THE SECOND INTERNATIONAL SEMINAR ON ANIMAL INDUSTRY

"Empowering Local Resources for Sustainable Animal Production in Adapting to Climate Change"

Jakarta Convention Center, Jakarta-Indonesia
5-6 July 2012

PROCEEDING

Organized by:

Supported by:
PROCEEDING

The Second International Seminar on Animal Industry

"Empowering Local Resources for Sustainable Animal Production in Adapting to Climate Change"

Jakarta Convention Center, Jakarta-Indonesia, 5-6 July 2012

LIST OF EDITORS

Scientific Editors

Chief Member:

Prof. Dr. Ir. Dewi Apri Astuti, MS.

Prof. Dr. Ir. Komang G. Wiryawan

Prof. E. R. Orskov

Prof. H.M. Shelton

Prof. Jong K. Ha

Prof. Dr. Ir. Wasmen Manalu, M.Sc

Prof. Dr. Ir. Ronny R. Noor, M.Rur. Sc.

Prof. Dr. Ir. Muladno, MSA

Prof. Dr. Ir. Cece Sumantri, M.Sc

Prof. Dr. Ir. Toto Toharmat, M.Sc

Dr. Sri Suharti, S.Pt., M.Si.


Tuti Suryati, S.Pt., M.Si.

Technical Editors:

Irma Nuranthy Purnama, S.Pt.

Nur Hidayah, S.Pt.

Titis A. P. Apdini, S.Pt.

List of Reviewers

Prof. Dr. Ir. Dewi Apri Astuti, MS.

Dr. Despal, S.Pt., M.Agr.Sc.

Prof. Dr. Ir. Komang G. Wiryawan

Dr. Anuraga Jayanegara

Prof. E. R. Orskov

Dr. Ir. Dwierra Evvyernie, MS

Prof. H. M. Shelton

Dr. Ir. Henny Nuraini, M.Si.

Prof. Jong K. Ha

Dr. Ir. Idat Galih Permana, M.Sc

Prof. Junichi Takahashi

Dr. Ir. Isnafa Arief, S.Pt., M.Si.

Dr. John B. Moran

Dr. Ir. Luki Abdullah, M.Agr.Sc.

Prof. Dr. Ir. Muladno, MSA

Dr. Ir. Panca Dewi MHKS, MS

Prof. Dr. Ir. Ronny R. Noor, M.Rur. Sc.

Dr. Ir. Rarah Ratih A.M., DEA.

Prof. Dr. Ir. Toto Toharmat, M.Sc

Dr. Rita Mutia, M.Sc.

Prof. Dr. Ir. Wasmen Manalu, M.Sc

Dr. Rudi Afnan, M.Sc.Agr.

Prof. Dr. Ir. Erika B. Laconi, MS

Dr. Ir. Rudy Priyanto, MSc.

Prof. Dr. Ir. Iman Rahayu, MS

Dr. Sri Suharti, S.Pt., M.Si.


Dr. Ir. Sumiati, M.Sc.

Tuti Suryati, S.Pt., M.Si.

Dr. Ir. Yuli Retnani, MS

Dr. Ir. Asnath M. Fuah

Faculty of Animal Science, Bogor Agricultural University

Jln. Agrois, Kampus IPB Darmaga, Bogor 16680 Indonesia

Phone: +62 251 8620553; Fax: +62 251 8620553/8622842

e-mail: isai_ipb@yahoo.co.id
LIST OF CONTENTS

Foreword from Chairperson of Organizing Committee iii
Remarks from Dean of Faculty of Animal Science v
Seminar Program vii
Seminar Layout xiv
List of Contents xv
Invited Speaker

1. GM and Non-GM Rumen Microbes in Enhancing Animal Productivity. T.S. Park, J. K. Seo, & Jong K. Ha.................................................. 3

2. Consumer Preferences in Meat. Louw Hoffman & Donna Cawthorn........ 9

3. Improving Local Feed Resource to Increase Nutrient Availability to Support Sustainable Agriculture. E.R. Ørskov.......................... 23


