Milk Production of Ettawah Grade Goat Fed Diet Containing Different Protein and Energy Contents Supplemented with Organic Mineral and Grapes Seed Oil

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Submission date: 04-May-2023 10:03PM (UTC+0700)
Submission ID: 2084131246
File name: uktiani_2018_IOP_Conf._Ser.__Earth_Environ._Sci._119_012051.docx (364.95K)
Word count: 2236
Character count: 11792

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Abstract

This study aimed to investigate the effect of different protein and energy contents and supplementation ofZinc (Zn), Chromium (Cr) and grapes seed oil on milk production in dairy goat.Randomized block design(RBD) was used in this study. Twelve lactating Ettawah crossbreed goats divided into three groupsbased on milk production. The treatment ration were:T1 = ration containing 16% CPand 66% TDN ;T2 = ration containing 14% CP and 63% TDN supplemented with Zn 20 ppm + Cr 2 ppm; and T3 = T2 + 22 ml grapes seed oil/head/day. The ration wasa dry complete feed in the form of pellet. The feed ingredients used were rice bran, cassava, wheat pollard, soybean meal, coconut meal, molasses, coffee husk and corn straw.Experiment was conducted over 30 days. Results revealed that the goat fed the ration supplemented with Zn and Cr(T2) producehigher milk yield (1012.29 g/day) and better in milk fat production (P<0.05)compared to those fedT1 and T3. Feed intake was decreased in treatment supplemented with grapes seed oil in the T3 (P<0.05), but no significant in milk fat production compared with T1. In conclusion,drycomplete feed containingof CP 14%, TDN 63% supplemented with Zn 20 ppm + Cr 2ppm is recommended for lactating dairy goat.

1. Introduction

Goats are foliage eaters (browsers), but in the lowlands especially in the dry season, this feedstuff is very limited. Therefore, alternative feeding is required, which is available throughout the year.Complete feed is one of the right solutions. Complete feed is a nutritionally adequate feed for animal by specific formula, to be fed as the sole ration and is capable of maintaining life and promoting production without any additional substance being consumed except water [1]. The complete feed is a blend of concentrate feed and fiber source [2].

In Indonesia the most common type of dairy goat is the EttawahCrossbreed goat, which is a descendant of Ettawah goat from India mated to local goat. The EttawahCrossbreedgoat has the ability to produce milk which is not different from the Ettawah goat, which is 1.5 - 3.7 kg / day [3] but in the lowlands the production of goat milk of PE is less than 1 kg / day, ie between 90-572 grams / day [4] or 440-590 ml / day [5]. This is due to the failure of goat maid adaptation to the environment, both to the environment temperature and feed according to the nutrient requirement. Complete nutrient feed composition for childcare, fattening and breeding purposes is different, especially in crude protein content (PK) and total digestible nutrients (TDN) [7].Therefore it is necessary to find level energy and protein content for lactating goats.

Zinc supplementation (Zn) needs to be done, because the mineral content of Zinc in feed ingredients in Indonesia is generally less, while the requirement of goats is 10-50 ppm depending on the physiological conditions [7]. Chromium (Cr) minerals in physiological form as glucose tolerance factor (GTF) play a role in increasing insulin activity and insulin like growth factor-I (IGF-I), it cause uptake of amino acid and glucose into cells mammary gland increased [8].Glucose is the main precursor of milk lactose synthesis,therefore the supplementation of Cr will increase the synthesis of milk lactose and milk production.The addition of oil to lactating dairy goat ration was one method to increase energy. Grapes seed oil containinghigherpolyunsaturated fatty acids compared with sunflower seed oil. Polyunsaturated fatty acidhave no negative effect to rumen fermentation.Morsy et al.[9] obtained that giving sunflower seed oil to goats as much as 20 ml per head per day could increase the production of acetate and NH_3 rumen. The purpose of this study was to find the proper energy and protein content and to examine the effect supplementation of mineral organic and grapes seed oil on dairy goat to support milk production.

2. Materials and Methods

The research was conducted in experimental enclosure of Faculty of Animal Husbandry and Agriculture Diponegoro University of Semarang. Twelve lactating Ettawah crossbreed goats with an average live body weight 42.14±3.25 kg and in first lactating seasons were used in this experiment. Goats were divided into three groups based on milk prodoctionto be fed treatment ration.

2.1. Experimental design.

The study was prepared based on randomized block design with 3 treatment and 4 replications. The experimental dietswere :T1 = ration containing 16% CP and 66% TDN ; T2 = ration containing 14% CP and 63% TDN supplemented with Zn 20 ppm + Cr 2 ppm; and T3 = T2 + 22 ml grapes seed oil/head/day.

2.2. Ration

The shape of ration is dry complete feed in the form of pellet. The feed ingredients used were rice bran, cassava, wheat pollard, soybean meal, coconut meal, molasses, coffee husk and corn straw. Samples of treatment ration were analyzed with proximate analysis method [10].The nutrient composition of the rations as listed in Table 1.

Zn and Cr minerals used were Zn-proteinate and Cr-proteinate produced by Laboratory of Nutrition and Feed Science , Faculty of Animal Science and Agriculture, Diponegoro University. The Znproteinate containing Zn at 1501.36 ppm, while Crproteinatecontaining at 166,67 ppm.The feedingexperiment was conducted for 7 days of preliminary and 30daysof treatment period.

