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The Evaluation of Using Bio Activators Based on Rumen Content of Dry Matter, Organic Matter, and Crude Protein on Oil Palm Fronds as Ruminant Feed

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ABSTRACT

This study aims to examine the effect of using rumen content bioactivators with the addition of different energy sources on nutrient content, fiber fraction content, and energy estimation in palm leaves and midribs that will be used as feed ingredients for ruminants. Factorial completely randomized design 2x4 with 4 replications for each treatment was used in this study. Factor A is the source of the rumen contents, where A1 = Cattle rumen, A2 = Buffalo rumen. Factor B is a microbial energy supply; B1 = Molasses, B2 = Molasses + palm frond extract, B3 = Molasses + palm leaf extract, B4 = Molasses + palm frond and leaf extract. Parameters observed were dry matter content, organic matter, crude protein. The results of the variance analysis showed that there was no interaction (P> 0.05) between the source of rumen content and the type of microbial energy supply. The dry matter content of palm fronds is not affected by the source of the rumen content of cows or buffaloes. The source of the rumen content based on cattle or buffaloes have no effect on the dry matter content of palm fronds.

Keywords: Bioactivator, oil palm frond, ruminant.

INTRODUCTION

Feeding is the main component that for the success of a livestock business, and the feeding is the highest cost of all the daily operational of a livestock business [1, 2, 3]. The Grass as the main source of forage for ruminants [4, 5, 6, 7] is currently limited in availability due to the conversion of agricultural land into housing and other infrastructure development. This causes an effort to find alternative sources as a substitute for forage in ruminants. Palm oil plantations in addition to providing benefits from their production [8] and processing for food

[9], there is also a large amount of waste [10], both in terms of quantity and type, both from plantation waste and waste from processing factories. Oil palm fronds are solid waste from oil palm plantations that have the potential to be used as basal feed for ruminants [11, 12, 13]. The oil palm fronds must be trimmed to reach 8.6 tons per hectare/year [11]. Utilization of oil palm fronds is a potential as substitution of field grass for the source of forage ruminant feed [14], because of its abundant availability and is not seasonal. Palm oil by-products can be pursued as potential feed for ruminants. The utilization of plantation waste as feeding is always constrained by the presence of lignocelluloses bonds which usually have high lignin content and low nutritional value [15] that oil palm fronds contain 3.25% crude protein, 49.51% dry matter, and 95.96% organic matter [16] the lignin content of oil palm fronds is 15.34%. In addition, there are many thorns and sticks of palm leaves on the oil palm fronds which are quite sharp, difficult to digest, and it is feared that it will be risky for livestock if consumed in the long term. It needs to treat feed processing technology before using a feeding. Treatment of feed ingredients through a biotechnology fermentation approach is considered easier, cheaper, and environmentally friendly compared to chemical treatment [17]. Astuti et al [18] showed that the total number of colonies of local microorganism (MOL) bacteria in the rumen with the addition of energy sources (tofu soaking water and molasses) and palm fronds was 10 x 10^{10}/ml. There are so many waste rumens of cattle and buffalo from the slaughterhouse. In 2018 the cattle and buffalo slaughtered at slaughterhouses was 1,147,657 [19]. The Slaughter of ruminants is always increasing every time, in line with the increasing human needs for ruminant meat food. Rumen fluid also contains the enzymes a-amylase, galactosidase, hemicellulose, cellulase, and xylanase [20]. Oil palm fronds can be used as a source of forage feed ingredients by improving nutrient quality both through physical and biological processing using rumen content bio activators. Fermentation process oil palm frond with bio activator cattle rumen causes a decrease in crude protein by 3.93% and increase crude fiber by 42.96% [21]. The composition of amino acids, minerals, and vitamins as well as enzymes, also depends on the treatment of the feed given [22]. Rumen fluid enzymes as an alternative technology that can be used to hydrolyze crude fiber and increase the nutritional value of local feed raw materials [23]. This study aimed to evaluate the nutrient content, fiber fraction, and energy estimation of palm fronds incubated with bio activators from the rumen contents of cattle and buffalo. Microorganisms contained in the contents of the rumen are "bred" first by feeding/supplying the required energy that is adjusted to the expected target of enzyme production.

MATERIALS AND METHODS

This study was conducted to determine the effectiveness of the use of rumen content bio-activator on oil palm fronds.

Bio-Activator Production Process

The rumen contents were taken from the slaughterhouse. The contents of the rumen are taken using a thermos and filled with hot water to keep the temperature stable which consisted of beef rumen contents and buffalo rumen contents, each mixed with soybean

soaking water, molasses in a certain ratio as a source of protein and carbon which is the rumen microbial energy supply. In addition, a substrate is also added as a source of enzymes that will be expected to be produced by rumen microbes. There are 4 (four) types of bio activators with the addition of different enzyme sources. This solution mixture was incubated for 7 days.

