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Supplementation of Trace Minerals and Nuleotides in Concentrate Containing Moringa Leaf Flour on Consumption and Nutritional Digestibility of Pregnant Goats

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ABSTRACT: This study aims to evaluate trace mineral and nucleotide supplementation in concentrate feed containing Moringa leaf flour on the consumption and nutritional digestibility of late pregnant goats. This research was carried out at the Feed Chemistry Laboratory and Field Laboratory, Faculty of Animal Husbandry, Marine Fisheries, Undana for 3 months. The livestock used in this research as test material for the use of concentrate feed containing Moringa leaf flour supplemented with trace minerals and nucleotides were late pregnant goat mothers aged 8 months - 1 year. This research used an experimental method with a 4x3 randomized block design, namely 4 weight groups and each was repeated 4 times. There were also treatments in this study as follows: R_0: pregnant mother goats were given field grass forage (control), R_1: R_0+Concentrate containing Moringa leaf flour, R_2: R_1+supplementation of 100 mg of trace minerals and nucleotides in 1 kg of concentrate based on dry matter, R_3 : R_1+ supplementation of 150 mg trace minerals and nucleotides in 1 kg concentrate on a dry matter basis. Feeding is based on the dry matter requirements of ruminants, namely 3.5% of body weight, with a balance of 70% natural grass and 30% concentrate. The results showed that the treatment had a significant effect of $p<0.05$ on crude protein consumption, energy and crude protein and energy digestibility with the average value for each treatment on crude protein consumption (g/h/d) $_R0$ 23.37±2.76, R_1 48 .92±6.25, R_2 49.82±6.64, R_3 49.96±7.10, Energy Consumption (kcal/h/d) R_0 944.73±111.42, R_1 1555.28±201, 78, R_2 1582.51±220.04, R_3 1594.11±236.58, Crude Protein Digestibility (%) R_0 53.04±2.07, R_1 65.92±2.30, R_2 68.74±2 .89, R_3 72.80±5.17, Energy Digestibility (%) R_0 67.66±2.64, R_1 75.60±3.99, R_2 76.23±2.02, R_3 76.32±3.58. So it was concluded that supplementation of trace minerals and nuclotides in concentrate feed had an effect on increasing crude protein consumption, energy, crude protein digestibility and energy in late pregnant goats.

KEYWORDS: Concentrates, Local pregnant goats, Nucleotides, Supplementation, Trace minerals.

INTRODUCTION

Goat development has good prospects because it is an integral part of integrated farming in East Nusa Tenggara (ENT). The business system is small scale and still traditional, where livestock are released to find their own food, so this is a farming pattern that is commonly used by breeders. In ENT, goat farming is a commodity that is commonly raised on a small scale to support the family economy and consume animal protein.

Peanut goats as local goats have the advantage of being able to produce in less supportive environments and peanut goats have a relatively small body size and relatively low growth. In addition, food in the pasture fluctuates following seasonal changes, causing high mortality rates for the cempe that are born. This is because during pregnancy, mother goats do not receive enough nutritional intake such as protein (amino acids), energy, vitamins and minerals, especially during the peak of the dry season, even though during the rainy season it is sufficient.

In increasing the production of late pregnant goats, one effort that can be made is providing additional feed which aims to increase the growth and development of the fetus both during pregnancy and after birth. One of the ingredients that can be used in making concentrate is the Moringa plant. The Moringa plant *(Moringa Oleifera, Lam*) is a food source that has the potential to be used as animal feed. This plant is able to adapt to almost all tropical regions and has high nutritional content [1]. It was further stated that the crude protein content of Moringa leaf flour ranges from 27 -36.5% with complete amino acid content, both essential and non-essential. Apart from that, Moringa also contains high levels of macro-micro nutrients. Based on the results obtained by [2], there are 18 types of essential amino acids and are rich in bioactive compounds, so Moringa leaves have the potential to be used as a food

