The Evaluation Of Buffaloes Feeding With Different Level Of Forage On The Content Of Fiber Fraction And Estimation Energy

[1]Tri Astuti, [1]S.A. Akbar, [2] D. Afrini and Nurhaita
[1]Department of Animal Science, Faculty of Agriculture, University of Mahaputra Muhammad Yamin, Jalan Jenderal Sudirman No 6 Solok City, West Sumatera. Indonesia

[2]Department of agribussnes, Faculty of Agriculture, University of Mahaputra Muhammad Yamin, Jalan Jenderal Sudirman No 6 Solok City, West Sumatera. Indonesia

Email: adektuti@gmail.com

Abstract- This study aimed to evaluate of buffaloes feeding with different level of forage on the content of fiber fraction and estimation energy**. Us**ing a completely randomized design with 4 replicates. The diet treatments were: (R1), 100% field grass + 0% concentrate, (R2), 70% field grass + 30% concentrate. (R3), 60% field grass + 40% concentrate (R4) 50% field grass + 50 % concentrate. The experimental results showed that the treatments feeding have significantly affected ($p<0.01$) on the content of Acid Detergent Fiber, Neutral Detergent Fibre, and estimation energy, but no effect (P>0, 01) on cellulose, hemicellulose, and lignin. Based on the data from the research results it could be concluded that using the different levels of forage and concentrated rations to buffaloes provides better productivity than just getting field grass.

Keywords: the buffaloes, fibre fraction, energy estimation, feeding, concentrate

Introduction

Buffaloes are a potential source of protein food beside of cattle and other ruminants. Buffaloes have an advantage over cows, which can live in low - quality feed availability and can still reproduce well (Diwyanto and Handiwirawan, 2006). Currently, the system for maintaining buffaloes in Indonesia is generally maintained in marginal environmental areas, with a relatively small scale of business, traditional maintenance management, and has not been implemented the giving of balanced ration. The most important case the buffalo do not

get the maintenance feeding, so it causes buffaloes production not as good as in cattle (Muthalib, 2006; Sudirman et al, 2015). Suhubdy et al (2005) said that if livestock management of buffaloes is carried out with a pattern of livestock raising, then the productivity of buffalo would be better than cattle. Many research about feed management on ruminants have been done, but just a little bit for Buffalo cattle. The Research of Irawati et al., (2011) that no different affected production male buffalo eat concentrates 3 and 6 times a day. This research was conducted to improve the potential of Buffalo as a food protein with increased feed management and maintenance. The research treatment consists of forages and concentrates which were arranged based on the nutritional formulation of requirements feeding. This feeding needs to first evaluate the quality by analyzing the fiber fraction containing Acid Detergent Fiber (NDF), Neutral Detergent Fiber (NDF), Cellulose, Hemicellulose, and Lignin. The strategy of ruminant feeding formulation needs a very urgent fiber fraction. Fiber fraction is a very potent energy source in ruminants when is not inhibited by other factors such as lignification and crystallization. Research of Ron et al., (1993) about the levels of NDF and ADF contained in local feed ingredients given to cattle in collected because it is more accurate for estimating feed consumption, energy value, and total undigested nutrients. When a decreasing value of the Neutral Detergent Fiber will cause an increase in the lignin and decreases cellulose and hemicellulose levels. Hemicellulose and cellulose are components of cell walls that can be digested by microbes. The high levels of lignin cause microbes to be unable to utilize hemicellulose and cellulose perfectly. Therefore, the content of the fiber fraction should be optimal so the feeding will be beneficial to ruminants. The purpose of this study was to study the composition of fiber fractions (ADF, NDF, Cellulose, hemicellulose, and lignin) in buffalo rations with different forages and concentrates levels.

Material and Methods

This research aimed to evaluate the buffalo ration with different forage concentrate balance on the content of fiber fraction and energy estimation by base on ADF and NDF content. Forage used was field grass, *Setaria sp.* and some kind of leguminous that grow around the farming. Cconcentrates were formulated from sources of feed ingredients (tofu waste, rice bran, sago, palm oil cake) that are easy to obtain, and have given to 16 heads of female buffaloes. The sample took with the randomizing sampling.

