging the effectiveness and efficiency of the business and building togetherness among farmers without changing the business objectives. Data analysis used was descriptive analysis and RC ratio.

Results and Discussion

The results showed that pig farming who tried pigs are not sustain due to the increasingly expensive feed price constraints. Price of output also tends to decrease so that farmers were difficult to market pigs. The high price of feed followed by the decline in output prices causes the pig business was not continuous. Ownership of pigs by members of the group as many as 14 tail with the revenue of 4 (four) tail amounting to Rp 7,130,000, the cost incurred of Rp 6.860.000, so the RC ratio achieved of 1.04. RC value of this ratio was obtained with the sale price of pigs Rp 23000 / kg of live weight.

Pig farmers in the village of Pinapalangkow form a productive group for the development of their businesses, including the Kekelor and Anuta Group. Both groups were beginners established since 2013. Both groups aim to develop pig enterprises to improve their welfare.

Management of pigs business was done with the cage located in the residential house (beside the kitchen) and near the pond of mujair fish (Figures 1 and 2). Pig manure was channeled into mujair fish pond and the fish consume pig waste. This has an impact on environmental pollution (water and air) as well as disturbing human health (including mujair fish consumers). On the other hand the production and marketing of pigs becomes an obstacle that causes the pig business was not continuous.

Figure 1. Condition of Cages Kekelor Group

Figures 1 and 2 show that pig manure is channeled into mujair fish ponds and the fish consume pig waste. This certainly has an impact on environmental pollution (water and air) as well as disturbing human health (including fish consumers mujair). Pig business influenced surrounding environment due to the pollution (Zukri, 2012).

Figure 2. Condition of Cages Anuta Group

Based on the results of the research, empowerment of group members has been done through the manufacture of biogas reactors. Seseray et al (2012) states that other than meat producers, pig roles as organic fertilizers, as well as energy of biogas. Biogas technology is used as fuel for cooking to replace firewood and improve human health and the environment (Barnhart, 2012). Biogas is one of the most sustainable types of energy and sustainable development for energy and environmental planning (Srisertpol et al, 2010). Biogas is one of the renewable energy sources that can answer the need for energy while providing nutrient needs in a sustainable agriculture system. Benefits derived from biogas production by Elly (2012) are reducing expenditures for kerosene, reducing wood dependence, the yard being clean, pleasing to the eye and reducing odors. Pig waste management into alternative energy is very beneficial to various parties (Mariawan, 2012). Biogas technology can be applied to household scale, commercial or village (Eze, 2009). The results of Adl et al (2012), showed that the reactor was successfully started with pig manure. Utilization of biogas as a source of energy in small industries based on agricultural processing can provide multiple effects and become a driver of the dynamics of rural development. In addition, it can be used to increase the added value by giving green labeling on processed products that are processed by using green energy. According to Barnhart (2012), home-based biogas technology is used as fuel to replace firewood and improve human health and the environment.

Conclusions

Based on the result of the research, it can be concluded that pig business was profitable with high RC ratio. Consideration of waste management for producing to biogas need to be highlighted.

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An Analysis of Waste Utilization Technology Adoption in an Integrated Crop and Livestock System in Minahasa Regency

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Abstract

The existing farming system in the people of Minahasa Regency is mix cropping; therefore, a zero-waste model integrated agricultural system which is efficient in input use is required. The zero-waste technology model is implemented through various methods or models; among them is integrating corn planting and cattle raising. Introduction to silage feed, ammoniation, and composting was conducted as a waste utilization effort in the crop-livestock integration system in Minahasa Regency. Introduction to the technology was initiated by extension activities where the members of groups were given knowledge of the benefits, production stages, and economic value of silage, ammoniation, and compost. The study was conducted in Minahasa Regency. Sub-district and village samples were determined through purposive sampling based on (1) beef cattle development areas in Minahasa Regency, (2) forage fodder development locations in North Sulawesi, and (3) areas that have conducted corn-cattle integration. The Tonsea Lama Village in North Tondano Sub-district and East Ranotongkor Village in East Tombariri Sub-district were selected. In order to analyze the factors which influence the farmer adoption level in the integration system in Minahasa Regency, a multiple linear regression analysis was employed. The study results revealed that the factors influencing waste utilization technology adoption in the crop-livestock integration system in Minahasa Regency were age, education, and business experience. Out of the three variables, the regression coefficient of age and education had positive values, which means that waste utilization technology adoption in the crop-livestock integration in Minahasa Regency increased with the increase in age and improvement in education. On the other hand, the business experience variable had a negative value, indicating that the respondents felt comfortable with their current business pattern, making them tend to be apathetic towards novel technology.

Keywords: adoption, technology, waste, integration

Introduction

An integrated agricultural system is basically an agricultural system which applied the basic principles of bio-industry, namely: (1) zero waste, (2) zero imported production input, (3) zero imported energy, (4) processing biomass and waste into new, high value bio-products, (5) integrated and environmentally friendly, and (6) as an advanced science and technology-based biorefinery which produces foodstuffs and non-foodstuffs (Haryati 2006, Priyanti et al 2009, Umboh et al. 2017).The existing farming system in the people of Minahasa Regency is mix cropping;

therefore, a zero-waste model integrated agricultural system which is efficient in input use is required. The zero-waste technology model is implemented through various methods or models; among them is by integrating corn planting and cattle raising. The benefits of this activity is that the farmers operating their farms using an integrated agribusiness model is efficient in input use, environmentally friendly (zero waste), and have an impact on food and processed food product diversity (Diwyanto et al 2002, Umboh et al. 2016).

Pertaining to cattle-raising technology, introduction of technology components, namely young cattle selection, enclosures, feed management, disease and pest control, and marketing has been conducted extensively. However, it is still difficult to change the cattle-raising method, in feeding, enclosures system, and waste utilization. This condition indicates that technology introduction in the practical level is not as simple as discovering a laboratory-scale formula due to the varying appreciation responses from the farmers towards technological innovations.

The classical farmer-level problem is that extension/training activities have yet to have any effect on the farmers' behavior in adopting novel technology, frequently resulting in the farmers deciding to reject the technology. Even though the technology being introduced is the result of improvements to or modification of existing technology, it is not enough to persuade the farmers to adopt the technology. This is because technology adoption at farmer level does not occur as a whole technology package, but is limited to the components of the technology. In addition, the factors which influence technology adoption at farmer level are still unknown.

Based on the aforementioned issue, the pupose of this study was to analyze the factors influencing farmers' technology adoption in the corn-cattle integration system in Minahasa Regency.

Material and Method

The study was conducted in Minahasa Regency. Sub-district and village samples were determined through purposive sampling based on (1) beef cattle development areas in Minahasa Regency, (2) forage fodder development locations in North Sulawesi, and (3) areas that have conducted corn-cattle integration. The Tonsea Lama Village in North Tondano Sub-district and East Ranotongkor Village in East Tombariri Sub-district were selected. To analyze the factors which influence the farmer adoption level in the integration system in Minahasa Regency, a multiple linear regression analysis was employed.