6. Indonesia Farm Animal Genetic Resources in Adapting to Climate Change. Ronny Rachman Noor.................................................. 53


BREEDING AND GENETICS 75

8. Improvement the Genetic Potential of Local Chicken By Combination of Crossbreeding, Selection Method, Cellular Analysis and Nutritional Adjustment to Produce the Candidate of Local Layer. M. Aman Yaman, Yurliasni, Zulfan, & Muhammad Daud.................................................. 77


10. Genetic Variation of the IGF1 and OPN Genes in Holstein-Friesian Dairy Cattle of Historical and Non-Historical Twins. Anneke Anggraeni, Hasanatun Hasinah, Santi Ananda Arta, Bess Tiesnamurti, Restu Misrianti, & Eryk Andreas......... 91

11. Genetic Marker Approach for Confirming the Existing Twinning Trait in PO Cattle. Endang T. Margawati, Paskah P. Agung, & Muhamad Ridwan........ 97

Proceeding of the 2nd International Seminar on Animal Industry | Jakarta, 5-6 July 2012


Lipid Deterioration of Layer Diet That Contains Lemuru Fish Oil (*Sardinella longiceps*) and Turmeric (*Curcuma domestica*) as Antioxidant During Storage Period. Yosi Fenita

Effects of Dietary Supplementation of Natural Feed Additive on Leucocyte Profile and Lymphoid Organ of Broiler. R. Mutia, Deyusma, & D. M. Suci

Effects of Dietary Supplementation of Herbal Mixed on Ammonia and Protein Content of Laying Hen Manure. R. Mutia, A. Pujiayati, & D.M. Suci

Effect of Mannanases-predigested Palm Kernel Meal in the Diets on Nutrient Digestibilities and Broiler Performance. B. Sundu, R. Tantu, & J. Elisabeth

Reduction of *Salmonella typhimurium* in the Broiler Caecum Offered Rations Containing Banana Peel or Palm Kernel Meal. F. Sidiq, Ardiansyah, S. Nurjanah, D. Kristina, P. Kusumawati, & T. Toharmat

Sub Theme: Ruminant


Biodegradation of coffee husk substrate during the mycelia growth of *Pleurotus ostreatus* and the effect on *in vitro* digestibility. Irma Badarina, D. Evyernie, T. Toharmat, E. N. Herliyana, & L.K. Darusman

In *vitro* Fermentation and Bacterial Protein Synthesis in the Different Diets Supplemented with Lerak Extract plus Mineral (Ca, P, Mg, S). S. Suharti, N. Aizah, D. M. Suci, D.A. Astuti, & E. Wina

Ruminal Fungi Colonisation of Stem Tissue of Untreated and Urea Treated Rice Straw Varieties. Dwi Yulistiani

Reducing Methane (CH$_4$) Emission of Sheep Fed a Diet Supplemented With Cocomalt And Palm Oil. Asep Sudarman, Komang G. Wirayawan, & Agung Purwadi
Nutritive Values of Forages Evaluated Using a Mixed Bacteria Isolated From the Rumen Liquor of Buffalo. Iwan Prihantoro, Yulfita Sari, Lilis Riyanti, Triyana Enggar Sasmita, Dwieria Evvyernie, Suryani, Luki Abdullah, & Toto Toharmat

Greenhouses Gases Emissions from Dairy Cattle in Indonesia. I.G. Permana, Suryahadi, & E. Qurimanasari

Managerial and Nutritional Strategies to Minimize Lactational and Reproductive Losses in Heat-Distressed Dairy Cows. Armagan Hayirli


Palm Kernel Cake (PKC): A Potential High Energy Feed for Farm Animals. Mohammad Amizi A, Mohammed Alimul Islam, Connie Fay Komilus, & Assis Kamara


Ongole Crossbreed Performance Given Silage of Cattle Rumen Contens as a Feed Substitute for Grass. Engkus Ainul Yakyn, Ali Mursyid Wahyu Mulyono, Ahmida Kandi Sariri, & Sri Sukaryani

