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INCREASING PRODUCTION AND QUALITY OF GOAT MILK BY MANAGING MILKING FREQUENCY AND GIVING EXERCISES

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ABSTRACT

⁴ The aim of this experiment was to evaluate the effect of frequency of milking and duration of exercises on production and composition of crossbred Ettawah goat milk. Sixteen first-early lactating crossbred Ettawah goats were allocated into four treatments in factorial (2 x 2) arrangement based on completely randomized design. The first factor was the frequency of milking (once and twice a day) and the second factor was duration of exercises (one hour and two hours a day). All goats were fed field grass ad libitum supplemented with one kilogram concentrate containing rice bran and coconut meal (1:1). Increasing frequency of milking from once to twice a day significantly ($P < 0.01$) increased milk production of crossbred Ettawah does, whereas increasing duration of exercises from one hour to two hours a day significantly ($P < 0.01$) reduced milk production. The highest production was achieved by the combination of milking twice and one hour exercises a day. The composition of milk components in this experiment were not affected by the frequency of milking and or duration of exercises. The results indicate that milking cross-bred Ettawah does twice a day and giving the goat one hour exercises a day is the best for milk production of lactating cross-bred Ettawah does.

Key words: Cross-bred Ettawah goats; milk production; milk composition; milking frequency and exercises.

INTRODUCTION

The Government of West Nusa Tenggara through the provincial Department of Livestock Services (Dinas Peternakan Provinsi) and a private agency have several times imported and developed crossbred of dairy Frisian Holstein cattle (PFH) as a pilot project to produce fresh milk to fulfill the needs of Mataram and West Lombok communities. However, those efforts were economically unsuccessful. The average milk production was only 8 litres per day, which was only a half of those produced in their origin, Malang, East Java. Those dairy cattle in Lombok Island, East Indonesia also has poor persistency (Lestari, 2006). The low milk production and poor persistency of those cattle in this region were due to poor nutrition and unsuitable environmental temperature (Asih, 2007). Even the offspring of those cattle were producing milk only 5.4 liter/day (Irmansyah, 2011).

The development of dairy goats is an alternative for fulfilling fresh milk needs of the West Nusa Tenggara communities (Asih, 2006). The biological productivity per kg body weight of dairy goats is 8 - 28% higher than those of dairy cattle (Devendra, 1975). They produce 1-3 kids in one birth and when the goats in ideal feed management, their milk production exceed the need for their

kids, which could be consumed by the owners. In West Nusa Tenggara, particularly in rural areas face problems of poor nutrition associated with limited availability of nutritious food as well as poor buying power and lack of understanding of the importance of good nutrition for their health. Commonly, farmers in rural areas raise animals not for supplying their animal protein need, but they sell them for other family needs. They pay a little attention on the need of good quality food for their infants result in malnutrition. The government efforts to solve those problems only for shorth periods of times by providing them nutritious food when the problem appears. It does not totally solve the problem. Hence, the problems will appear back if the food supply was terminated. Therefore, there is a need to formulate a more suitable and sustainable solution for increasing nutritious status of rural society by realizing them that the important of consuming nutritious food for their good health and providing themself the nutritious foods.

One of the alternative solutions is to assist them in producing nutritious food, e.g. fresh milk in their home by giving them a rotary packet assistance of 1-3 dairy does (Asih, 2006). Presently, this system is developing. However, the productivity is still relatively low due to, there is no properly managed. While research on dairy goat feeding and management in Indonesia is still lacking.

On dairy animals, theoretically, an alternative of several methods to maintain the milk production is by milking them regularly, even increasing daily frequency of milking could increase milk production, provided that the amount feed given also increased. Furthermore, to keep the goats' clean and hygiene milk production, they are kept in the cages all the time, considering the poor environmental condition in this area. In fact, this causes the does become stress and produce more adrenaline hormone which could inhibit the milk production. Therefore, the aims of this experiment was to investigate the effects of combination of daily frequency of milking and duration of exercises on milk production and composition of cross-bred Ettawah goats fed local feed resources such as field grass and a concentrate which consisted of coconut meal and rice bran.