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ingredient antioxidants for digestive diseases, as well as amino acids, essential minerals that are needed in nutritional metabolism and livestock reproduction [3]. To increase the efficiency of using concentrate feed, it is necessary to add alternative antibiotics to increase production efficiency and modulate the intestinal microbiota, thereby ensuring the function of the immune system and animal health [4] thereby maximizing the performance of microbes in digesting nutrients for needs mother and fetus. However, the use of antibiotics as growth promoters is still limited due to the relationship between antibiotic use and the selection of resistant bacteria [5]. One alternative to using antibiotics as growth promoters is the use of nucleotides [6], because concentrate ingredients generally lack nucleotides. Nucleotide requirements in animals during the growth period and pregnancy period are very important [7]. Nucleotides are essential for cell growth and division and are essential for the rapid proliferation of cells such as intestinal mucosa and immune cells. Thus, the nucleotide requirements of animals are high during periods of rapid growth and gestation as well as the post-weaning period.

Meanwhile, trace minerals are essential micro minerals, even though the need is small, they will be quite detrimental to production and reproductive performance, conditions where the minerals are lower than needed will result in reduced growth and fertility. For feedlots (fattening), this is something that is very important, because the business depends on the growth of cows. Meanwhile, in breeding, fertility plays a very important role. When you have been given good trace minerals, in the sense of sufficient quantity and good quality, this quality is more about the level of absorption, then there will be an increase in immunity. Then increasing metabolic function and increasing enzyme function, this will certainly cause livestock to become more resistant to stress. If the ratio of macro nutrients and micro nutrients is balanced, you will achieve a good level of health and optimal performance.

Thus, trace mineral and nucleotide supplementation can be a possible alternative in feed as a growth promoter in the final pregnancy phase of goats. This research aims to determine the supplementation of trace minerals and nucleotides in concentrate feed containing Moringa leaf flour on the consumption and nutritional digestibility of late pregnant goats.

RESEARCH METHODOLOGY

This research was carried out at the Feed Chemistry Laboratory and Field Laboratory, Faculty of Animal Husbandry, Marine Fisheries, Undana for 3 months. The livestock used in this research as trial material for the use of concentrate feed containing Moringa leaf meal supplemented with trace minerals and nucleotides were late pregnant goats aged 8 months - 1 year, and used forage ingredients in the form of natural grass. As for the composition of the concentrate feed ingredients and the nutritional content of the treatment rations are presented in Tables 1 and 2.

Table 1. Composition of ingredients in concentrate feed

Ingredients	Presentase (%)
Rice bran	40
Ground corn	10
Banana Peal Meal	20
Moringa leaf meal	25
Salt	2,5
Urea	2
Probiotics starbio	0,5
Total	100

Table 2. Nutrient Content of Research Rations.

Ingredients	%DM	OM (%DM)	CP (%DM)	C Fat (%DM)	CF (%DM)	CHO (%DM)	NNFE (%DM)	Energy MJ/kg DM	Energy Kcal/kg DM
Natural Grass	19,27	79,85	8,64	1,53	24,18	69,68	45,50	14,67	3.493,02
Concentrate	81,54	80,02	16,38	4,59	18,43	59,05	40,62	15,75	3.750,38

Note: Results of analysis of the Feed Chemistry laboratory, Faculty of Animal Husbandry, Marine and Fisheries, Nusa Cendana University, DM; dry matter, OM;Organic matter, C fat; Crude fat, CF;crude fiber, CHO; carbohydrate, NNFE; Non nitrogen free extract.

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Research methods

This research used an experimental method with a 4x4 randomized block design, namely 4 weight groups and each was repeated 4 times. There are also treatments in this research as follows:

R_0 : pregnant goats given field grass forage (control)

R_1 : R_0 + Concentrate contains Moringa leaf flour

R_2 : R_1+ supplementation of 100 mg trace minerals and nucleotides in 1 kg of dry matter based concentrate

R_3 : R_1+ supplementation of 150 mg trace minerals and nucleotides in 1 kg of dry matter based concentrate

Feeding is based on the dry matter requirements of ruminants, namely 3.5% of body weight, with a balance of 70% natural grass and 30% concentrate.

