Running head : supplementation complete feed based on oil palm frond for Kacang Goats

DIETARY SULFUR AND PHOSPHORUS SUPPLEMENTATION ON KACANG GOATS FED DIET CONTAINING FERMENTED OIL PALM FRONDS

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ABSTRACT

The research purpose to evaluate the effect of sulfur and phosphorus supplementation in the complete feed-based fermented oil palm fronds (OPF) on the nutrient digestibility, consumption of feed, average daily gain, and feed efficiency of Kacang goats. Using the completely randomized design by 4 treatments with 4 replicates for the analysis in vitro method of diet and a block randomized design for the performance of goats in this research. The diet treatment consisted of 40% fermented OPF + 60% concentrates. The dietary

treatments consisted of R1 = control ration (40% fermented OPF + 60% concentrate) without sulfur and phosphorus supplementation. R2 = R1 + 0.4% sulfur, R3 = R1 + 0.27% phosphorus, and R4 = R1 + 0.4% sulfur + 0.27% phosphorus. The results of this experiment showed the significant effect of the sulfur and phosphorus supplementation in the complete feed on dry matter and organic matter digestibility ($p<0.05$), but no effect on; crude; protein, fiber, and the performance of goats. It could be concluded that the sulfure and phosphorus supplementation had no effects on feed intake, daily gain, and feed efficiency of Kacang goats.

Keywords: Sulfur, phosphorus, complete feed, oil palm frond, fermented

INTRODUCTION

Indonesia is one of the largest producer plantation of palm oil in the world's with a total area of approximately 11,300,400 ha (Statistic Indonesia, 2019). Plantation technology has reached to zero waste. Almost every part of the tree has been studied for its application in various fields including energy, food, materials, manufacturing and so forth. In the field of veterinary, the oil palm leaves or pruned oil palm fronds (OPF) have been found suitable for feeding the goats. The availability of OPF has the potential to be used as ruminant feed as a substitute for forage. Warly et al, (2017). The dry matter and crude protein digestibility of 60% OPF in Simmental cattle were 59.40 % and 59.40%. Unfortunately, the disadvantage of OPF have their high lignin content and the low of digestibility nutrients. Astuti's researched (2017) the lignin content of OPF mixed with concentrate was 11,64%. The dry matter

and organic matter digestibility of OPF was 35,47% and 53,68% (M. Tahsin, et al, 2018).

The technology of fermentation could improve the nutritional contents of feeds, and increase their biological values when being utilized by animals (Steinkraus, 2002). Some fermentation studies of animal feeds used commercial microorganisms of fungi, bacteria, and others, but in this research, the OPF were fermented by the source of the local microorganism of the rumen liquor. Astuti et al. (2016) use of local waste as a source of microorganisms was very profitable because of the cheaper cost and the process was easier. Furthermore, Astuti et al. (2019) reported that fermentation process OPF by local microorganisms of the rumen liquor, and Lactobacillus sp. with the addition of water-soluble carbohydrates could decrease the content of ADF, NDF, cellulose, and lignin of OPF. Akin et al. (1983) described that the microbes could be stimulated by adding sulfur, and improved animal weight gain. Rumen microbes could use sulfur to synthesize sulfur-containing amino acids (Karto, 1999). Sulfur (S) is part of cysteine and methionine (Richter, 2011) and a precursor for the other S-containing amino acid **(**NRC, 2000). Sulfur deficiency decreased the growth of rumen microbes and reduced their contribution to forage digestion (Bal and Ozturk, 2006). A lower phosphorus content in the rumen causes reduce rumen microbial growth and thereby reduces cellulose degradation (Witt and Owens, 1981). This researc purpose to analyze the effect of sulfur and phosphorus supplementation in complete feed-based fermented OPF on the production performance and nutrient digestibility of Kacang goatsThe supplementation of sulfur and phosphorus in the diet

treatment be thought to affect the digestibility of nutrients and the production performance of goats

MATERIALS AND METHODS

Feed preparation

The rumen liquors were taken from the abattoir and put into a tube, added with sugar and coconut water to feed microorganisms, then incubated for 10 days with anaerobic (Astuti et al., 2016). This mixture was called local microorganisms. Crushed OPF was mixed with these local microorganisms and then incubated for 7 days to generate the fermented OPF

The complete feed was composed of fermented OPF (as a forage) and concentrate mixture. The ration formulation consisting of forage and concentrates base on the nutritional requirements of Kacang goats. The mixture or complete feed was made into biscuit by pressing and drying procedures, and each biscuit had a dimension of $5 \times 7 \times 2$ cm^3. The complete feed biscuits were light brown in color cause of a non-enzymatic browning reaction. The purpose of making biscuits is to reduce dust, increase palatability, reduce feed residue, reduce feed volume, and facilitate handling, storage, and transportation (Saenab et al., 2010).