Performances and Meat Cholesterol Content of Fat Tail Sheep Fed Diets Supplemented with Sardinella Fish Oil Based Ca-soap Mixed with Herbal. A. Sudarman & D.A. Astuti

Diversity of Domestic Grasses for Sheep Browse in the Coastal District Gebang, Cirebon Residence. Muhammad Agus Setiana & M.A.K. Kusuma

Physical Characteristic and Palatability Test of Biscuit Feed for Sheep. Yuli Retnani, Eka I. Wati, & Lidy Herawati

Optimizing Vitamin-Mineral Supplementation in King Grass-Based Rations to Maximize Productivity of Bali Cattle. Ida Bagus Gara Partama


Utilization of Sunflower Seeds Oil and Sardine to Get Goat’s Milk Has Balanced Omega 3 and Omega 6 Ratio. A.I. Fajri, M. Arifin, E. Burton, A.C. Romadhoni, S. Syafaah, & R.R.A. Maheswari

ANIMAL MANAGEMENT AND PRODUCTION

Factors Affecting to Biosecurity Adoption on Laying Hen Farmers. V.S. Lestari, S.N. Sirajuddin, I. Rasyid, & K. Kasim

Proceeding of the 2nd International Seminar on Animal Industry | Jakarta, 5-6 July 2012

533
LIST OF ISAI COMMITTEE

Steering Committee
Chairman
: Prof. Dr. Ir. Muladno, MSA
: Prof. Dr. Ir. Komang G. Wiryawan

Secretary
: Prof. Dr. Ir. Wasmun Manalu, M.Sc
: Prof. Dr. Ir. Ronny R. Noor, M.Rur. Sc.
: Prof. Dr. Ir. Toto Thoharmat, M.Sc
: Prof. Dr. Ir. Cece Sumantari, M.Sc
: Prof. Dr. Ir. Iman Rahayu, MS
: Prof. Dr. Ir. Nahrowi, M.Sc
: Prof. Dr. Ir. Tjeppy D. Sujana, M.Sc
: Dr. Ir. Asep Saefudin, M.Sc
: Dr. Ir. Luki Abdullah, M.Sc
: Dr. Ir. M. Yamin, M.Agr.Sc
: Dr. Ir. Idat Galih Permana, M.Sc

Organizing Committee
Chairman
: Prof. Dr. Ir. Komang G. Wiryawan

Secretary
: Dr. Despal, S.Pt., M.Sc. (External affairs),
: Dr. Sri Suharti, S.Pt., M.Si (Internal Affairs)
: Dr. Irma Isnafia Arief, S.Pt., M.Si (Internal Affairs)

Secretariat
: M. Baihaqi, S.Pt., M.Sc.*
: Ir. Widya Hermana, MS.
: Sugeng A. Md., (IT)
: Fifi Luthfiah, S.Sos
: Nur Hidayah
: Titis A. P. Apdini

Treasurer
: Maria Ulfah, S.Pt., MSc.Agr.
: Triyati

Scientific & Proceeding
: Prof. Dr. Ir. Dewi Apri Astuti, MS.*
: Dr. Ir. Sumiati, M.Sc.
: Dr. Ir. Rahat A.M. DEA.
: Dr. Ir. Rita Mutia, M.Sc.
: Dr. Ir. Asep Sudarman, M.Sc.

Proceeding of the 2nd International Seminar on Animal Industry | Jakarta, 5-6 July 2012
Seminar Program

: Dr. Rudi Afnan, S.Pt, M.Sc.*
: Dr. Ir. Asnath M. Fuah, M.Sc.
: Dr. Ir. Rukmiasih, MS.
: Dr. Ir. Dwierra Evvyernie A, MS., M.Sc.
: Zakiah Wulandari, S.Pt, M.Si.
: Ir. Lucia Cyrilla, MS.
: Dr. Anuraga Jayanegara

Fund raising/Finance

: Prof. Dr. Ir. Erika B. Laconi, MS*
: Dr. Ir. Panca Dewi, MS
: Dr. Ir. Henny Nuraeni, MS
: Dr. Ir. Yuli Retnani, M.Sc
: Ir. Hotnida Siregar, MS