Research Procedures

Preparation of trial livestock

Before the experimental livestock were used, a pregnancy check was carried out first to determine the pregnancy age of the goats, then the livestock were weighed to determine the initial weight, as a reference for feeding according to dry matter requirements and grouping based on a Randomized Block Design to then be given treatment rations.

Preparation of ingredients and feed formulation

All feed ingredients needed to simulate concentrate feed formulation are collected and then dried and finely ground to reduce the size and particles of the feed and used as ingredients for concentrate feed. Next, trace minerals and nucleotides are added according to the treatment.

Variables studied

1. Consume crude protein = [Total ration consumed (g) × (% DM) × (% CP feed)]
2. Crude Protein Digestibility (%) : $\frac{consume\ CF\ feed - Excretion\ CF\ feces}{consume\ CF\ feed}$ x 100%
3. Consume Energy = [Total ration consumed (g) × (% DM) × (% Energy feed)]
4. Energy Digestibility (%) : $\frac{\text{Consume Energy} - \text{Excretion Energy feces x 100\%}}{\text{Consume Energy}}$ x 100%

Data analysis

The data obtained were tabulated and calculated then analyzed using Analysis of Variance (ANOVA) according to the Randomized Block Design to determine the effect of treatment [8].

RESULTS AND DISCUSSION

Adding feed supplements to goats with the aim of increasing growth and reproductive performance. In general, supplement feed is useful for livestock to complement the food substances needed by the body so that it can produce optimally, therefore supplement feed must contain elements of vitamins, minerals, amino acids, carbohydrates and protein. The protein content in ruminant feed is very important to improve productive performance, while carbohydrates act as a source of energy for basic living needs and production. Nutritional distribution during pregnancy has been proven to influence fetal growth and development and cempe mortality and greatly influences subsequent growth until adulthood. The following are the average consumption and digestibility of protein and energy in late pregnant goats supplemented with trace minerals and nucleotides.

Table 3. Mean consumption and digestibility of protein and energy

Parameter	Treatment				MSE
	R_0±SD	R_1± SD	R_2± SD	R_3± SD	
Consume crude protein (g/h/d)	23,37±2,76[a]	48,92±6,25[b]	49,82±6,64[b]	49,96±7,10[b]	4,66
Consume Energy (kcal/h/d)	944,73±111,42[a]	1555,28±201,78[b]	1582,51±220,04[b]	1594,11±236,58[b]	6,94

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Crude Protein Digestibility (%)	53,04±2,07[a]	65,92±2,30[b]	68,74±2,89[c]	72,80±5,17[d]	3970,7
Energy Digestibility (%)	67,66±2,64[a]	75,60±3,99[b]	76,23±2,02[b]	76,32±3,58[b]	9,85

Note: different superscripts in the same row show significant differences P<0.05, g/h/d; gram/head/day, MSE; mean square error

Effect of treatment on consumption and digestibility of crude protein

The data in table 3 shows that the treatment had a significant effect of p<0.05 on crude protein consumption and digestibility. This was caused by the addition of concentrate feed in the ration which caused differences in crude protein consumption, whereas in treatments supplemented with trace minerals and nucleotides it was able to make a difference in crude protein digestibility. According to [9] minerals are a nutritional component that has an important role in the growth, health, production, reproduction and immunity of animals. Meanwhile, the use of nucleotides in this research aims to reduce stress levels in peanut goat mothers as a result of heat stress and nutritional stress that occur during the dry season. This is in line with the opinion of [10] that when under conditions of heat stress, the need for nucleotides in the body increases. This increase is used to reduce heat stress produced by the body. Heat stress will affect changes in the weight of organ immunity so that the body's resistance [11]. Giving nucleotides can increase the relative weight of organ immunity [12], further added by [13] increasing the relative weight of immune organs is influenced. Yeast extract which is rich in nucleotides indicates good humoral immunity because of the large number of lymphocytes that are synthesized.