The analysis of fiber fraction done by Filter Bag Technique (ANKOM Tech.), Van Soest modification.

Experimental design

The experimental design used was completely randomized design with 4 replications.

The diets treatments were:

R1= 100% field grass + 0 % concentrate

R2 = 70% field grass + 30% concentrate,

R3 = 60% field grass + 40% concentrate

R4 = 50% field grass + 50 % concentrate

The observed variables included the content of ADF, NDF, cellulose, hemicellulose, and lignin ration treatments. The result of analyzing ADF and NDF have using to estimate the Net Energy Maintenance (NEM), Net Energy Gain (NEG), Net Energy Lactation, and Total Digestible Nutrient (Ron et al.1993).

The procedure for calculating energy estimates:

Net Energy Maintenance = 1,037 – 0,0124 x ADF

Net Energy Gain = [2,54 (2,42/(NEMx 2,2))]/2,2

Net Energy Lactation = 1,037 – 0,0124x ADF

Total Digestible Nutrient = 8 + 86 x NEL)

Statistical analysis

All data were subjected to an analysis of variance and significant differences were further tested by Duncan's multiple range test.

RESULT AND DISCUSSION

The Content of Fiber Fraction

Based on the results of statistic analysis shown the treatment rations with different levels of forage and concentrate showed a very significant affected ($p < 0.01$) on the content of ADF and NDF. Further testing with the Duncan multiple range test shown significant differences between R1, R2, R3, and R4. However, differences in the composition of the forage and the concentrate did not have a significant affected ($p > 0.05$) on the content of cellulose, hemicellulose, and lignin. Research's Astuti et al (2019) giving of ration concentrates on buffaloes provides better productivity than just getting field grass. Based on the data in Table 1, it can be seen that the R1 treatment ration was the highest content of ADF and NDF which significantly different from R2, R3, and R4. The content of ADF and NDF decreases being under the reduced of forage and increased concentrates in the ration. This was because R1, be arranged 100% of forage of grasses, certainly has a higher fiber content than other rations (R2, R3, and R4) that have used concentrates and reduced using of forage. However, the ADF and NDF contents are more abundant in forage grass than concentrates. ADF includes cellulose, lignin and lignified nitrogen compounds, NDF contains cellulose, hemicellulose, lignin, and lignified nitrogen compounds (Pathak, 2005). The content of cellulose, hemicellulose, and lignin showed no significant effect ($p > 0.05$) on differences in forage and concentrate levels. Table 1 shown the contents of cellulose was

directly proportional to the contents of hemicellulose, the higher the content of cellulose, and also of the hemicellulose content when the cellulose content increases, the hemicellulose content will be. The average of cellulose and hemicellulose content in this research was around 28.39-31.45%, and 13.31 16.79%. Taherzadeh (1999) said that the amount of hemicellulose was usually between 15-30% of the dry weight of lignocellulose. However, cellulose and hemicellulose content is inversely proportional to lignin content. If the lignin content increases, the cellulose and hemicellulose content will be decreased. Lignin binds cellulose and hemicellulose by lignocellulose binding. Sudirman, et al (2015) said the increasing levels of lignin, resulting in decreased hemicellulose levels. Hemicellulose and cellulose are part of digestible cell wall components. The results of this study indicate that the average content of the ADF treatment ration ranges from 25.15 to 39.48%, the NDF content is 51.19-56.27%.

Estimation Energy of Feed Treatment

Available energy of feeds important must be known for diet formulation and nutritional and economic comparisons among feedstuffs. The large demand for energy of high producing ruminants requires accurate determination of available energy of feeds. Based on the data from the ADF and NDF analysis done calculating an estimation of energy content and total digestible energy, as shown in Table 2.