Logistic and Accommodation

: Dr. Jakaria, S.Pt, M.Si*
: Dr. Ir. Didid Diapari, MS
: M. Sriduresta Soenarno, S.Pt, M.Sc
: Supriyadi
: Dadang

Refreshments

: Ir. Sri Rahayu, M.Si*
: Ir. Neny B. Polii, SU,
: Ir. Lilis Khotijah, MS,
: Ir. Dwi Margi Suci, MS
Biodegradation of coffee husk substrate during the mycelia growth of \textit{Pleurotus ostreatus} and the effect on in vitro digestibility

Irma Badarina\textsuperscript{1}, D. Evyernie\textsuperscript{1}, T. Toharmat\textsuperscript{1}, E. N. Herliyana\textsuperscript{2} & L.K. Darusman\textsuperscript{3}

\textsuperscript{1}Department of Nutrition and Feed Technology, Faculty of Animal Science, Bogor Agricultural University, Bogor 16680 Indonesia, Email: erniedwierra@yahoo.com
\textsuperscript{2}Department of Silviculture, Faculty of Forestry, Bogor Agricultural University
\textsuperscript{3}Department of Chemistry, Faculty of Mathematics and Natural Science, Bogor Agricultural University.

Abstract

The aim of this studies were conducted to evaluate culturing of mushroom \textit{P.ostreatus} on coffee husk in solid state fermentation as means of improving the nutritive value of coffee husk for ruminant animals. The influence of \textit{P.ostreatus} on coffee husk biodegradation was investigated. The dry matter and composition changes of coffee husk substrate for \textit{P.ostreatus} cultivation were analysed on day 0, 30 and 60 after seeding. The profile of cellulose, hemicellulose and lignin were changed when it was used by \textit{P.ostreatus}. Meanwhile their rate of change varied at different growing day. The increase of protein content and the reduction of lignocellulose content increase dry matter digestibility of coffee husk substrate. This fact could provide an alternative of biofermentation product based on coffee husk substrate which is safe for environment.

Keywords: biodegradation, coffee husk, digestibility, substrate, \textit{P. ostreatus}.

Introduction

\textit{Pleurotus ostreatus} is one of the popular cultivated mushroom. It can be cultivated on a wide range of lignoselulosic substrates such as wheat straw, cocoa husk and cotton stalks (Fazaeli \textit{et al.}, 2004; Li \textit{et al.}, 2001; Alemawor, 2009). \textit{Pleurotus ostreatus} belongs to white rot fungi which are able to degrade lignin because produce ligninolytic extracellular enzymes, such as laccases, lignin peroxidases and Mn peroxidases (Kerem \textit{et al.}, 1992; Chang and Miles, 2004).

The ability of \textit{P.ostreatus} degrades a wide variety of lignoselulosic substrates, enabling it to play an important role in managing organic wastes whose disposal is problematic. \textit{Pleurotus} species have been used by human for their nutritional value,
medicinal properties, transformation of wastes into animal feed and other beneficial effects (Hadar and Arazi, 1986; Gregori et al. 2007; Adamovic et al., 1998).

Coffee husk is the major byproducts produced during the operation of coffee cherry to get coffee grain by sun drying (Fan et al., 2004). In coffee-producing regions, coffee husk is barely utilized. Therefore, it is considered the most abundant pollutant material. Coffee husk has potency as a source of ruminant feed. The protein content is 9.2-11.3% equally to rice bran protein (±10.4%) and has metabolic energy around 3.356 Kcal/kg (Zainudin and Murtisari, 1995). The content of lignin is 35.4-40.0% (Fan and Soccol, 2005). The digestibility of these materials are limited by the presence of lignin which prevents access of hydrolytic enzymes to cellulose and hemicelluloses.

Application of *Pleurotus ostreatus* is worth considering for improving the nutritive value of coffee husk. This study was carried out to assess the effect of a solid state fermentation involving *Pleurotus ostreatus* on the nutrition composition of coffee husk and to evaluate in vitro digestibility. In addition, fermentation period on the process was evaluated.