Based on the results of Duncan's further tests, it showed that in terms of crude protein consumption, the R_0 treatment was very significantly lower than treatments R_1, R_2 and R_3, while in terms of crude protein digestibility, the R_0 treatment was very significantly lower than treatments R_1, R_2 and R_3, the R1 treatment was different. significantly lower compared to treatments R_2 and R_3 and treatment R_2 also showed a significantly lower difference compared to treatment R_3. This difference is due to the supplementation of trace minerals and nucleotides in the ration, the higher the level of supplementation, the more crude protein digestibility of pregnant goats increases. According to [9] Ruminants need minerals, but ruminant mineral needs are influenced by several factors such as age, pregnancy status and lactation status. Added by [14] Minerals transported for fetal development and subsequently the health of newborn calves depend on the mother's mineral intake and status, minerals continue to have an impact on offspring health through colostrum and milk quality. Meanwhile, the addition of nucleotides is semi-essential and is needed in the growth process and plays a role in the cell division process of living organisms, including the performance of immune organs [15]. added [16] that 2 – 5% of nucleotide supplements are in the small intestine, liver and muscle tissue. [17] added that nucleotide requirements can be influenced by several factors, including rapid growth, sick livestock, temperature and environmental conditions and nutritional deficiencies in feed.

Effect of treatment on energy consumption and digestibility

The data in table 3 shows that the treatment had a significant effect of p<0.05 on energy consumption and digestibility. This is because the addition of concentrate feed in the ration causes differences in energy consumption, whereas the treatment supplemented with trace minerals and nucleotides also has the same effect on energy digestibility in pregnant goats. According to [9] the mineral needs of ruminant livestock are influenced by several factors such as age, body weight and production stage. Imbalances between certain minerals can also affect ovarian function through a blocking action on the pituitary gland [18]. The role of minerals in the endocrine system and its integrity is very necessary for fertility and follicle development [19]. Meanwhile, nucleotides in the body cannot be fulfilled endogenously due to certain conditions such as stress and the healing process. According to [10], under normal conditions the endogenous need for nucleotides is met, but under stressful conditions the need for nucleotides increases.

Based on the results of Duncan's further tests, it showed that the R_0 treatment was very significantly lower than the R_1, R_2 and R_3 treatments on energy consumption and digestibility. This is due to the supplementation of trace minerals and nucleotides in the goat's diet, which causes increased energy metabolism as a form of immunological response. According to [17] Lack of nucleotides in the body can cause damage to immune cells. Lymphocyte cells in lymphoid tissue continue to be produced, so the availability of nucleotides must be maintained. Added [10] that Nucleotides play a role in contributing to energy metabolism, increasing phagosity

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or immunological responses including the cellular and humoral immune systems as well as the formation or multiplication of new cells. In conditions of rapid growth, stress or illness, animals are unable to meet sufficient nucleotides in their own bodies. Nucleotides play a role in the activation of lymphocytes, as energy metabolism and precursors of nucleic acid synthesis. This role also helps the proliferation of lymphocyte cells. Exogenous addition of nucleotides is necessary to ensure optimal lymphocyte proliferation [16]. Meanwhile, mineral use is closely related to the reproductive ability of ruminants [20]. Mineral excess or deficiency can result in repeated mating [21]. Reproductive failure can be caused by a deficiency of one or several types of minerals and the harmony between one mineral and another [22]. Deficiency, imbalance and toxicity of certain minerals will cause reproductive disorders [23].

CONCLUSION

Based on the results and discussion above, it can be concluded that supplementation of trace minerals and nuclotides in concentrate feed has an effect on increasing crude protein consumption, energy, crude protein digestibility and energy in late pregnant goats.

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