Results and Discussion

Corn Waste and Cattle Dung Utilization Technology Introduction

The introduction of silage-making, ammoniation, and compost was done as an effort to utilize waste in the crop-livestock integration system in Minahasa Regency. Technology introduction was initiated by extension tension activities where farmer group members were given the knowledge of the benefits, production stages, and economic value of silage, ammoniation, and compost. This was conducted because the group members had no knowledge of the waste utilization technology introduction package in the crop-livestock integration system.

The technology introduction in silage feed production and ammoniation of corn stalks were conducted to overcome feed shortages in the dry season. Farmers had to look far for grass on agricultural land and even resorted to purchasing bran and oilcake to fulfil the catlle's feed requirements. On the other hand, during harvest season, the farmers simply ignored, discarded, or burned corn-stalk waste after harvesting. This was because the farmers did not have the knowledge of alternative feed through the utilization of abundant agricultural waste. The farmers' knowledge was limited to feeding roughage directly to the cattle although the crop waste had great potential as a raw ingredient for a complete feed which could overcome cattle feed shortages, especially during the dry season. Technology introduction was done collectively without other group members through a number of stages: the collection and transportation of corn stalks from fields belonging to members, drying, silage-making/ammoniation, packing, and finally the product was ready to feed to the cattle.

At farmer level, livestock dung was unused and wasted and caused pollution. Introduction to compost was conducted as an effort to improve and increase the diversity of soil organisms. Through the processing and introduction to waste technology, livestock waste could be processed into organic fertilizer which has multiple benefits; aside from being beneficial for the crops, it can also improve the nutrients in the soil which cannot be done by chemical fertilizers (Simatupang 2004, Umboh et al 2017). Moreover, the rising prices of inorganic fertilizers or factory-produced chemical fertilizers make the production of compost a profitable business opportunity.

Factors Influencing Technology Adoption

The process of technology adoption is the process of applying a novel idea. In this case, the technology adoption level can be assessed through the quality and quantity of adoption. The quality and quantity of adoption are associated to the accuracy and number of technology components applied to the agribusiness according to the guidelines (Rogers 2003, Bulu et al 2009, Abdullah et al 2015, Kabir et al 2013) listed five stages of the adoption process: awareness, interest, evaluation, trial, and adoption. Based on the information above, technology adoption in this study is defined as farmers' ability to apply waste utilization technology in the integrated system which is categorized as: accepting is given a score of 3, dubious is given a score of 2, and rejecting is gven a score of 1.

The study results revealed that the factors which influence waste processing technology adoption in the corn and cattle integration system were both internal and external factors. These factors were age, education, and business experience. The regression analysis results demonstrating that the three variables had a significant effect on the waste utilization adoption level in the integrated system in Minahasa Regency can be seen in Table 1.

Table 1. The Result of Regression Analysis

Independent Variable	Dependent Variable	Coeficient Regression	Thit	Sig.
Constanta	Technology Adoption (Y)	2.021	3.452	0.001
Age (X1)		0.116	0.751	0.56
Education (X2)		0.111	0.519	0.064
Business Experience (X3)		-0.156	-1.055	0.48
Rsquare=0.782				

Age

Pertaining to the agricultural technology adoption context, the age concentration at productivce age can become a resource asset which will increase the speed of agribusiness technology adoption. Generally, the respondent farmers in this study were between 39 and 57 years old (56.25 percent), followed by those 58 – 75 years old (31.25 percent), and the remaining 8 percent were 20 – 38 years old. These data demonstrated that the farmers were within the productive age range (Table 2).

Table 2. Farmer's Age in Integrated System in Minahasa Regency

No	Indicator (year)	Scor	Farmer (Respondent)	Percent (%)
1	58 – 75	3	15	31.25
2	39 – 57	2	27	56.25
3	20 – 38	1	6	8
			48	100

Source: Primary Data (processed), 2018

The result of the regression analysis showed that the regression coefficient of the age variable (X1) was 0.116, meaning that for every increase in the age value would cause an increase in adoption value by 0.116 percent, with a ceteris paribus assumption. This indicates that the farmers' age influences the speed of technology adoption. This result was not in line with the results of the the study by Rangkuti (2009) who stated that the older the farmer is, the less his/her involvement in the communication network.

Education

Education can influence a farmer's ability to adopt a novel technology. The higher the farmer's education level, the faster he/she grasps the understanding of a new technology. Education reflects the intelligence level which is related to a person's cognitive ability. The higher a person's education level, the more extensive his/her knowledge is lower. This was supported by the opinion by Rogers (2003), Musyafak and Ibrahim (2005), Bulu et al. (2009). who stated that education influences a person's understanding in learning something, either a skill or knowledge. The implication is that the farmers did not have the courage to adopt a technology because they were ignorant of the benefits of the technology. Therefore, the farmers' education variable is a significant determining factor in making the decision to adopt new technology.

The Education Level regression coefficient (X2) was 0.111 which means that every increase in the education value would cause an increase in the technology adoption value by 0.111 percent with a ceteris paribus assumption. This result indicates that farmers with high education relatively quickly applied the suggestions from the extension officials. On the other hand, farmers with minimum education were generally reluctant to accept/increase their knowledge. Rogers (2003) stated that the level of formal education undergone by farmers reflects the farmers' knowledge level and outlook in applying introduced technology.

The result of the study revealed that the largest percentage of farmers in the integrated system in Minahasa Regency finished elementary school (45.83 percent), followed by farmers who graduated from junior to senior highschool (37.50 percent), and those who had college diplomas (16.66 percent) (Table 3). This indicated that the education level was still low, leading them to believe that adequate education isunnecessary for raising livestock.

Table 3. Farmer's Education in Integrated System in Minahasa Regency

No	Indicator (formal education)	Scor	Farmer (Respondent)	Percent (%)
1	Diploma – PT	3	8	16.66
2	SMP – SMA	2	18	37.50
3	SD	1	22	45.83
			48	100

Source: Primary Data (processed), 2018

The implication of the low level of the farmers' formal education is that they need supervision in the order to increase the speed of adoption of technological innovations. Rogers (2003), Abdullah et al. (2015) stated that education is one of the factors which strongly influential in the livestock-raising business. An adequate education level would have an effect on the ability to manage the livestock-raising business. In other words, the higher a person's formal education, the faster he/she adapts to developments in technology and it could also increase a person's thought processing speed.

Business Experience

There was an apparent disparity in the respondent farmers' livestock-raising business experience, between 2 and 40 years. A person's livestock-raising business experience shows how long the person has been involved in the business. The more experience in the livestock-raising business, the higher the farmer's involvement, diversity, collaboration, and openness in the communication network with other farmers. The bond strength is one of the determining indicators for the speed of technology adoption. Business experience (X3) in this study is defined as the length of time the farmer has been running a business in the integrated corn-catttle system.

Business experience influences decision-making in the option to adopt a certain technology. The more the experience in the agribusiness, the more easily a person will understand a technological innovation and he/she tends to apply it more readily (Simatupang 2004, Musyafak and Ibrahim 2005). Priyanti et al. (2007) stated that an integrated agribusiness technological innovation is the result of modifying yang technology aimed to assist farmers in their agribusiness activities. The results of this study revealed that the farmers in the integrated system in Minahasa Regency had business experiences between 2 and 40 years. This can be seen in Table 4.