The table 2 shown that the lowest NDF content of ration treatment was 51, 19%, there were shown that all ration formulation has the content of NDF up 50%, and this means that the feed formulation more of half a part of ration as a forage and the source of fiber. The results of the variant analysis showed that the use of forages and concentrates of buffaloes feeding with intensifications shown the high significant affected ($P < 0.01$) on the estimated NEM, NEG, NEL, and TDN. The further test using Duncan's multiple range test shown the

ration of R1 the only forage of field grass has the lowest energy estimate compared by the ration of R2, R3, and R4 using a concentrate. Estimated Energy Maintenance ranges from 0, 55-0, 71 Mcal, NEG range 0, 24-0, 47Mcal, NEL 0, 55-0, 71 Mcal. The data (Table 3) shown that the highest estimated energy (NEM, NEG, NEL, and TDN) the ration treatments on the R4, and the lowest was on R1 ration treatment. It means the ration R1, only consisted of field grass was estimated energy to be significantly lower than the treatment ration added by concentrates. The Buffaloes need energy for maintenance, growth, development, reproduction, and production performance. (Zicarelli L, 2004; Ståhl and Lind, 2003). Energy is generally acquired from carbohydrates such as starch, cellulose, and fat. The physiological nature of the digestive system in buffaloes makes the cellulose (exist in the roughage) a very important and rather cheap energy source. The energy requirement is also closely associated with the type, amount, quality, and presentation method of feed consumed by buffaloes. The buffaloes feeding better when formulated the field grass and concentrates.

CONCLUSION

Based on the results of research, it can be concluded that the content formulation rations were field grass and concentrate better energy than just getting field grass for buffalo. The best formulation feeding can ben achieved at the ratio of 50% field grass and 50% concentrate.

ACKNOWLEDGMENTS

The authors are extremely grateful for the financial assistance from the Ministry of Research, Technology and Higher Education of the Republic of Indonesia through Fundamental Research 2018.

REFERENCES

Astuti Tri, R.M. Sari and U. Santoso 2019. The effectiveness of forage and balanced

concentrate feeding on the nutritional values and performance of buffaloes. Buffalo Bulletin (April-June 2019) Vol.38 No.2

Diwyanto, K. and E. Handiwirawan. 2006. Strategi pengembangan ternak kerbau: Aspek penjaringan dan distribusi. *In Prosiding Lokakarya Nasional Usaha Ternak Kerbau Mendukung Program Kecukupan Daging Sapi*. Pusat Penelitian dan Pengembangan Peternakan. Bogor, Indonesia.

Irawati, E., A. Widyaningrum, E. Purbowati, R. Adiwinarti, S. Dartosukarno and W.S. Dilaga. 2011. Penampilan produksi dan parameter pertumbuhan kerbau yang diberi pakan konsentrat dengan frekuensi yang berbeda. prosiding. *In Seminar Nasional Teknologi Peternakan dan Veteriner*, Bogor,

Pathak NN (2005) Comparison of feed intake, digestibility of nut rients and performance of cattle (B. indicus and B. indicus x B. taurus crosses) and Buffaloes (Swamp and Indian) In: Coping with feed scarcity in smallholder livestock systems in developing countries. Ayantunde AA, Fernandez-Rivera, McCrabb editors. Animal Science UR, Wageningen, The Netherlands, University of Reading, Reading, UK, Science Institute of Technology, Zurich, Switzerland and Intern Livest Res Inst, Nairobi, Kenya. 209-233

Ron L. Belyea, Barry Steevens, George Garner, Jack C. Whittier and Homer Sewell, 1993. Using NDF and ADF To Balance Diets. Department of Animal

Ståhl-Högberg M, Lind O (2003) Buffalo Milk Production. http://www.milkproduction.com/Library/Authors/Mikaela_Ståhl_Högberg.htm

Sudirman, Suhubdy, Sofyan Damrah Hasan, Syamsul Hidayat Dilaga, I Wayan Karda. 2015. (Neutral Detergent Fibre (NDF) and Acid Detergent Fibre (ADF) Contents of Local Forages Fed to Cattle at Communal Cages. Jurnal Ilmu dan Teknologi Peternakan Indonesia Volume 1 (1) : 66-70; Desember 2015

Suhubdy, 2005a. Development of buffalo cattle in indonesia: Obstacles and knitting strategy. *In the National Seminar Modern Ii Animal Husbandry Industry*, LIPI Cooperation - Livestock Service Office. Mataram, Indonesia.

