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APCBEE Procedia 00 (2013) 000–000

APCBEE Procedia

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Application of Ammoniation-Fermentation Technology Based on Palm Plantation Waste For Increasing Productivity of Pampangan Buffalo

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Abstract

This research aimed to study the ammoniation-fermentation technology based on palm plantations waste in increasing productivity of Pampangan Buffalo. Research used a Latin Square Design (RBSL) 4 X 4. The treatment consists of A = Grass+Concentrates, B = Grass+Palm Fiber+Concentrates, C = Grass+Ammoniation Palm Fiber+Concentrates, D = Grass+Ammoniation-Fermentation Palm Fiber+Concentrate. The observed variables were consumption of dry matter, crude protein, TDN, digestibility of (dry matters, organic matter, crude protein, and crude fiber), and body weights. The research showed that treatment using ammoniation-fermentation technology (EM-4 and urea) not significantly effected ($P>0.05$) consumption of dry matter, crude protein, TDN, digestibility of (dry matters, organic matter, and crude fiber), and body weights, but significantly effected ($P< 0.05$) digestibility of crude protein. It was concluded that the addition of urea and EM-4 through the amoniation-fermentation process were relatively equal over the consumption, digestibility, and body weight gain of Pampangan Buffalo

Keywords: AMMONIATION-FERMENTATION TECHNOLOGY, PALM PLANTATIONS WASTE, PRODUCTIVITY, PAMPANGAN BUFFALO.

1. Introduction

Palm fibers are waste of palm oil processing that considerable potential for buffalo feed. In Indonesia, The production of palm oil waste is quite abundant. Zain [13] reported that production of palm oil with 1.8 million Ha reached 5.7 million ton/year. Palm fiber is known as fiber source for buffaloes feed. Elisabet and Ginting [3] reported that the nutrients contents of palm fibers are dry matter 93,11 %, crude protein 6.2 %, crude fat 3,22 %, crude fiber 48.1 %, and ashes 5.9 %.

One effort to improve the quality of palm fiber nutrients as Buffalo feed can be done with ammoniation-fermentation technology. This technology is quite cheap and applicable for farmers. It is because urea and EM-4 that is required for this technology are cheap and easily to be obtained. Combination of ammoniation and fermentation treatment is called amofer. This combination is able to increase the necessary nutrients

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higher than if each treatment conducted separately. Suharto [11] reported that the utilization of fermented Palm fiber as much as 15-30% of dairy cows to feed the male gives a weight gain of 1.33-1.74 kg/head/day.

2. Methods

2.1. The Making of Ammoniation Palm Fiber

Using 4% urea (urea 4 kg to 100 kg of palm fiber in dry condition). Comparison between water used to dissolve urea and palm fiber is 1: 1. Than, urea dissolved in water spray on a palm fibers evenly. Palm fiber that has been mixed with a solution of urea are put in plastic bags. After that, the plastic bag is tied and stored at room temperature for 2 days. After 21 days, plastic bags is opened and ready to be given for buffalo.

2.2. The Making of Ammoniation-Fermentation Palm Fiber

using urea 4% (w/w) and EM-4 8% (v/v) of palm fiber. Urea mixed with palm fiber and then is sprayed by using EM-4 solution. Put the mixture into plastic bags and than compact so that an anerob condition could be achieved. After that, the plastic bag is tied and stored at room temperature for 21 days. After 21 days, the plastic bag is opened and ammoniation-fermentation of palm fiber are ready given to buffalo. Composition of feed rations substances that used on research shown on Table 1.

Table 1. Composition of feed nutrients used on research

Feed Nutrients	**Dry matter**	**Ash**	**Crude fat**	**Crude Protein**	**Crude fiber**	**TDN**
Palm fiber control	93.63	4.76	8.66	5.93	34.26	66.14
Palm fiber amoniasi	91.98	5.17	6.93	8.19	37.59	59.25
Palm fiber amofer	91.41	6.36	6.57	7.69	35.84	59.53
swamp grass	24.81	12.81	1.70	9.00	27.62	55.50
Palm oilcake	94.69	4.06	7.12	16.17	12.78	56.96
Rice bran	90.91	13.21	7.33	10.88	14.82	17.37
Molases	50.23	11.90	0.90	3.10	0.60	8.81
Urea	95.00					120.67
Mineral Mix	-					
salt	92.00					

2.3. Preparation of Housing and Animal

Firstly, housing is cleaned by disinfectant. Than, buffaloes were given worm medications. Housing is divided into several spaces and given numbers. Buffaloes put into each space randomly, as same as with feed treatment.