Table 4. Farmer's Business Experience in Integrated System in MInahasa Regency

No	Indicator (year)	Scor	Farmer (Respondent)	Percent (%)
1	28-40	3	9	18.75
2	15-27	2	17	35.14
3	2-14	1	22	45.83
			48	100

Source: Primary Data (processed), 2018

Table 4 shows that the largest percentage of farmers had business experience in the integrated system ranging between 2 to14 years, forllowed by 15 to 27 years, and finally 28 to 40 years. The Experience regression coefficient (X3) was -0.156 which means that for every increase in business experience value would decrease the adoption value by 0.156 percent with a ceteris paribus assumption. This condition indicates that the more business experience a farmer has, the more difficult it is for him/her to accept and and apply novel technology. This was opposite of the findings by Rogers (2003) who stated that the more experience a person has in an agribusiness, the more easily he/she understands a technological innovation and the more readily he/she applies it . Business experience can indicate a deep understanding of the current business, leading to thoughts of making the task easier or the will to increase his/her business's productivity using the available resources. In the case in this study, the respondent farmers were in a business pattern comfort zone, making them apathetic towards novel technology. This was due to more extensive experience which allowed them to make more comparisons in making their decision. The results of this study are supported by Umboh et al (2016), but not supported by Rahardi (2003) who found that farmers who have much experience in an agribusiness would apply innovations more quickly than beginner farmers.

Conclusion

Waste utilization technology adoption in the corn-cattle integration system was significantly influenced by age, education, and business experience. From these three variables, the regression coefficients for age and education had positive values, meaning that waste utilization technology adoption in the corn-cattle integration system in Minahasa Regency were proportional to the variables age and education. On the other hand, the business experience variable was inversely proportional, indicating that the respodents were within a comfort zone in their agribusiness, making them apathetic towards certain technology.

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Empowerment of Farmers in Efforts to Develop Sustainable Cattle Farming in Sangkub District Regency of North Bolaang Mongondow, North Sulawesi Province, Indonesia

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Abstract

Sangkub is one of District in North Bolaang Mongondow Regency geographically has a strategic position and significance for province of North Sulawesi because it is located in the border area with the province of Gorontalo. District of Sangkub is one of areas of development of cattle farms. Cattle as a source of income are still done traditionally. Based on this background, research has been conducted with the aim to identify development problems faced by farmers. The research was conducted by using survey method and case study approach. The research area was determined by purposive sampling that was development area of Regional Partnership Program (PKW) in District of Sangkub. Respondents are farmers who are grouped and ready to receive technology introductions. The empowerment method used was a combination of appropriate technology application method with adult learning technique (andragogic) so that it is easier to create mechanisms, procedures, climate and atmosphere that support the learning process independently and to maximize the participation of the community groups in Sangkub District. In essence the approach of andragogic learning, encouraging the target group to take on wide responsibilities, includes taking the decision to participate in this activity. Furthermore, the empowerment technique used is a combination of application of technology for community groups, pilot projects, tutorials, discussions, brainstorming, and community development movement through life skill action activities on integrated cattle-crops farming. Based on the result of the research, it can be concluded that through the empowerment of farmers has produced the land that is planted with grass, solid fertilizer and feed processing technology forage.

Keywords: food crops, cattle, empowerment

Introduction

Sangkub is one of the District in North Bolaang Mongondow Regency geographically has a strategic position and significance for the province of North Sulawesi because it is located in the border area with the province of Gorontalo. Ditrict of Sangkub was one of areas that has developed cattle farming, and government provides support for cattle farming to be a priority as a source of income for community. Efforts made by the government is to encourage the increase in population and productivity of beef cattle by introducing cattle livestock. An increase in cattle population has an impact on improving the social status of farmers (Lambertz *et al*., 2012). Increased consumption of animal protein from livestock for family nutrition, in this case encouraged by increasing populai cattle. A significant increase in beef demand over recent years suggests a good market opportunity for beef cattle.

Cattle as a source of income and animal protein from livestock are still done traditionally. The effort is shown on a small scale and in a rural environment. The technology used in the cattle breeding business is simple or traditional technology. Muis (2015) further stated that the traditional cattle breeding is caused by the knowledge of conventional breeding and has not been able to develop its business better. Based on this background, research has been conducted with the aim to identify the development problems faced by farmers.

Materials and Methods

The material of this research is cattle (farmer's cattle), feed (grass and agricultural waste consumed by farmer's cattle) and introduced technology that is forage planting, feed processing and processing of solid compost was sourced from cattle dung. Forage introduction to increase cattle productivity, fertilizer processing to overcome environmental pollution and feed processing in anticipation of over forage production and waste and overcome the lack of feed in the dry season. The research was conducted by using survey method and case study approach. The research area was determined by purposive sampling that was the development area of Regional Partnership Program (PKW) in Sangkub District. Respondents were farmers who are farmers grouped and ready to receive technology introductions. The number of respondents as many as 15 farmers PKW group members. The empowerment method used was the combination of appropriate technology application method with adult learning technique (andragogic) so that it is easier to create mechanism, procedure, climate and atmosphere that support the learning process independently and to maximize the participation of the community in Sangkub Sub-district.

Results and Discussion

The results showed that most (70.93%) families in Sangkub District process agricultural production and 30.13% of agricultural families are farm families. The results showed that most (70.93%) families in Sangkub District process agricultural production and 30.13% of agricultural families are farm families. The farmer's family is a family whose members are farm laborers. This condition is related to the income received by the farmworker's family. Farm labor families are categorized as low income families. This phenomenon shows that Sangkub District needs to get attention related to agriculture sector. The agricultural sector is the prime mover of this region's economy so its development should be the government's priority. Government attention in this regard to the agricultural sector is often linked to livestock development.

The management of cattle business by PKW group members is done in a simple and not business oriented way. Potential local resources available have not been optimally utilized by group members. The number of cattle owned by each member of the group ranged from 2-6 heads grazed on farms. The cattle belonging to some of the group members were stoned at night. Cattle in this case are given corn waste and field grass for consumption. Corn waste consumed about 8-10 kg and grass about 5-10 kg per head per day. This condition results in low cattle productivity seen from weight gain of only 0.4-0.8 kg per day. Although, the results of this study is greater than Jamilah (2017), that the average weight gain of cattle by 0.4 kg per day. Research that has been done in several regions in Indonesia shows that the productivity of cattle is dependent on feed (Susanti *et al*., 2013, Sitindaon, 2013).

Cattle, besides acting as a source of animal protein from livestock, sources of income, can also produce alternative energy from their faeces, and as a source of organic fertilizer that can be used to fertilize agricultural lands. Based on the role of cattle so that the government encourages the increase of cattle population by launching various programs. This phenomenon suggests a cattle revolution is urgently needed. However, on the other hand, the cattle revolution has an impact on the increase of cattle waste, which consequences of environmental pollution. This is as stated by Muis (2015) that the cattle breeding business also has negative impacts on the environment and public health. Total cattle ownership by group members amounted to 43 tails. Cattle dung produced 10 kg per head per day. Thus, cattle dung produced annually is 156,950 kg. This is considered a problem to the environment if it is not internalized. The current global issue that cattle ranching is one of the businesses considered to be an increase in CO2 emissions, as a greenhouse gas producer thereby increasing global warming.