Oil Palm Fronds Fermentation Process

The fronds and palm leaves are mashed then fermented with rumen contents bioactivator for 7 days. The factorial randomized design used was a 2 x 4 with 4 replications for each treatment. Factor A was the type of rumen content: A1 = Cow rumen, A2 = Buffalo rumen. Factor microbial energy supply; B1 = Molasses, B2 = Molasses + palm frond extract, B3 = Molasses + palm leaf extract, B4 = Molasses + palm frond and leaf extract. Parameters measured were dry matter content, organic matter, crude protein.

Statistical Analysis

All data tested by analysis variant and the significantly affect data were further tested by Duncan's multiple range test.

RESULTS AND DISCUSSIONS

The average dry matter, organic matter, and crude protein content of oil palm fronds incubated with rumen bio-activator. The data in table 1 was the analysis of the average dry matter content, organic matter, and crude protein of palm fronds incubated with cow rumen content bio-activator and buffalo rumen content with the addition of different enzyme energy sources.

The results of the diversity analysis showed that there was no interaction ($P>0.05$) between the source of rumen content and the type of microbial energy supply. Sources of rumen content of cows and buffaloes gave no different effect on the dry matter content of oil palm fronds, as well as the addition of energy and feed sources for microbes gave no different effects as well. This is because in this study the contents of the rumen used were rumen fluid which contained a lot of rumen microbes. Some microorganisms digest glucose and produce water, carbon dioxide, and large amounts of energy (ATP) which are used for growth. The results of the analysis of diversity showed that the organic matter content in this study showed no significant effect ($P>0.05$), on the content of oil palm fronds incubated using cow rumen content bio-activator and buffalo rumen content (92.57 vs. 92.56 %). This shows that the activities carried out by cow rumen microbes and buffalo rumen do not differ in degrading organic matter found in oil palm midribs. There was a significant interaction ($P<0.05$) between the source of rumen content and the source of microbial energy on the crude protein content of the palm fronds. This is because in the contents of the rumen there are various rumen microbes that grow and develop based on the energy source provided. Microbes (bacteria, and fungi) are proteins. The best crude protein content was found in palm fronds incubated with cattle rumen contents with the addition of molasses, soybean soaking water, and palm leaves extract (9.03%). Based on Table 1, it can be seen that the average protein content was higher in

palm fronds fermented using cow rumen content bio activator compared to buffalo rumen content (8.14 vs 8.01%).

Table 1. The Average Nutrient Content of Oil Palm Frond Incubation Using Bio–Activator of Cattle and Buffalo Rumen Content

Factor A	Factor B				Average
	B1	B2	B3	B4	
Dry Matter Content					
A1	36.49	35.33	36.14	36.37	36.08
A2	40.43	42.63	42.20	44.66	42.48
Average	38.46	38.98	39.17	40.52	
Organic Matter Content					
A1	92.54	92.81	92.42	92.50	92.57
A2	92.64	92.81	92.39	92.40	92.56
Average	92.59	92.81	92.40	92.47	
Crude Protein Content					
A1	8.04^{aA}	7.35^{bA}	9.03^{aA}	8.15^{aA}	8.14
A2	7.81^{bA}	8.09^{aA}	7.19^{bA}	8.98^{aA}	8.01
Average	7.92	7.72	8.11	8.98	

Note: The superscripts (a,b) in the same row and (A,B) in the same column showed significantly different effects ($P<0.05$)

Based on the results of the study, it was also seen that the average crude protein content based on the source of enzyme supply was the highest in the treatment of rumen contents mixed with molasses, soybean soaking water, leaves, and palm fronds (8.98%). This crude protein content is higher than the research by Rizali *et al.* [15] which found that the crude protein content of fermented oil palm fronds with was 5.35%. When compared with the protein content of palm midrib without treatment, there was an increase of 121.23 – 177.85% in this study (3.25 vs 7.19-9.03%). This was because the rumen contents bio activator consists of bacteria and fungi whose main component is protein. Riswandi [24] stated that as the number of microbes increases, the crude protein content of fermented feed will increase, because microbes are a source of single-cell protein. In addition, in the process of making bio-activators, the rumen contents are mixed with soy water immersion, where the crude protein content of soybeans is 46.2%.

CONCLUSIONS

Based on data, it can be concluded that there was no interaction effect on dry matter and organic matter content of oil palm fronds by bio-activator treatment, and there is a highly significant interaction effect on crude protein content.

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