2.4. Implementation of the Research

Adaptation period. It is conducted for one month. This period aimed to accustom buffalo with the environment research and feed that will be tested.

Introduction period. This period aimed to deprive the remains feed before. It is conducted for 15 days

Growth period. This period is time to measure the body weight of buffaloes. It aimed to find out the effect of tested feed to body weight gain of buffaloes. This period was conducted for 30 days. The buffalo were weighed 3 days in serial at early periods and 3 days in serial at last period.

Collection period. This period aimed to know digestibility of nutrient. This period conducted for 1 week. During this period, buffaloes feces and feed is collected every day for 24 hours and than weighed. As many as 10% of it is taken as sample for analysis.

Research Design

This research used Latin Square Design (RBSL) 4 X 4. Treatments consist of:

A : grass + concentrates
B.: grass + palm fiber + concentrate
C : grass + ammoniation palm fiber + concentrate
D : grass + ammoniation-fermentation palm fiber + concentrate

Data obtained were analyzed by using ANOVA analysis. If among the treatments show the real influence, it wiil be carried out the further tests by using BNT test.

Variebel

The observed variables are consumption (dry matter, crude protein, TDN), digestibility (dry mater, organic matter, crude protein, and crude fiber), and body weight gain.

3. Result and Discussions

3.1. The Consumption of Dry Matter, Crude Protein, and TDN

Consumption is one parameter used to valuate the palatability of feed ingredients. A feed palatabel will be known by seeing low or high feed consumption. Consumption of dry matter, crude protein, and TDN on feed treatment is shown in Table 2

Table 2. Consumption of dry matter, crude protein and TDN on treatment

treatment	consumption		
	Dry matter	Crude Protein	TDN
A	5.48±1.05	0.75±0,16	2.85±0.51
B	5.94±0.93	0.70±0,08	3.26±0.56
C	4.91±0.33	0.67±0,03	2.49±0.23
D	6.46±0.18	0.77±0,04	3.45±0.20

Note : A = Grass+Concentrates, B = Grass+Palm Fiber+Concentrates, C = Grass+ Ammoniation Fiber Palm +Concentrates, D = Grass+ Ammoniation-Fermentation Palm fiber +Concentrate.

Table 2 shows that the lowest consumption of dry matter, protein and TDN was in feed treatment with the addition of ammoniation palm fiber. Although, each treatment did not show significantly effect ($P>0.05$) on consumption of dry matter, crude protein and TDN. This is due to the treatment with addition of ammoniation palm fiber generates smell of ammonia so that it affect the palatability of feed. In ammoniation process, it will increase NPN (Non Protein Nitrogen). Besides that, there are some of NPN component that is poisonous, so it can decrease feed consumption (Saun and Heinrichs) [8]. Numerically, treatment of amofer palm fiber is higher than the other treatment. This illustrates that the feed palatability of using amofer palm fiber feed is not lower than that of using basic grass feed. There is even a tendency that ammoniation-fermentation palm fiber (amofer) is preferred by livestock. On buffalo, olfactory stimuli (smell) is very important to search and select feed (Rasjid) [7]. The value of dry matter consumption are already in accordance with the opinion of the Bamualim [1] that the feed consumption of dry matter by ruminants livestock can range between 1.5- 3.5%, but generally 2- 3% of cattle weight. The consumption value of feed substances have met the needs of buffalo and is higher than the results of Grant research that is quoted by Pratas [6]. It is reported that buffaloes with weight 200 kg need dry matter, crude protein, and TDN is 3.84; 0.46; and 2.65 kg/head/day, respectively. Next, Parakkasi [6] states that amount of dry matter consumed is affected by several factors, namely, (a) the physical or chemical properties of feed, (b), the physiological demand of cattle for basic life and production according to the growth of digestive tract, (c) the body weight that is associated with growth of the digestive tract. Because generally, the capacity of digestive tract increases along with the body weight, so that it can hold up to dry matter in great numbers.

3.2. The Value of Nutrient Digestibility and Body Weight Gain

The digestibility of nutrients and increasing of body weight on research is strongly affected by the treatment. The digestibility value of dry matter, organic matter, crude protein, crude fiber and body weight using feed treatment is shown in Table 3.