Cattle dung serves as the basic ingredients of solid compost fertilizer (Ohorella, 2012, Pangaribuan *et al*., 2012, Rachmadhani *et al*., 2014). Complete nutrients contained in compost fertilizer can be utilized as a soil fertility enhancer at a lower cost (Gomies *et al*., 2012). Solid compost fertilizer acts as an organic material so that the physical, chemical, and biological properties of the soil can be improved to improve the growth and yield of crops such as corn (Kusuma, 2013) and wetland rice (Tufaila *et al*., 2014).

The success of livestock business management depends on the characteristics of group members, such as age and education level. The results showed that the age of group members ranged from 22-63 years. This age range is categorized that group members are still productive. Productive age group is shown by the ability of the physical members of the group is adequate in implementing the production process of cattle farming. The education of group members is still categorized as low with the distribution of 73.33% primary school education level, 20 percent of junior high school level and 6.67 percent of senior secondary level. The low level of education of group members affects the adoption of technology. A higher level of education allows group members to change their attitude and behaviour to act more rationally.

Empowerment was done with adult learning techniques. In essence the approach of andragogic learning, encouraging the target group to take on wide responsibilities, including taking the decision to participate in this activity. Furthermore, empowerment techniques that will be used is a combination of application of technology for community groups, pilot projects, tutorials, discussions, brainstorming, and community development movement through life skill action activities about cattle business integrated with food crops.

The results of the study indicate that there are problems related to the development of cattle farms in the research area, such as feed and cattle dung issues that pollute the environment. Based on these problems, empowerment of cattle farming groups belonging to the PKW group in District of Sangkub has been done. The introduction of high quality forage has been done with the planting of dwarf grass. The group members have developed the grass under coconut trees that have not been utilized. Introduction of technology is a strategy to achieve the success of beef cattle business (Rahmansyah *et al*., 2013), The area of planted grass has grown to 6 ha. This introduction is carried out in support of forage production, according to Dianita *et al*., (2014) that one of the important factors in the livestock production system when the forage production is sustainable. The interest of breeders in the provision of quality forages needs to be improved by increasing intensive assistance (Jasmani and Haryanto, 2015). The need for sufficient forage feed causes the productivity of cattle can be improved.

Forage feed processing technology in the form of silage and amoniation has been done by group members. But silage and ammonia have not been continuously developed due to the feed requirements still being met from the grass grown and corn waste available. Farmers in District of Sangkub have developed corn crops up to 300 ha, so that corn waste can still be fulfilled.

The introduction of compost fertilizer technology has also been made and this has been developed by group members. A cow produces 10 kg of feces / day processed into compost of 3 kg. Ownership of 43 livestock produces 12.9 kg per day with fertilizer price of Rp 1500 / kg then in a day group members earn an income of Rp 19,350 or Rp 7,062,750 per year. Currently the group members have sold a solid compost of 1 ton.

Conclusions

Based on the result of the research, it can be concluded that through the empowerment of farmers has produced 6 ha of grass planted land, the resulting solid composted fertilizer has been sold as much as 1 ton with the price of Rp 1,500 per kilo and forage feed processing technology has been done by group members but not continuous.

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The Role of Feed Technology in Increasing Cattle Productivity In South Minahasa Regency, North Sulawesi, Indonesia

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Abstract

This study aimed to analyze the role of technology utilization in increasing the income of traditional cattle farmers in South Sulawesi Regency. The study was conducted by survey research that illustrate the systematic and factual about the actual phenomenon. The results showed that: (1) The use of food technology led to an increase in production costs, but also leads to increased acceptance, resulting in an increase in household income of traditional cattle farm; and (2) Some policies can improve the production yield and can reduce the cost factor that can improve the economic of the traditional cattle farmer households. Some suggestions for policy makers based on the results of this study, which is expected to implement policies: (i) support the use of feed technology application on cattle farming; and (ii) the subsidy increase in the number of cattle ownership.

Keywords: The Role, Feed Technology, Traditional, Cattle.

Introduction

One of the current livestock development programs in Indonesia is a program to increase domestic beef production and provide safe, healthy, whole and halal animal food. Livestock development policies need to be based on local resource potential. The government programs and policies need to be implemented to increase the production and productivity of beef cattle breeding businesses with all the pro-people technical guidelines and implementation. The main actors in achieving the target of animal husbandry and animal health development are farmer households.

In the household economy, households act as producers and as consumers. The household allocates its workforce to produce production in an effort to increase income, then the income obtained is allocated for consumption both food consumption and non-food consumption (Chayanov, 1966 and Bernstein, 2009). The household economic model is carried out to maximize usefulness (maximize the utility) of resources with four constraints, namely a) production level, b) acceptable minimum income level (Ellis, 1989 and Harison, 1975); c) maximum number of farmer's household workdays (Chayanov, 1966 dan Chavas, Petrie and Roth 2005); and family income is influenced by the amount of man-days labor in the process of production (Osak, et al., 2015).

The use of feed technology greatly influences the decision of households in carrying out production activities, allocation of labor and consumption, so it is necessary to conduct research on the relationship between the use of technology and household decisions in carrying out their activities. By studying the impact of technology on household decisions, it can be calculated how much household income is due to the use of technology in the study area.

Feed given to beef cattle in South Minahasa Regency is in the form of grass, agricultural waste, and in the last few years concentrate has been processed by using local ingredients, and has been given additional feed. The technology of feed used is classified as effective technology that is simple, in addition to being able to play a role in increasing the productivity of cattle, but it causes increased business production costs and affects the household economy of farmers. Based on the background and problems, the problem is formulated, namely: How is the role of using feed technology in improving production results and increasing the business income of traditional beef cattle.

Materials and Methods

This research was conducted in South Minahasa District. The research was conducted by survey method. The purposive sampling was selected as many as 65 household sample farmers as respondents.

Cattle production is thought to be influenced by the outpouring of labor in beef cattle, farm laborers and the amount of expenditure for animal feed, which is formulated as follows:

$$PoC = f(AoL, EfF)$$

$$PoC = a_0 + a_1 AoL + a_2 EfF + e_i$$

Hypothesis : $a_0, a_1, a_2, > 0$

Note: PoC = Production of Cattle (IDR/year)
AoL = Allocation of Labor (hours/year)
EfF = Expenses for Feed (IDR/year)
a_0 = Constant coefficient
a_1 and a_2 = The parameter coefficients of each independent variable.

Results and Discussion

Adoption of technology is an important effort to increase productivity in various production systems, namely producers benefit from the application of technology either through opportunities to reduce production costs, increase output from the same input, or by keeping the same output from input reduced.

Cattle farming in the study area is generally still appropriate technology, so the adopted technology is simple. The technology analyzed in this study is feed technology that has been used by farmers, as processing of concentrates, hay, silage and ammonia of agricultural waste. The results of this study compare respondents' calculations about costs, revenues and cattle business income as seen in Table 1.

The analysis results as shown in Table 1 indicate that with the adoption of technology causes an increase in the average labor supply of 1,655 hours/year before using feed technology to 3,310 hours/year after using feed technology, thereby increasing wage costs. Increased labor expenditure is done to increase productivity, namely an increase in average income from IDR4,976,070 before using feed technology to IDR6,038,462 after using feed technology.