Materials and Methods

Coffee husk were obtained from coffee hulling plant at Rejang Lebong Residence Bengkulu Province. Coffee husks were air-dried to moisture content 10-15%. The solid state substrate were prepared with the composition adopted from sawdust standard medium (Herliyana et al. 2008). The mushroom substrate may be defined as a kind of lignocellulosic material supports the growth, development and fruiting of mushroom. The substrate were consisted of 82.5% coffee husk, 15% rice bran, 1.5%gips and 1.0% CaCO₃. The clean water were added to the substrate as much as 60-65% (v/w). All these components were placed in polypropylene bag in amount 400 gram per bag. Each bag was closed with a small cotton plug inserted in the middle of its opening. The bags were sterilized at 121°C for 30 minutes. After cool, each of bag was seeded with 15 gram (3.75%) of *Pleurotus ostreatus* spawn. All spawned bag were placed in growing room with the temperature was 22-28°C and relative humidity 60-80%. After 30 days, the substrate was fully colonized, and on 60 days primordial started to appeared.

The content of protein was analyzed using Kjeldahl method. The cell wall components (NDF, ADF, Lignin, cellulose and hemicelluloses) were analyze using detergent analyze method as described by Goering and Van Soest (1970). *In vitro* dry matter digestibility was evaluated according to Tilley and Terry method (1963).

The treatment was the fermentation time consisted of 0 untreated), 30 and 60 days after seeding. The nutrient composition changes were described descriptively. For the dry matter measurement the treatment was arranged in Block Randomised Design (3x4). The rumen inoculum were obtained from four cattles as block.
Significant differences were calculated using Duncan’s multiple range test following analysis of variance.

Result and discussion

The celluloses, hemicelluloses and lignin are the main sources of carbon and energy for *P. ostreatus* growth, while protein serves as the nitrogen source. Their degradation and utilization can greatly affect *P. ostreatus* growth and resulting feed value of the substrate. The change of nutrient composition contents during the *P. ostreatus* mycelia growth period are shown in Table 1.

There were increasing of protein content and decreasing of fiber fraction (lignin, NDF, and ADF) produced by biofermentation. The decreasing of fiber fraction is the indication that *Pleurotus ostreatus* can degrade the cell wall component of coffee husk. The decreasing of NDF and ADF from coffee husk suggested that these fungi could utilize the cell wall component as carbon source and energy for growth. The decreasing of NDF and ADF contents of treated coffee byproduct has been reported by Penaloza et al. (1985). The decreasing of NDF, ADF and ADL in the first 30 days of mycelia growth were 2.339%, 4.586% and 19.874%, respectively. Meanwhile in 60 days, the decreasing of NDF, ADF and ADL were 16.587%, 15.036% and 31.611%, respectively from the initial value.

The fermentation time was important to improve the nutritive value of straw. The longer fermentation period led greater depletion of carbohydrate source of coffee husk by fungi. This condition could improve the digestibility of coffee husk as a result of the changes in non structural carbohydrate to structural carbohydrate ratio. Decreasing of lignin in coffee husk could be a result of lignin degrading enzymes produced by *Pleurotus* (Hong et al., 2003). These result are supported by the report from Widiastuti et al. (2008) who noted ligninolytic enzyme activities followed the pattern of lignin disappearance from substrate and directly corrected with time of its disappearance. Plat and Hadar (1983) noted that during the mycelia growth period, *P. ostreatus* mycelia were more capable to degrade lignin, and the degradation of lignin played an important role in mycelia development.

The rapid decreasing of hemicellulosic component in 30 days fermentation showed that hemicelluloses were the first substrate utilized by mycelia as the carbon and energy sources at the beginning phase of growth. The decreasing of hemicelluloses was 31.578% from initial value in 30 days fermentation. This suggest that hemicellulose is more easily degraded than cellulose and lignin. *Pleurotus ostreatus* mushroom secreted enzyme to demolish the easier used compound. *Pleurotus ostreatus* needs a carbon source which is easier to metabolize (Crawford, 1981). Hemicelluloses were degraded easier than cellulose and lignin (Perez, 2002). The cellulose content increased 35.574% in 30 days and 27.063% in 60 days.
Biofermentation broke the lignocelluloses bond. Delignification has important role in mycelia growth which cleavage polysaccharide component (cellulose and hemicelluloses) (Agosin and Odier, 1985). This component will be utilized by fungus as substrate for their growth (Hatakka, 2004).

