EVALUATION OF THE EFFECT OF FEEDING BUFFALOES WITH DIFFERENT LEVELS OF FORAGE ON THE CONTENT OF FIBER FRACTION AND ESTIMATION ENERGY

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ABSTRACT

This research aimed to evaluate effect of feeding buffaloes with different levels of forage on the content of fiber fraction and estimation energy. Furthermore, it was carried out by using 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, and (R4) 50% field grass +50 % concentrate. The experimental results showed that the feeding treatments significantly affected ($P<0.01$) the content of Acid Detergent Fiber, Neutral Detergent Fibre, and estimation energy, but had no effect ($P>0.01$) on cellulose, hemicellulose, and lignin. Based on the data obtained, it is concludable that feeding buffaloes with different levels of forage and concentrate rations provides better productivity than using field grass only.

Keywords: *Bubalus bubalis*, buffaloes, fibre fraction, energy estimation, feeding, concentrate

INTRODUCTION

Buffaloes are a potential source of proteinous food besides cattle and other ruminants. They have an advantage over cows, because of ability to live on low quality feed availability and still reproduce well (Diwyanto and Handiwirawan, 2006). Currently, the system for maintaining buffaloes in Indonesia generally involves keeping the animals in marginal environmental areas, with a relatively small-scaled business, practicing traditional management, and with no implementation of balanced ration until now. The most important case is that buffaloes are not given feed for maintenance, which causes their production not to be as good as that of cattle (Muthalib, 2006; Sudirman *et al*., 2015). Suhubdy *et al*. (2005) said when management of buffaloes is carried out with a pattern of livestock raising, then the productivity tends to be better. Many studies on feed management in ruminants have been conducted, which include only few on buffalo compared to cattle. The Research of Irawati *et al*. (2011) stated there was no different effect on the production of male buffalo that ate concentrates 3

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to 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 treatment used consisted of forages and concentrates which were arranged based on the required nutritional formulation. 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 which is known to be a very potent energy source when it is not inhibited by other factors such as lignification and crystallization. The research of Ron *et al*. (1993) about the levels of NDF and ADF contained in local feed ingredients given to cattle was collected because it is more accurate for estimating feed consumption, energy value, and total undigested nutrients. When there is a reduction in the value of the Neutral Detergent Fiber, that tends to cause an increase in the lignin and decreased levels of cellulose and hemicellulose which are both components of cell walls that are digestible 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 need to be optimal to ensure the feeding is beneficial to ruminants. The purpose of this research was to examine the composition of fiber fractions (ADF, NDF, Cellulose, hemicellulose, and lignin) in buffalo rations with different forage and concentrate levels.

MATERIALS AND METHODS

This research aimed to evaluate the buffalo ration with different forage and concentrate levels that is balanced in fiber fraction and energy estimation based on ADF and NDF content. The forages used were field grass, *Setaria* sp. and some kinds of leguminous plants that grow around the farm. The concentrates were formulated from sources of feed ingredients (tofu waste, rice bran, sago, and palm oil cake) that are easy to obtain, and was given to 16 female buffaloes. However, the method used for selection was random sampling.

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

Experimental design

A completely randomized design with 4 replications was used for the experimental process.

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 was used 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

examined by Duncan's multiple range test.

RESULTS AND DISCUSSION

The content of fiber fraction

The results of statistical analysis showed that the treatment rations with different levels of forage and concentrate had a very significant effect (P<0.01) on the content of ADF and NDF. Further examination with the Duncan multiple range test indicated significant differences between R1, R2, R3, and R4. However, differences in the composition of the forage and concentrate did not have a significant effect (P>0.05) on the content of cellulose, hemicellulose, and lignin. The research by Astuti *et al.* (2019) stated that feeding buffaloes with concentrate rations provides better productivity than using field grass only. Based on the data in Table 1, it can be seen that the R1 treatment ration had the highest content of ADF and NDF which is significantly different from R2, R3, and R4. The content of ADF and NDF decreases in the ration of reduced forage and increased concentrates. This was because R1, which composed of 100% forage grasses, certainly had a higher fiber content than other rations (R2, R3, and R4) that used both concentrates and reduced forage. However, the ADF and NDF contents were more abundant in forage grass than in concentrates. ADF includes cellulose, lignin and lignified nitrogen compounds, while 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 showed that the contents of cellulose was directly proportional to that of hemicellulose. The average of cellulose and hemicellulose content in this research was around 28.39 to 31.45%, and 13.31 16.79%. Taherzadeh (1999) said that the amount of hemicellulose was usually between 15 to 30% of the dry weight of lignocellulose. However, cellulose and hemicellulose content is inversely proportional to lignin content. Lignin binds cellulose and hemicellulose by lignocellulose binding. Sudirman *et al*. (2015) said the increasing levels of lignin, causes decreased hemicellulose levels. But note that, cellulose and hemicellulose are part of digestible cell wall components. The results of this study indicated that the average content of the ADF treatment ration ranged from 25.15 to 39.48%, while the NDF was 51.19 to 56.27%.

Estimation energy of feed treatment

Available energy of feeds must be known for diet formulation and nutrition as well as economic comparisons among other feedstuffs. The great demand for energy by highly producing ruminants requires accurate determination of available energy of feeds. Based on the data from ADF and NDF analysis, an estimation of energy content and total digestible energy were calculated, as shown in Table 2.

The Table 2 showed that the lowest NDF content of ration treatment was 51.19%, and it was also indicated that all the formulations in this study have up to 50%, and this means that the feeds used were more of half part as forage and the source of fiber. The results of the variant analysis showed that the use of forages and concentrates for feeding buffaloes with intensifications showed high significant effect (P<0.01) on the estimated NEM, NEG, NEL, and TDN. The further examination using Duncan's multiple range test indicated that the ration of R1 composed of only forage has the lowest energy estimate compared to R2, R3,

and R4 that used more of concentrate. Estimated Energy Maintenance ranged from 0.55 to 0.71 Mcal, NEG was 0.24 to 0, 47 Mcal, and NEL was 0.55 to 0.71 Mcal. The data (Table 3) showed that the highest estimated energy (NEM, NEG, NEL, and TDN) of the ration treatments was found in R4, and the lowest was in R1. It means the estimated energy of R1 that only consisted of field grass was significantly lower than the treatment ration added in combination with 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 these animals makes the cellulose that exists 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. Actually, they eat better when the feeds are formulated with field grass and concentrates.

CONCLUSION

Based on the results of this research, it is concludable that the content formulation rations composed of both field grass and concentrate provided better energy than giving field grass only to buffaloes. The best feeding formulation is achieved at the ratio of 50% field grass and 50% concentrate.

ACKNOWLEDGMENT

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.

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