Tabel 1 Labour Allocation and Cattle Farming Revenues

	Description	Before Feed Technology	After Feed Technology
1	Total Labour Allocation (hours/year)	107.591	215.182
	Average Labour Allocation (hours/year/respondent)	1.655	3.310
2	Total Revenue (IDR/year)	323.444.552,9	392.500.004,9
	Average Revenue (IDR/year/respondent)	4.976.070,0	6.038.462 ,0

Table 2 Costs, Revenues, and Profit of Cattle Farming without Feed Technology or Using Feed Technology

	Description	Before Feed Technology	After Feed Technology
1	Total Cost (IDR/year)	1,369,292,947.1	1,778,812,495.1
	Average Cost (IDR/year/Respondent)	21,066,045.0	27,366,346.0
2	Total Revenue (IDR/year)	1,692,737,500.0	2,171,312,500.0
	Average Revenue (IDR/year/Respondent)	26,042,115.0	33,404,808.0
2 – 1	Total Profit (IDR/year)	323,444,552.9	392,500,004.9
	Average Profit (IDR/year/Respondent)	4,976,070.0	6,038,462.0

The results of the analysis as shown in Table 2 show that with the adoption of technology an average production cost increased from IDR 21,066,045 before using feed technology to IDR 27,366,346 after using feed technology, but also an increase in the average profit from IDR 26,042,115 before using feed technology to IDR 33,404,808 after using feed technology, resulting in an increase in profit from IDR 4,976,070 before using feed technology to IDR 6,038,462 after using feed technology. This means that even though the use of feed technology causes more expensive production costs, it is accompanied by a significant increase in cattle farm business revenue so that it can earn a greater profit or income than without using feed technology.

Utilization of feed technology by the respondent breeders aims to increase cattle farming productivity, namely cattle weight gain and increase in income, so that farmers prefer to use feed technology even though production costs increase but produce greater additional income.

The results of the estimation analysis of the parameters of Production of Cattle (*PoC*) in relation to Allocation of Labour (*AoL*) in Cattle Farming and Expenses for Feed (*EfF*) can be seen as follows:

$$\text{PoC} = 69.208 + 0{,}3696\,AoL + a_2\,EfF + e_i$$

Probability analysis results F <0.05 means that simultaneously variables consisting of Allocation of Labour (*AoL*) in Cattle Farming and Expenses for Feed (*EfF*) have a significant effect on Production of Cattle (*PoC*). Partial test results using the t test show several things as follows:

(1) The Effect of Allocation of Labour (*AoL*) on Production of Cattle (*PoC*), obtained t-count value of 6.30> t-table of 1.99, and Prob t of <0.0001 (p <0, 05). The results of this analysis show that partially allocation of labour (*AoL*) affect the production of cattle (*PoC*). The positive AoL parameter coefficient indicates that if the allocation of labour is increased, it will result in an increase in the production of beef cattle (*PoC*). These results are as reported by Hartono (2011) and Wantasen et al (2012) that the more cattles are maintained, the more efficient outflow of labor.

(2) Effect of Expenses for Feed (*EfF*) on the value of Beef Cattle Production (*PoC*), obtained t-count of 2.96> table of 1.99, and Prob t of 0.0043 (p <0.05). This result shows that partially expenses for feed (*EfF*) affects the value of Beef Cattle Production (*PoC*).

The parameter coefficient of Expenses for Feed (*EfF*) has a positive sign indicating that if the expenses for feed is raised, it will lead to an increase in cattle production or an additional value of beef cattle. The results of this study indicate the role of feed in production, because the feed given has been done by technology to improve quality. This means that the increase in livestock production will increase if an increase in the quantity and quality of feed. This result is in accordance with Hartono's (2011) research that theoretically the increase in production lies in the improvement in the quantity and quality of feed used.

The results of the analysis of this equation show that the average number of labor outflows is 107.590,75 hours/year or with an average of 1.655,24 hours/year/respondent for a year or 4,5 hours/day for each respondent. This means that the average amount of labor expenditure per unit of livestock is 607 hours per animal unit (AU) of cattle each year or 1,66 hours per AU/day. The amount of labor allocation is higher than that of dairy cattle from Ihsan, et al (2001) of 138,17 hours per AU/year or Hartono (2010) of 68,69 hours per AU/year.

Allocation of farmer workforce after using feed technology is actually higher than before they use feed technology, which seems different from Chayanov's theory, that using technology will reduce the allocation of family work hours on his farm, so as to provide leisure or leisure time for family members to recreation or other activities. This difference is due to the different characteristics of technology and employment opportunities in the Chayanov area in this research area, where technology in the study area only uses traditional technology or traditional technology with a high allocation of labour time for family human labour.

Conclusions

1. Allocation of Labour (AoL) in Cattle Farming and Expenses for Feed (EfF) have a significant effect on Production of Cattle (PoC)
2. The average number of labor outflows is 107.590,75 hours/year or with an average of 1.655,24 hours/year/respondent for a year or 4,5 hours/day for each respondent. This means that the average amount of labor expenditure per unit of livestock is 607 hours per animal unit (AU) of cattle each year or 1,66 hours per AU/day.
3. Allocation of farmer workforce respondents after using feed technology is actually higher than before they use feed technology.The technology in the study area only uses traditional technology or appropriate technology with a high allocation of labour time for household human labour.

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Introduction of Technology for the Development of Duck Farming in the Village of Tompaso District Minahasa North Sulawesi Province, Indonesia

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Abstract

The village of Tempok has a duck farming group that is "Batik" which conducts duck farming development. The problem is the breeding of ducks by members of the group is for eggs as well as for meat. This study was conducted with the aim to identify problems related to duck development. The research method used was survey method with case study approach. The sample location was Tempok village determined by purposive sampling with consideration of one of the villages developing and marketing ducks. Respondents were group members who are determined purposively ie group members who develop ducks and were ready for empowerment activities through the introduction of technology. Data analysis was done by using descriptive analysis. The results showed that egg production by members of the group is only about 60-70 percent of the number of ducks, this is because the feed is not in accordance with the needs of ducks. Cage management is still traditional, meaning that group members do not pay attention to duck breeding management. The cage belonging to the group has not been suitable for duck breeding purposes. The price of breed (DOD) tends to increase so difficult to reach by group members that is around Rp 12,500 to Rp 15.000 / ducks. On the other hand, managed duck farming is not continuous, due to costly feed price constraints. Based on the results of this study it can be concluded that duck farming done by members of the group is still traditional so it needs to be done through the introduction of technology empowerment. Empowerment responded well by group members. Suggestions submitted need the development of environmentally friendly duck farming.

Keywords: Ducks, empowerment, development

Introduction

The village of Tempok is one of the villages in Tompaso District, Minahasa Regency of North Sulawesi Province has farmers who have long duck breeding. Duck as a source of income for farmers in the village of Tempok although cultivated as a sideline business and generally still traditional. More ducks are grazed during the day or grazed to rice fields. Duck breeding systems by farmers who are only grazed in paddy fields after harvesting are referred to as extensive cultivation systems. Cultivation by grazing, according to the farmer this is because the feed is available if the farmers harvest rice. Farmers form groups to expand their business in supporting demand for eggs and duck meat. The village of Tempok has a duck farming group that is "Batik" which conducts duck business development. The problem is the cultivation of ducks by members of the group is for eggs as well as for meat. This study was conducted with the aim to identify problems related to duck development.

