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The Effect of Using Local Microorganism of Rument Contents and Crude Enzymes with Different Dosage on The Nutrient Content of Oil Palm Frond

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Abstract

This study aims to evaluate the dry matter, organic matter, and crude protein content of palm oil fronds incubated with local microorganism source of rumen content and crude enzymes produced through the rumen of cattle. The rumen contents of the beef were incubated for 7 days with a fermented system in the rumen with the addition of molasses and soybean soaking water as a source of food and energy, as well as the addition of palm fronds as a source of lignin enzymes. The design used was factorial completely randomized design 2 X 3 with 3 replications for each treatment. Factor A consisted of two treatments, there were: A1 = Local microorganism source of rumen content of beef, A2 = crude enzyme. Factor B using of dose: B1 = 10%, B2 = 20%, B3 = 30%. The parameters observed were: dry matter content, organic matter, crude protein. The resulted were 33.11-34.75% the content of dry matter, 93.40-93.08% the content of organic matter, and the content of crude protein based on this research data, it can be concluded that the incubation treatment of oil palm fronds with local microorganisms (Mol) and crude enzymes affects the dry matter and organic matter content. Crude protein content ranged from 6.70 to 7.38%.

Keywords : Palm oil fronds, local microorganisms, enzymes

INTRODUCTION

Palm oil is an agricultural crop that produces human food needs (Mahat, 2012). In the process of producing cooking oil as the main production of palm oil, it leaves a lot of by-products starting from the harvest process in the plantation to the process at the factory. Palm oil fronds and leaves are solid waste from palm oil plantations which have the potential to be used

as basal feed for ruminants as a substitute the field grass as a source of forage (Maluyu, 2014). The oil palm fronds must be trimmed to reach 8.6 tons per hectare/year. The area for planting this plantation in 2019 will reach 6,035,700 Ha, (BPS Indonesia, 2019). The use of leaves and palm oil fronds in ruminant feeding is a potential for abundant availability and not seasonality. Utilization of plantation waste as feeding is always constrained by the presence of lignocellulose bonds which usually have a high lignin content of around 15.35% (Astuti *et al*., 2017), and the nutritional content of oil palm fronds is not good, the dry matter content (DM) was 92.15%, Organic Material (OM) was 90.27%, Crude Fiber was 33.47%, and the content of Crude Protein (CP) was 4.84 % (Astuti *et al*, 2016). This condition causes palm oil fronds to need a technology treatment before being used as feeding.

The results of Biyatmoko (2013) research showed that the fermentation of palm fronds using different types of inoculums showed a significant increase in fermented palm frond crude protein from 2.11% (control) to 2.41% (Effective Microorganism-4 or EM-4inoculums). Astuti *et al*., (2016) fermentation of palm fronds with Mol content of the rumen caused an increase in protein content by 36.57%. The contents of cattle rumen originating from slaughterhouse waste are quite abundant. The number of slaughtered cattle in the slaughterhouse was 1.102.256 heads (BPS, 2020). This slaughtering process leaves the contents of the rumen unutilized and is only the waste of slaughterhouses in every district and city that has the potential to pollute the environment. The contents of the rumen store a lot of rumen microbes which can still be used as local microorganisms to increase the nutritional value of feed ingredients. Astuti *et al*. (2020) the total number of colony of Mol mushrooms filled with beef rumen is around 554.83 (CFU /g) at 10^4 dilutions. Several studies have used rumen contents to increase the nutritional value of feed ingredients. Rumen fluid is rich in fiber-degrading enzymes and vitamins. Rumen fluid also contains the enzymes a-amylase, galactosidase, hemicellulase, cellulase, and xylanase (Williams and Withers, 1992). Fitriliyani (2011) study using fresh rumen fluid enzyme extracts was able to reduce the phitic acid content by 68.09%. This study purposed compared the effect of using rumen content of local microorganism and rumen crude enzymes on the content of dry matter, organic matter, crude protein in different doses.

MATERIALS AND METHODS

Local microorganism sources

The rumen contents were collected from cattle in fields and placed in tubes, and then mixed with molasses and soybean bath water as an energy source for microbes. This solution has added the leaves and palm fronds that have been mashed in order that the microorganisms will produce enzymes that can degrade the oil palm fronds. The jar is closed tightly and made a hole in the lid of the jar and connected with a small tube with a bottle filled with distilled water. This solution is incubated 7 days aerobically and then name with Mol.

The crude enzyme

Crude enzyme extract was obtained by centrifuging the Mol at 3,000 rpm for 15 minutes at 4 ° C (Heck *et al*., 2002), the supernatant obtained was the extract of crude enzyme.

Fermentation process

Fifty (50) g of crushed palm fronds was put into a plastic bag and sterilized by autoclave at a temperature of 121^{o}C. The sample was then mixed with the Mol and crude enzyme. Mixed the solution with the samples was 10%, 20%, and 30% according to the research treatment. The sample was then incubated for 7 days. After the fermentation was over, the sample was dried in an oven at 60°C. Then the sample was analyzed for the content of dry matter, organic matter, and crude protein (AOAC, 1995).