Taherzadeh, M. J. (1999). Ethanol from Lignocellulose: Physiological Effects of Inhibitors and Fermentation Strategies, Chemical Reaction Engineering, Chalmers University of Technology, Göteborg, Sweden.

Van Soest, P. J., J. B. Robertson, and B. A. Lewis. 1991. Methods for dietary fiber, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition. J. Dairy Sci. 74:3583-3597.

Zicarelli L (2004) Water Buffalo Nutrition, ZOOTEC 2004 – VI Congresso Internacional de Zootecnia, XIV Congresso Nacional de Zootecnia, X Reuniao Nacional de Ensino em Zootecnia e XVII Forum de Entidades de Zootecnia, Brasilia 28–31.

Table 1. The Average of Fibre Fraction of Ration Treatments (% Dry matter)

Variables (%)	Ration treatments				SE
	R1	R2	R3	R4	

ADF	39.48 [a]	26.40 [b]	26.35 [b]	25.14 [b]	0.87
NDF	56.27[a]	54.29[a]	53.22 [b]	51.19 [b]	0.90
Cellulose	31.45	30.08	29.30	28.39	0.96
Hemicellulose	16.79	14.54	13.18	13.31	2.16
Lignin	8.02	8.24	9.06	8.41	0.46

Note:

R1: 100% native grass + 0% concentrate, R2: 70% native grass + 30% concentrate, R3: 60% native grass + 40% concentrate, R4: 50% native grass+50% concentrate. (a - c) Significant differences between the rows ($p<0.05$)

Table 2. The Average of estimation energy

Variables (%)	Ration treatments				SE
	R1	R2	R3	R4	
NEM (Mkal)	0.55 [b]	0.71 [a]	0.71 [a]	0.71 [a]	0.01
NEG (Mkal)	0,24 [b]	0,45 [a]	0,45 [a]	0,47 [a]	0.02
NEL (Mkal)	0,55[b]	0,71[a]	0,71 [a]	0,73 [a]	0.01
TDN (%)	55,08 [b]	69,03 [b]	69,08 [b]	70,38 [a]	0.92

Note:

R1: 100% grass field + 0% concentrate, R2: 70% grass field + 30% concentrate, R3: 60% grass field + 40% concentrate, R4: 50% grass field +50% concentrate. (a - c) Significant differences between the rows ($p<0.05$)., NEG = net energy gain, NEm = net energy maintenance, net energy gain (NEg, Mcal/kg), and Total Digestible Nutrients (TDN, %).

ID-3119

Participants

Miss Kanchana Anuphan (libkna)

Tri astuti (triastuti)

Messages

Note	From
Dear Dr. Tri Astuti, Apologize for inconvenient and too late reply, According we got too much manuscripts in submission online system so could you please wait in queue for start published process about one or two years or more. Anyway, if you have another journal for published please don't hesitate to choose that. Yours Sincerely, Miss Kanchana Anuphan, Information Specialist	libkna Jan 23
Dear Dr. Tri Astuti, Please accept our apologize for inconvenient and too late about your manuscript publish, However, please reply and confirm to us as soon as if your manuscript ID-3119 still not published in any journal and so however, we will take your manuscript to next step if you still would like to publish in Buffalo Bulletin but at the same time if you are not confirm or reply we will be not active for the manuscript. Thank you very much for your contribution. Sincerely yours, Miss Kanchana Anuphan, Information Specialist, International Buffalo Information Center, Main Library, Kasetsart University. Thailand. Phone number: +66 2942 8616 ext. 344 Facebook fanpage: www.facebook.com/International-Buffalo-Information-Center-188662994509008	libkna Feb 19