Materials and Methods

The material of this research is duck livestock (number of group member), feed and introduced technology that is hatching machine, hatching egg, duck breeds (DOD). The introduction of hatching machines to overcome the difficulty of obtaining breeds (DOD), eggs are introduced to train group members using hatching machines, duck breeds are introduced to train farmers to manage duck business, which is good and correct as suggested. This research was conducted by using survey method with case study approach. The sample location is Tempok village determined by purposive sampling with consideration of one of the villages developing and marketing ducks. Respondents are group members determined by purposive sampling, ie 8 (eight) members of the group that develop ducks and are ready for technology introduction empowerment activities. Data analysis used descriptive analysis.

Results and Discussion

Batik Group established since 2006 with members as many as 20 people. But group members were mostly less active. Active members of the group are only 8 (eight) people who are domiciled in Tempok village. Age of respondents ranged from 28-70 years, with 87.5 percent of the details categorized as productive age and the remaining 12.5 percent unproductive. The education level of the group is still low, with the distribution of 37.5 percent of respondents each graduating from elementary and junior high school, and 25 percent of respondents at high school level. The amount of duck ownership for each group member ranges from 50 to 200 individuals. The development undertaken with current ownership is not continuous. Ducks belonging to group members are generally grazed, resulting in low productivity. Some farmers cultivate ducks in fields after harvest. At certain times, farmers will cultivate their livestock outside the area for many months and farmers build cottage dwellings in the paddy fields. This is done to meet the needs of duck feed and avoid the cost of feed is quite expensive.

Group members undertake a continuous production process due to their knowledge in developing duck business is still low. The problem to date, duck farming managed by members of the group is still traditional. Its characteristics are knowledge of low duck cultivation, low management technology and not supported by good management. Although according to Budi et al (2015) and Thermolen et al (2016), this condition occurs in any region in Indonesia.

Egg production is low so it needs to increase duck population but breed price tends to increase so difficult to reach by group member. Duck breed prices (DOD) currently ranges from Rp 12,500 to Rp 15.000 / duck. Duck breeds (DOD) are also often difficult to obtain members of the group so that their production process is not continuous. Ducks in this case start laying at the age of 5.5-6 months, meaning that if group members buy DOD they need big capital to feed. Farmers buy ducks ready to produce eggs because of the difficulty of obtaining DOD. Whereas the price of ducks ready to produce eggs is quite expensive that is Rp 75.000 / duck. On the other hand egg demand tends to increase and often can not be met by group members. According to Budi et al (2015) that breeders are still eager to continue to cultivate ducks due to the increasing demand for duck eggs.

Ducks that are sold as broiler so that the demand of broiler ducks can not be fulfilled. Demand of broiler duck every week from 300 to 500 heads. This request can not be fulfilled by the group. Male ducks are often the choice of group members who are raised from DOD, harvested at 6 to 8 weeks old, and sold for Rp 50,000 per head. According to Thermolen et al (2016), the contribution of meat producing duck to the national is only three percent. The low contribution of duck meat in Indonesia due to the production of broiler ducks is still dominated by small farms (Thermolen et al., 2016). The indication of the development of broiler ducks (males) has a great opportunity. Cultivation broiler ducks may benefit members of the group. According to Rukmiasih et al (2015), in recent years ducks have been widely used as broiler, because it is very profitable for duck breeder. According to Lembong et al (2015) broiler duck breeding reached break even point at duck production volume of 51 heads per period with an average weight of 2.5 kg / head.

On the other hand, managed duck farming is not continuous due to costly feed price constraints. The high price of feed causes duck farmers can not maintain their business. Some research results indicate that adult ducks typically consume 170-227 grams of feed per day, but adult female ducks (who are laying eggs full) can consume 283 grams of feed. Group members are not able to provide feed as it is recommended until ducks are rejected. This condition causes the group members not to conduct the production process continuously. In fact, duck farming is very supportive of the economy of group members. Income for the scale of 231 tails was higher at Rp 1,744,348.78 / month (Budiraharjo and Handayani, 2008). According to Fauzi (2011), the contribution of duck farming to family income is 35.9%. While the profit of ducks according to Marmiati (2011) amounted to Rp 682.038, 46 / month for the ownership of an average 150 ducks. The type of duck belonging to the group is Mojosari, which is purchased to farmers located in a neighboring village with a population of about 50 heads for laying ducks as well as broiler.

The results showed that eggs produced by group members were only about 60-70 percent of the total duck, this is because the feed is not in accordance with the needs of ducks. Cage management is still traditional, meaning that group members have not paid attention to the management of duck breeding. The cage belonging to the group has not been suitable for duck breeding purposes. Price of breed (DOD) tends to increase so difficult to reach by group member that is around Rp 12,500 to Rp 15.000 / duck. On the other hand, managed duck farming is not continuous due to costly feed price constraints.

The problem is that group members do not use hatching machines. Duck farmers buy breeds that are expensive. If farmers have a hatchling machine then they can supply the breeds (DOD) and can be sold to other farmers. Group members did not use cages so ducks were cultivated in paddy fields after harvest. The knowledge of duck farmers about the preparation of quality rations but cheap and using local resources is lacking. Lack of knowledge of duck farmers about post-harvest so that when there is over production of eggs, unproductive ducks sold at cheaper prices. Another problem is the group members doing the production process of duck farming without recording so that activities are done without accurate data because it is only based on the memory of farmers. In addition farmers have never analyzed the results of their efforts due to their lack of knowledge about cash flow analysis. Business analysis for duck farmers is important for commercial duck development.

Based on the above problems then empowerment has been done through the application of science and technology to group members. This activity aims to increase the knowledge of group members on technology related to the development of duck farming. Introduction of technology in the form of hatching of duck eggs. The existence of hatching machine is useful for group members in the provision of seeds continuously.

The application of science and technology for members of duck farming group is done by introducing duck breeds : Mojosari Alabio Raja Ratu type. This type of duck is newly known by group members. The purpose of the introduction of duck breeds is to increase the knowledge of group members in managing good duck farming as recommended. If group members, trying to broiler ducks then their income increases about 50-75% of income available. This is supported by the community's need for duck meat tends to increase seen from the increasing number of restaurants serving duck meat (Purba and Ketaren, 2011). Implementation of science and technology was also done by utilizing the cage for ducks. Making the cage utilize local resources that was using bamboo. A good cage was available for a place to eat and a drink. Some studies show higher egg production when ducks were cultivated in cages.

Conclusions

Based on the result of the research, it can be concluded that the duck business done by the members of the group is still traditional so it needs to be empowered through the introduction of technology. Empowerment responded well by group members. The introduction of hatching machine has been utilized with hatching eggs as much as 360 egg and MA Raja Ratu ducks as much as 200 tails. Suggested suggestions need to develop an environmentally friendly duck farm.