The factorial randomized design 2x 3 with 3 replications for each treatment using in this research. Factor A was: A1 = Local microorganism of cattle rumen, A2 = crude enzyme. Factor B were doses; B1 = 10%, B2= 20%, B3 = 30%,

The parameters measured were the content of dry matter, organic matter, and crude protein. Statistical analysis: All data were subjected to an analysis of variance and significant differences were further tested by Duncan's multiple range test.

RESULTS AND DISCUSSION

The Dry Matter Content

The results of the analysis of diversity showed that the interaction was not significantly different ($P<0.05$) in the treatment of inoculums source and the dose used (Table 1). The results of further tests using Duncan's multiple range test showed that the use of a dose of 30% was a significantly different effect from the treatment using a dose of 10 and 20%. Table 1 showed that the dose used has a very significant effect ($P<0.01$) on the dry matter content of palm fronds. This is because the main component of Mol was a liquid consisting of a mixture of the contents of the rumen and soybean soaking water, so increasing the dosage will be increased the water content and reduces the dry matter content. This can be seen in the data Table 1, that the lowest dry matter content was seen in the treatment using a dose of 30% which indicates the high waters content of the material. In addition, the dry matter content is also influenced by a large number of microbes present in this mol. The results of Astuti *et al*., (2020) research which calculated the total number of Mol mushroom colonies filled with beef rumen were around 554.83 (CFU/g) at dilution 10^4, which indicates a large number of microbes in the mole solution that will play a role in the degradation process of palm fronds. According to Gervais (2008), stated that changes in the dry matter content result from the growth of microbes and changes in moisture content. Changes in moisture content occur due to substrate hydrolysis or metabolic water production. Fardiaz (1989) stated that during fermentation, the microorganisms use carbohydrates as an energy source to produce H_2O and CO_2molecules. Most of the H2O molecules remain in the product, therefore, the moisture content of the product increased.

Table 1. Average dry matter, organic matter, and crude protein content of treated palm fronds

Factor A	Factor B			Average
	10	20	30	
Dry Matter				
Mol	36.99	32.47	29.88	33.11
Crude Enzym	37.27	34.85	32.13	34.75
Average	37.13[a]	33.66 [a]	31.01[b]	SE= 1.85
Organic Matter				
Mol	93.40[aA]	92.54 [aA]	94.27 [aA]	93.40
Crude Enzym	93.30 [aA]	92.97 [aA]	92.96 [aA]	93.08
Average	93.35	92.76	93.61	SE = 0.3
Crude Protein				
Mol	7.29	7.04	7.36	7.23
Crude Enzym	6.70	6.91	7.38	7.00
Average	7.00	6.97	7.37	SE = 0.85

Note: Superscripts (a, b, c) indicate significant differences within the rows and (A,B) in the column ($P<0.05$)

The Organic Matter Content

The results of the analysis of diversity showed that there was an interaction significant effect between the type of inoculums and the dosage of inoculums use on the organic matter content of palm oil fronds ($P<0.05$). This shows that the treatment using local microorganisms and crude enzyme products by local microorganisms was influenced by the dosage inoculums. No matter how good the enzymes found in rumen content of crude enzymes work without using the right dose, the results will not be optimal. The higher the organic material contained in the feed ingredients, the higher the nutritional content in the material (Muhtaruddin *et al*., 2018), because in the organic material there are carbohydrates, fats, proteins, and vitamins. In this study, the organic matter content of oil palm fronds was similar with the organic matter content of fermented palm fronds in Haq *et al*. (2018) researched was 93.76%. The increase in organic matter content is thought to be influenced by the activity of microorganisms (Schnecker *et al*., 2014) because, in the fermentation process which causes the breakdown of substrate content, the micro-service activity causes changes that affect nutritional value. According to the Indonesian National Standard (SNI3148.2: 2009), the maximum content of ruminant feed ash is 12% of the total material (Directorate General of Animal Husbandry and Animal Health,2009). It meaning the organic matter content was 82%.

The Crude Protein Contents

Based on the analysis variant, it shows that there is no interaction ($P>0.05$) between the type of inoculum and the dosage on palm fronds. Based on the data in Table 1, it describes the crude protein content of palm fronds after treatment ranging from 6.70 to 7.38%. These results indicate an increase in the protein content of palm fronds in all treatments Suryani research (2016) showed that the crude protein content of oil palm fronds was 2.23%, crude fiber 47.00%, crude fat 3.04%. When compared with the results of this study with Suryani et alresearch (2016), there was an increase in crude protein content of 200% (2.23% vs 6.70%). The crude

protein content of the results of this study is higher than the research of Rizali *et al*. (2018) which ferments palm fronds with several *Trichoderma* sp. with protein content ranging from 4.48-5.35%. The increase in crude protein content of palm fronds in this study was a contribution of the microbes found in local microorganisme. Diether and Willing, (2019) statedthat increases in crude protein might be affected by the additional protein of the microbes. Wahab *et al*. (2014)found that decreases in crude fiber content wereaccompanied by increases in other nutrients, such asorganic matter and crude protein.

CONCLUSION

Based on this research data, it can be concluded that the different dose treatment of palm oil fronds with local microorganisms and crude enzymes affects the dry matter, and there was interaction effect on the both factor treatment of organic matter content. No difference effects the treatment with the crude protein content but the treatment can improve the crude protein content compare without treatment.

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