2.3. Parameter and data analysis

The parameters observed were daily dry matter intake and daily milk yield. Fat,protein and lactosa contentsof milk composition were analyzed with Lactoscan. All the data obtained were statistically analyzedusing a variance analysis and if there were differences between treatments followed by Duncan's Multiple Range Test [11].

Table 1. Ration nutrient compositions with different protein and energy level.

Nutrient	Treatments	
	T1	T2
Crude protein (%)	16.67	13.92
Total Digestible Nutriens ,TDN (%)	66.58	63.22
Crude fiber (%)	22.06	24.75
Ether extract (%)	3.5	2.87
Ash (%)	8.39	8.76
Nitrogen free extract (%)	49.38	49.7
Calcium (%)	0.54	0.61
Phosphor (%)	0.47	0.52
Zinc (ppm)	22.57	46.11
Chromium (ppm)	1.87	3.29
Neutral Detergent Fiber (NDF)	42.34	40.11
Acid DetergentFiber (ADF)	26.02	23.96

3. Results and Discussion

Feed intake, milk yield and feedconversion are listed in Table 2. It can be seen in the table that ration treatment has a significant effect on dry matter intake, milk production and feed conversion. The dry matter intake was decreased in the addition of grapes seed oil (T3). The decrease of dry matter intake was caused by the increase of the ration energy due to the addition of grapes seed oil. Addition of 2% oil can cause TDN increase between 4-4,5%. The fact occurred was agree to that described by [12], that the higher level of energy in the diet gives the lower feed intake. On the other hand dry matter consumption between T1 and T2 are not significantly different. This means that Zn and Cr supplementation in low quality rations (CP 14%, TDN 63%) can increase consumption equivalent to high quality rations (CP 16%, TDN 66%). Dry matter intake in this study was lower than [9] and [4], which found that goats weighing 44-51 kg could consume dry matter above 1000 g/day. The low intake in this study was possibly due to the form of ration, which is dry complete feed without fresh forage.

Milk yield was increased with supplementation of Zn and Cr also with grapes seed oil ($P<0.05$). The increased of milk yield obtained with Zn and Cr may be due to the increased digestibility of feed. [13] explains that Zn minerals are trace minerals that are the compilers of 300 kinds of digestive and metabolismenzymes. Furthermore,the addition of Cr will increase the availability of glucose for lactose synthesis. This is in agreement with the statement of [8] that Cr in the form of glucose tolerance factor can increase the potential of insulin activity that causes uptake of glucose and amino acids into udder gland cells increases.Supplementation of grapes seed oil increased the energy but decreased dry matter intake, this is due to increase milk yield higher than T1 but lower than T2. In relation to both parameters, T2 and T3 treatments resulted in better feed convention than T1 treatment. Although the T2 and T3 feed conversions were not significantly different, T2 treatment was recommended for lactating goats because they could enhance milk production.

Table 2. Dry matter intake and milk yield due to treatment effect.

Parameter	Ration treatment		
	T1	T2	T3
Dry matter intake (g/d)	939.92[a]	963.40[a]	859.62[b]
Milk yield (ml/d)	801.96[c]	984.17[a]	891.85[b]
Milk yield (g/d)	826.74[c]	1013.40[a]	919.51[b]
Feed conversion	1.14[a]	0.95[b]	0.93[b]

Mean with different superscript indicates significantly different (p<0,05).T1 = ration containing 16% CP and 66% TDN; T2 = ration containing 14% CP and 63% TDN supplemented with Zn 20 ppm + Cr 2 ppm; and T3 = T2 + 22 ml grapes seed oil/head/day

Based on the contents of milk fat, protein and lactose, Table 3 listed production of milk fat, milk protein and milk lactose. Milk fat production was higher in ration supplemented with Zn and Cr (T2) compared withthose inT1 and T3 (p<0.05).

Table 3.Milk fat, milk protein and milk lactose yield due to treatment effect

Parameter	Treatment		
	T1	T2	T3
Milk fat yield (g/day)	44.00[b]	59.08[a]	49.22[b]
Milk protein yield (g/day)	26.47	31.03	28.64
Milk lactosa yield (g/day)	48.56	52.07	47.80

Mean with different superscript indicates significantly different (p<0,05).T1 = ration containing 16% CP and 66% TDN ; T2 = ration containing 14% CP and 63% TDN supplemented with Zn 20 ppm + Cr 2 ppm; and T3 = T2 + 22 ml grapes seed oil/head/day

Milk fat contains long-chain fatty acids and short chains. Short chain fatty acids are synthesized from acetate and beta hydroxybutyrate. Both fatty acids are the result of digestion of fiber feed in the rumen. [14] found that Zn supplementation of 20 mg per kg increased the digestibility of acid detergent fiber (ADF). While Cr supplementation in ration can contribute uptake of glucose, which is the raw material of alpha glycerol phosphate in milk fat synthesis. The addition of grapes seed oil can produced milk fat equivalent to T1 treatment, this is beneficially for farmers because the price of ration is cheaper.

4. Conclusion

It could be concluded that feeding dry compete feed containing CP 14% and TDN 63% suplemented with Zn 20 ppm and Cr2 ppm recommended for lactating dairy goat.

Acknowledgments

Author would like to thank to Diponegoro University for funding this project through professorship research program.

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