Acknowledgment

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FULL PAPERS

POSTER SESSIONS

SUBTHEME: ANIMAL PRODUCT TECHNOLOGY

Nutritional Content and Digestibility of Protein Tortilla Corn Chips with the Addition of Egg Powder as Protein Source

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Abstract

Tortilla corn chips is one example of snack food diversification based on corn. Snacks in the market have a low nutrient content so it needs an increase in nutrition, for example with the addition of a macronutrient like protein. The added protein may come from animal protein such as eggs. This study aims to determine the effect of adding egg white powder to the chemical composition and protein tortilla corn chips with the addition of egg white powder as a protein source. Method of this study was the addition of egg white powder (0%, 5%, 10% and 15%) on tortilla corn chips. The experimental design used was complete randomized design with treatment 0%, 5%, 10%, and 15% concentration of egg white powder and each 3 replications. The addition of egg white powder significantly influenced water, ash, protein, fat, and carbohydrate content. The higher concentration given the higher the levels of protein, water, ash and fat, but not at carbohydrate levels. The addition of egg white powder enhance the digestibility of protein tortilla corn chip products. The addition of egg white powder improve the deficiency of tortilla products that are generally poor in amino acids. This study recommends the addition of 5% egg white powder is the best concentration based on the nutrients contained and protein digestibility.

Keywords : egg white powder, tortilla corn chips, amino acid, snack.

Introduction

Tortilla corn chips is one example of snack food diversification based on corn. Snacks in the market have a low nutrient content, it needs an increase in nutrition, for example with the addition of a macronutrient like protein. The protein addition may come from animal protein such as eggs.

Egg is a food origin of livestock that has high nutritional value, especially protein, easy to digest and nutritious. Protein from eggs has a complete amino acid. Egg white powder is one form of application of food preservation technology using drying method. The addition of protein macronutrients derived from egg white powder is expected to add the nutritional value of tortilla corn chips products especially amino acid content and also expected to obtain snack products that have higher nutritional content than similar products.

This study aims to determine the effect of adding egg white powder to the chemical composition and protein tortilla corn chips with the addition of egg white powder as a protein source.

Materials and Methods

Materials

The ingredients used in this research are: eggs of chicken, yeast bread, yellow corn, tapioca starch, sugar, salt, and water. The chemicals used are among others proximate analyzes such as aquadest, H_2SO_4, NaOH, phenoptalein, HCl, hexane, 0.1 N HCl, tris buffer, TEMED (tetrametile-ethylenediamine), bromphenol blue, pepsin enzyme, phosphate buffer, ethanol, $N_2S_2O_35H_2O$, aquabidest, Na_2CO_3 and formaldehyde. Equipment used include blender, roller, knife, analytical scales, autoclave, Soxhlet apparatus, Kjedahl, eksikator, HPLC (high performance liquid chromatography), centrifuge, homogenizer , microscope, micrometer, oven and pipette.

The experimental design used was complete randomized design with treatment 0%, 5%, 10%, and 15% concentration of egg white powder and each 3 replications.

Procedure

This research was conducted in two procedures, the first procedure of research was making egg white powder and corn grits, and second procedure research was making tortilla corn chips with the addition of egg white powder. The process of making tortilla corn chips consists of mixing, flaking, molding, and baking dough.

Results and Discussion

First procedure Research

The results of egg white powder obtained from one liter of egg white was as ± 100gram. This shows that the powder yield obtained by the oven dryer method was ± 10% of the egg white liquid. The size of egg white powder in this study was 80 mesh with a slightly yellowish white color. The results of proximate analysis of egg white powder and grits can be seen in Table 1.

Table 1 Proximat analysis result of egg white powder and grits

Parameters	Egg White Powder	*Grits*	SNI of Egg White Powder
	--------------------------	%	--------------------------
Water content	5.97	57.14	<8
Ash Content	3.01	0.36	<5
Lipid Content	0.21	1.86	<1
Protein Content	72.06	7.13	>75
Carbohydrate (by difference)	18.09	36.51	-

Chemical Composition of Tortilla Corn Chips

Based on the results of the analysis, all variables measured: water, ash, protein, fat and carbohydrate content was very significantly influenced (P <0.01) by the difference in egg white powder concentration

Tabel 2 Proximate analysis result of tortilla corn chips

Egg white powder	Water Content (%)	Ash Content (%)	Protein Content (%)	Lipid Content (%)	Carbohydratte Content (%)
0%	2.13 ± 0.58^{C}	1.78 ± 0.44^{C}	2.94 ± 0.15^{D}	2.23 ± 0.26^{C}	90.91 ± 0.82^{A}
5%	2.69 ± 0.36^{C}	2.20 ± 0.34^{B}	8.51 ± 0.19^{C}	2.89 ± 0.17^{B}	83.72 ± 0.21^{B}
10%	3.75 ± 0.20^{B}	2.68 ± 0.29^{AB}	13.45 ± 0.20^{B}	3.27 ± 0.15^{AB}	76.85 ± 0.26^{C}
15%	6.43 ± 0.50^{A}	3.23 ± 0.26^{A}	17.98 ± 0.96^{A}	3.65 ± 0.13^{A}	68.72 ± 1.65^{D}

Note: Different capital superscript within the same row shows significant difference at $\alpha = 0.01$

Based on Table 2, it was known that the range of tortilla corn chips water content of the four treatments accordance the standard based on SNI 01-6630-2002 (maximum 7%). Egg white powder has an ash content of 3.01% (Table 2). The largest source of protein in tortilla corn chips was obtained from egg white powder, and corn grits. Egg white powder has a protein content of 72.09% and corn grits have a protein content of 7.11.

Protein Characteristics

Analysis of Amino Acids. The addition of egg white powder enhance the amino acid of tortilla corn chip. The results of amino acid analysis can be seen in Table 3.

Table 3. Amino Acid analysis result of tortilla corn chips

Parameter	F1	F2	F3	F4
	----------------------------%w/w---------------------------			
Aspartat	0.45	1.38	1.94	2.07
Glutamate	0.08	0.49	0.76	0.85
Serine	0.05	0.21	0.31	0.33
Histidine	0.07	0.36	0.56	0.58
Glisine	0.06	0.33	0,54	0.56
Threonine	0.33	1.17	1.72	1.80
Arginine	0.03	0.21	0.34	0.36
Alanine	0.07	0.30	0.45	0.48
Tyrosine	0.01	0.11	0.17	0.27
Methionine	0.10	0.55	0.89	0.91
Valine	0.11	0.50	0.75	0.79
Fenilalanine	0.09	0.46	0.73	0.76
Leucine	0.32	0.86	1.22	1.26
Lisine	0.03	0.41	0.72	0.75

Note : F1 : treatment 0%, F2 : 5%, F3:10%, and F4: 15% concentration of egg white powder

The highest essential amino acid levels of all treatments were the amino acid threonine and leucine. Leucine is an amino acid that is most widely owned by food sources of protein, which is as much as 9% (Walsh, 2002). The availability of lysine amino acids that become limiting amino acids in cereals (Winarno, 1982) .