Table 3. The digestibility value of dry matter, organic matter, crude protein, crude fiber, and body weight gain

Treatment	Value of Digestibility				body weight gain
	Dry Matter	Organic Matter	Crude Protein	Crude fiber	
A	71.78±3.54	72.91±3.33	80.22^{c}±2.00	72.90±4.95	0.52±0.46
B	68.82±4.96	70.51±4.19	74.76^{a}±3.20	68.39±4.39	0.66±0.21
C	68.26±6.35	68.85±6.20	77.13^{b}±2.70	66.41±7.35	-0.07±0.44
D	67.23±5.87	68.09±5.77	75.30^{a}±4.51	67.41±7.81	0.43±0.34

Note : A = Grass+Concentrates, B = Grass+Palm Fiber+Concentrates, C = Grass+Fiber Palm Amoniasi+Concentrates, D = Grass+ Palm-fiber Amoniasi-Fermentation+Concentrate. Means with different letter along the column are significantly different (P<0.05)

Dry matter is a combined unit of feed nutrients composed of crude protein, crude fat, crude fiber, and extract without nitrogen. Thus, dry matter consumed by buffaloes in this experiment will affect the amount of nutrients consumed, so it will also affect the value of nutrient digestibility.

The results of analysis shown that the giving of ammoniation-fermentation (EM-4 and urea) palm-fiber did not significantly effect (P>0.05) digestibility of dry matter, organic matter, and crude fiber, but it significantly effected (P>0.05) digestibility of crude protein. Results of further test showed that the highest protein digestibility value was in treatment A (basic grass feed). It is significantly different (P >0.05) with treatment B, C and D. Between treatment C with B and D were also significantly different. This is because feed fiber content on treatment A (basic grass feed) is lower than that in treatment B, C and D. It is indicated that the lower crude fiber in feed, the value of nutrient digestibility will be higher. Rasjid [7] reported that contents of NDF and ADF in feed have negative correlation to feed digestibility. High or low of correlation value is dependent on degrees of lignification of feed substance. It is because lignin will protect cellulose and hemiselulosa so that the degree of crude fiber digestibility is getting lower. The high of protein digestibility in treatment C (amoniase palm fiber) compared to treatments B and D. It is because there are weak base reactions occured during ammoniation process. Finally, it causes ligoselulosa and lignohemiselulosa bounding being tenuous, so that the digestibility of feed ingredients and protein content increase. Protein is a substrates that needed for growth of rumen microba. Besides that, proteins is also a nutritional substances that very important in digesting of sellulosa and as protein source for livestock (Soepranianondo) [10]. This is accordance with Belgess *et al.* [2] that digestibility of ammoniation sugarcane bagase increasing from 23,5% to 52,7% will make increasing of feed substance digestibility. According to Varga [12], in vivo digestibility, values of feed is influenced by amount of dry matter consumption, type and quality of forage, and content of structural and nonstructural carbohydrate of feed, particle size and feed processing method, speed and rate of degradation in rumen, and ways of feeding.

The results of analysis shown that the giving of ammoniation-fermentation (EM-4 and urea) palm fiber did not significantly effect (P>0.05) body weight gain. This is because the content of nutrients, consumption, and digestibility of dry matter and feed nutrient in any treatment is relatively the same. Daily life weight gain is a reflection of accumulated consumption, fermentation, metabolism, and absorption of feed nutrients in body and is a reflection of quality and biological value of feed (Simanihuruk) [9]. Body weight in treatment C (ammoniation palm fiber) is decreasing. This is due to the feed consumption on this treatment is low because as a feed palatability is also low. So, the feed nutrient that are available for livestock is also a bit. Low of palatability on ammoniation treatment is resulting from the strong scent of urea thereby affecting consumption of feed. Zain [14] reported that changing of field grass with ammoniation cacao fruit leather up to 100% shows the same in body weight gain. Daily body weight gain seem pararel with consumption and digestibility of feed. Up and down body weight gain is influenced by high and low feed consumption. Increasing of feed

consumption can raise body weight gain and decreasing of feed consumption can lower body weight gain (Muck) [4].

4. Conclusions

Conclusions of this study that addition of urea and EM-4 through the ammoniation-fermentation process shows the results relatively equal control over the consumption of feed, digestibility, and body weight gain of Pampangan Buffalo.

5. Acknowledgment

Researchers thank to the Ministry of Research and Technology through Research Centre for Sub-optimal Lands (PUR-PLSO) University of Sriwijaya that have financed this study.

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