Experimental animals

A total of 16 Kacang goats (body weight ranged from 9.5 to 24.7 kg) were employed in the present experiment. Guideline for ethics study of experimental animals based on the law of the Republic of Indonesia number 18 of 2009 about Animal livestock and animal husbandry. All the goats were placed in individual cages and received experimental diets at a level start of

3% body weight on a dry matter basis. Kearl (1982) stated that the nutrient requirement of goat (BW10-20 kg, ADG 75 g) is about 3.1-3.5% of body weight). The goats were obtained from the farmers who have kept the previous extensification. Thus, it need the preliminary and introduction fase before starting experiment.

Experimental design and data analysis

The research design has done using a completely randomized with four treatments and four replicates. The dietary treatments consisted of R1 = control ration (40% fermented OPF + 60% concentrate) without sulfur and phosphorus supplementation. R2 = R1 + 0.4% sulfur, R3 = R1 + 0.27% phosphorus, and R4 = R1 + 0.4% sulfur + 0.27% phosphorus. A block randomized design was used to evaluates the performances of goats. The formulation of ration treatment were presented in Table 1.

The observed variables in the present study were nutrient digestibility such as dry matter (DM), organic matter (OM), crude protein (CP) and crude fiber (CF) digestibilities. The performances of goats such as feed intake, daily gain, feed efficiency wee also measured. Moisture, CP, CF, and ash were analyzed using the AOAC method (AOAC, 2011), while the nutrient digestibility was measured using an *in vitro* rumen fermentation technique (Tilley and Terry, 1963).

The analysis of variance used to analyze all data and continued using Duncan's multiple range tests when a certain variable showed significance at $P<0.05$.

RESULTS

Nutrient Digestibility

The nutrient digestiblity of the experimental diets is presented in Table 2. The experimental results showed that dry matter and organic matter digestibilities were significantly affected ($P<0.05$), whereas crude fibre and crude protein digestibilities did not signficantly affected ($P>0.05$). It was showed that R1 had more lower DM digestibility than R2,

Performance of Kacang Goats

Table 3 shows the effect of experimental diets on feed intake, feed efficiency, and daily gain of Kacang goats. Experimental results shows that feed intake, feed efficiency and daily gain were not siginficantly affected by the treatments ($P>0.05$).

DISCUSSION

Nutrient digestibility

It is quite interesting that the 0.4% sulfur in the feed formulation (R2) had higher the digestibility of both dry matter and organic matter as compared with the phosphorus (R3) and the sulfur-phosphorus mixture (R4). The supplementation of sulfur and phosphorus to the complete feed based on OPF may be unable to optimize the functioning of rumen microbes to produce the fiber and protein digestive enzymes. Tahsin et al. (2018) reported that the digestibility of DM and OM of fermented OPF were 58.56 and 73.88%, respectively.

The sulfur supplementation failed to improve the crude protein and crude fiber digestiblilities. it is possible that the dose of sulfur was unadequate to upgrade the functioning of rumen microbes. This result was different from Zain et al. (2010) who reported that sulfur supplementation to the rice straw ammoniation could improve the DM, OM, CP, and CF digestibilities.

Performance of Kacang goats

The supplementation of sulfur and phosphor to the complete feed based on fermented OPF did not affect the palatability resulting in similar feed intake. The feed intaked on this research about 462-480 gram/ head/day. The result of this research was similar to the research of Nurhaita et al. (2014) who declare that the average of feed intake ranged from 307,25% - 375,79% g/head/day. The feed inatke result of this research was lower than Musnandar et al (2011) who reported that the average of feed intake was 895.87 g/day.

The goats weight daily gain, feed intake, and feed efficiency were not affected by sulfur and phosphor supplementation. The daily gain of goats research about 16.6 - 52.2 gram/day, and the highest on R1 treatment (control ration without supplementation S and P). This was because the Kacang goats have typically small size of weight and the low of daily gain (Setiadi, 2003), and suspect doses of suplementation S and P not affect the activity rumen microbe of goats in this research.

The result of this researched was similar with the saragih resulted (2014) that used OPF silage as feeding of kacang goats, and getting about 9.14 – 50.57 gram/head/day daily gain.

CONCLUSION

Supplementation of sulfur and/or phosphorus improved DM and OM digestibility but had no effects on CP and CF digestibility. The supplementation had no effects on feed intake, daily gain and feed efficiency of Kacang goats.

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CONFLICT OF INTEREST

The author state that there is no conflict of interest for this article

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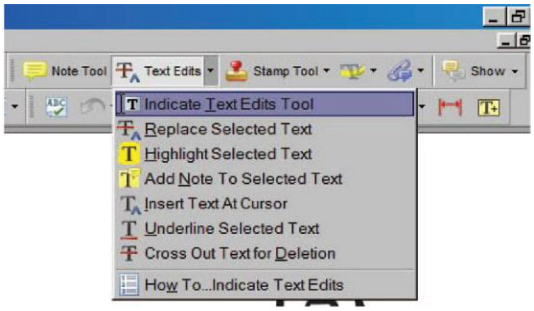

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