During the mycelia growth, the protein content increased 0.927% in 30 days and 17.220% in 60 day fermentation. Mycelia in 60 days were thicker than 30 days. Fungal cell in mycelia contributed the protein content of substrate because 60 and 70% of nitrogen present in the fungal cell is protein (Chang and Miles, 2004). The higher protein content in 60 days in the substrate were prepared to transferable nitrogen into fruit bodies. The extensive formation of primordia in 60 days indicated the end of the vegetative growth phase of Pleurotus. As coffee husk substrate was degraded and nutrient used by Pleurotus, the total organic matter of substrate decreased (Table 1).

The increasing of protein content and the decreasing of lignocelluloses of coffee husk after fermentation showed that Coffee husk could be used as substrate Pleurotus cultivation. The improving nutrition value after fermentation especially on 60 days indicated that the substrate can be used as a product feed.

In vitro dry matter digestibility tests for ruminant were conducted for the digestibility of untreated and treated coffee husk. Four replication were conducted and the result are shown in figure 1. Average dry matter digestibility (Table 1) increased significantly 4.983% in 60 days fermentation and decreased 14.435% in 30 days fermentation from untreated coffee husk. The possibility of this condition is that in 30 days fermentation the higher level of cellulose made digestibility lower.

### Table 1. Changes of nutrient contents and average in vitro dry matter digestibility of coffee husk substrate during Pleurotus ostreatus mycelia growing (0, 30, and 60 days fermentation) (as % dry matter)

<table>
<thead>
<tr>
<th>Nutrient contents (%)</th>
<th>0 days (Untreated)</th>
<th>(Treated) 30 days after seeding</th>
<th>(Treated) 60 days after seeding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic matter</td>
<td>93.710</td>
<td>92.950</td>
<td>86.599</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>10.360</td>
<td>10.456</td>
<td>12.144</td>
</tr>
<tr>
<td>NDF</td>
<td>95.177</td>
<td>92.950</td>
<td>79.390</td>
</tr>
<tr>
<td>ADF</td>
<td>87.184</td>
<td>83.186</td>
<td>74.075</td>
</tr>
<tr>
<td>Hemi celluloses</td>
<td>7.993</td>
<td>5.469</td>
<td>5.3170</td>
</tr>
<tr>
<td>Cellulose</td>
<td>19.514</td>
<td>26.456</td>
<td>24.795</td>
</tr>
<tr>
<td>Lignin</td>
<td>65.421</td>
<td>52.419</td>
<td>45.035</td>
</tr>
<tr>
<td>Dry Matter</td>
<td>29.518±1.249b</td>
<td>25.257±0.721b</td>
<td>30.989±1.263c</td>
</tr>
</tbody>
</table>

Different superscript in the same row means significantly different (P<0.05)
It is suggested that on 30 days, the degradation of lignocellulosic component was not optimal yet. Therefore, it could be acceptable to use the coffee husk substrate after Postreatus cultivation on 60 days fermentation as ruminant feed.

Figure 1. In vitro dry matter digestibility of coffee husk during Pleurotus ostreatus mycelia growing

Conclusion

It was concluded that protein content and cell wall components in coffee husk substrate changed during Pleurotus ostreatus mycelia growing period. In 60 days of fermentation times, cellulose, hemicelluloses and lignin contents in the substrate were decreased and protein content increased as compared with the untreated coffee husk. This could contribute to the increasing in dry matter digestibility of the substrate. It is suggested to use the coffee husk substrate as a ruminant feed especially in 60 days fermentation.

Acknowledgement

This research was funded by DP2M Dikti through HIBAH BERSAING with research agreement no: 256/h30.10/pl/2011 on date April 20th 2011.

References