Animal protein in general has digestibility up to 90%, while vegetable protein 60 -70%. Tortilla corn chips has protein digestibility 50 -71%, by using in vitro method. This indicates that this product has a low protein digestibility level. According to Harris and Karmas (1989), food is said to be of good quality protein if the protein digestibility rate is at least 80%. Factors affecting protein digestibility will affect the availability of amino acids. Protein content of this product obtained from a combination of animal and vegetable raw materials of egg white powder and corn grits. The level of maize digestibility as a food of low plant origin can be increased by the addition of food of animal origin that has high levels of digestibility such as eggs. However, external factors, especially the warming treatment greatly affect the level of protein digestibility in this product. Data on protein digestibility can be seen in Table 4.

Table 4. Protein digestibility content of tortilla corn chips

Treatments	Protein digestibility (%)
F1	52.05
F2	62.18
F3	64.29
F4	71.61

Note : F1 : treatment 0%, F2 : 5%, F3:10%, and F4: 15% concentration of egg white powder

Conclusion

The addition of egg white powder significantly influenced water, ash, protein, fat, and carbohydrate content. The addition of egg white powder enhances the digestibility of protein tortilla corn chip products. The addition of egg white powder can mask the deficiency of tortilla products that are generally poor in amino acids. This study recommends the addition of egg white powder at a concentration 5% as the best concentration based on the nutrients contained and protein digestibility.

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DISCUSSION

<table>
<tr><td>
18018
Endang Sulistyowati; Irma Badarina; Sigit Mujiharjo

Despal
Q: Is there any antinutrition in the durio? Is the fermentation will reduce the antinutrition ?
A: I am not sure about that, because I have not really ellaborate it so far.
F.S.G. Oley
Q: Why the diet contained 10%fermented duriozibethinus peel flour concentrate and20% rice straw produced the lowest milk yield and feed efficiency?
A: Because ingredients in the diet was better and optimally used.
Rudy Afnan
Q: How did you collect and prepare the material for your research and how to implement it in industrial scale?
A: It was very difficult to collect it but maybe with the help of machine at industrial scale, it will be easier.
Idat Galih Permana
Q: Fermentation process usually breakdown the organic materials and left fiber. Did you find this condition in your fermentation process?
A: We did evaluate the organic material as well as van soest analysis. Organic matter increased after the fermentation. However animal consumption on ration containing higher fermented durio was lower.

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18020
Allaily Tarman; Muhammad Aman Yaman; Herawati Latif; Zulfan Zulfan; Nahrowi Ramli; Muhammad Ridla; Aeni Nurlatifa

Łozicki A
Q: did you measure the vitamins for your fermented feed?
A: No I didn’t. Maybe we will try another method in the future.

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18033
Yuli Retnani; Taryati Taryati; Dipa Argadyasto

IrmaBadarina
Q: Where you get this product?
A: This product can easily find in Bogor or in the habbatussauda industry.

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18007
James Hellyward; Argus Saadah, Fuad Madarisa; B.R.T Putri

1. Bertus Bronkhorst
   Q: What kind of methodolgy you used to get information?
   A: Secondary data from the government and other institutions and primer data from farmer, FGD, and farmer group corporation.
2. Allaily
   Q: How about the dairy farm production?
   A: At the temperature 18-20^{0}C we can get 12 L/day meanwhile here in Bogor at the same temperature is 25 L/day. The problem are diseases, feed, and breed.

18054
Jolanda K.J Kalangi; Jeane C Loing; Femi H. Elly; Sintya J.K Umboh

1. Irma Badarina
   Q: How is the integration of the economic with cattle farming?
   A: The economic of the group increased. Because the cattle producing manure and the farmers can get the income from them around Rp 81,000 per day.
2. Bertus Bronkhorst
   Q: Could you explain how the increased happenned?
   A: It is because the culture activities and from the manure production

18009
Muhammad Daud, M. Aman Yaman, Zulfan, Asril

1. Bertus Bronkhorst
   Q: Is there any smell of fishmeal? Did you do a smell test?
   A: There is no smell of fishmeal.

18099
La ode Arsad Sani; Usman Rianse; Bahari; Harapin Hafid; Widhi Kurniawan

1. Heri Ahmad Sukria
   Q: Did you have any difficulties?
   A:The government is not consistent in running the programs
2. Huub Mudde
   Q: What the advices to increase the number of cattle based on your paper?
   A: our farmer do not have a good income and a stable economic. SPR is the best way to increase the economic of farmers, make community to manage groups and of course the goverment must keep help them.

18034 Heri Ahmad Sukria; Suharyati Suharyati; Dewi Apri Astuti 1. Sumiati Q: What is your expectation? A: Studied for quiel farm, to see the effect on hematology variable and increase of production. 2. Iman Rahayu Q: How about the procedure of taking the blood? A: I didn'tknow the detail because I didn't do it by myself, my other team member who did that. 3. Khalil Q: How about WBC in this moringa treatment feed? A: It wasn't affected
18098 Dwi Margi Suci; Yuhelensi; Widya Hermana 1. Sumiati Q: What is the potential value of Salvinia molesta? A: Salvinia molesta is easy to growth in the rice field. 2. Andrew Q: The protein just about 11.19%, and the fiber 21%. Is it not a high number? A: the content protein can higher about 26% from the other research but in mine only 11%. SM just as an alternative feed, we use the vit C as an antioxidant to protect the oil fish. 3. Heri Ahmad Q: What is the local name of Salvinia molesta? A: The local name of Salvinia molesta is Kayambang
18006 Khalil; Suyitmam; Montesqrit 1. Aeni Nurlatifa Q: What is the reason of different number of CP in different area? A: the difference of soil under the banana tree make it different. 2. Iman Rahayu Q: Why bother to compared them while there was no doubt the crude protein in each areas were the same?

A: To see the mineral status in different area and find the area that has lots of minerals
18076 Ida Maria Lestari Hutabarat; Nahrowi Ramli; Yoshiki Matsumoto 1. Dewi Apri Astuti Q: How much the fiber content in bamboo ration? And how to measure the height of villi? A:we measured it under the microscope, put the picture, and useda software.
18027 Aeni Nurlatifah; Mathari Ilman; Iis Arifiantini; Didid Diapari; Kokom Komalasari; Dewi Apri Astuti 1. Endang Q: If we use this kind of diet to human, will it work the same? A: Maybe it will. But it haven't studied yet.
18104 Fensa Eka Widjaya; Yuli Retnani; Despal; Luki Abdullah; Rudi Priyanto 1. Khalil Q: What is the type of the feed? Mash or pellet? A: We used mash and wafer
18051 Femi Hadidjah Elly; Agustinus Lomboan; Charles L Kaunang; Ramlan Pomolango 1. Despal Q: Is there any antinutrition in the durio? Is the fermentation will reduce the antinutrition ? A: I am not sure about that, because I have not really ellaborate it so far. 2. F.S.G. Oley Q: Why the diet contained 10% fermented durio zibethinus peel flour concentrate and 20% rice straw produced the lowest milk yield and feed efficiency? A: Because ingredients in the diet was better and optimally used. 3. Rudy Afnan Q: How did you collect and prepare the material for your research and how to implement it in industrial scale?

A: It was very difficult to collect it but maybe with the help of machine at industrial scale, it will be easier.

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