MATERIALS AND METHODS

Sixteen lactating Crossbred Ettawah goats were randomly allocated into four groups of four goats each, based on factorial (2x2) and completely randomized design. The two factors were the frequency of milkings (A) and the duration of exercises (B). Detailed treatments were:

- A1B1 = milked once and one hour exercises daily,
- A1B2 = milked once and two hours exercises daily,
- A2B1 = milked twice and one hour exercises daily, and
- A2B2 = milked twice and two hours exercises daily.

During the first two weeks post parturition, the kids were leaved with their mothers to give sufficient colostrum and milk, then the does were transferred into the individual pens and their kids kept in group pen and identified accordingly to their mothers. The does were allowed to adapt to a new management in individual cages for two weeks and hand-milked twice a day. They were fed field grass ad-libitum and 1 kg concentrate consisted of 1:1 rice bran and coconut meal on the dry weight bases. The drinking water was also provided ad-libitum. Their milk production were measured and fed to their kids accordingly by using baby bottle. The amount of field grass and concentrate consumed by each goats were noticed for references feed given to each goat during the experimental period with 10% addition.

The experimental period was run for three months, where the goats were given field grass three times (07.00 AM, 12.00 PM and 05.00 PM) and the concentrate twice a day (08.00 am and 04.00 PM)). Feed refusals were collected and weighed every morning for calculating the daily nutrients intakes. The goats were hand-milked and the milk produced were noted. The goats in treatment A1B1 and A1B2 were milked only at 07.00 AM, while those in A2B1 and A2B2 were milked at 07.00 AM and 05.00 PM before last feeding of the field grass. The goats were allowed to have exercises for one and two hours for treatments having combination B1 and B2 respectively, after morning feeding. Fifty millimeter milk samples from each goats were collected weekly then kept in the freezer. Monthly milk samples from each goat were pooled, and analysed with two replicates for their composition according to AOAC (1984). The data were analysed using PROC GLM (Sas, 1990) and the differences among treatment means were tested for their significancies with Duncan's New Multiple Range Test (Steel and Torrie, 1991).

RESULTS AND DISCUSSION

Milk Production

Results of the experiment is presented in Table 1. Frequency of milking and the duration of exercises significantly ($P < 0.01$) affect milk production of the PE goats. The goats milked twice a day with one hour exercises produced more milk than those milked once a day. However, increasing the duration of exercises did not elevate the milk production, vice versa reduced milk production. It may be caused by the more time exercises; the more time we let the goats to spend energy and no feed surrounding them. Consequently, besides losing more energy, the goats also consumed less feed, therefore, the dry matter consumptions were reduced (Table 1). Too long exercises may reduced milk production because of more energy is used for physical movement, resulted in decreasing the milk production due to less energy is available for milk production. Furthermore, reduce the dry matter consumptions of the goats also caused declined milk productions. This study showed that the goats allowed to have one hour exercises tended to produce more milk than those allowed to have two hours exercises at similar frequency of milking. In fact, those goats milked twice a day with two hours exercises (A2B2) produced significantly ($P < 0.01$) less milk than those given one hour exercise (A2B1).

To maintain or to increase milk production, the goats should be given a regular one hour exercises and milked twice a day at a fixed time, a part from feeding enough amount of a good quality diet.

Overall, the average milk production in this first experiment was 0.59 ± 0.208 liter. The results was slightly lower, but still in a normal range of production of PE given field grass. It might also because of their first lactation. According to Asih (2004) milk production will increase in line with increasing the stage of lactation. This means that the milk production in this experiment still has a potency to be elevated for the next stage of lactation with the same treatments. Triwulaningsih (1986) showed that milk production of PE was 0,498 0,692 liter/day, with the peak production around 0.868 liters.

Milk production varied depending upon breeds. Devendra (1983) showed that the average milk production of Ettawah was 0.7-1.0 kg, in 140 days lactation period. In general 4-5 years old

dairy goats produced around 1-3 liter/day, (Asih, 2000; Atabany, 2001), including Saanen (Asih, 2001).

Table 1. Production performances of first lactating PE given field grass supplemented with 1:1 rice bran and coconut meal.

Variable	Treatment				STD ERROR
	A ₁ B ₁	A ₁ B ₂	A ₂ B ₁	A ₂ B ₂	
Body weight (kg)	29.03	25.20 ^o	30.63 ^o	28.10 ^o	1.98
Feed consumption (kg dry weight/head)	1.45	1.13	1.63	1.29	0.10
Dry Matter consumption (% Body Weight)	5.01	4.54 ["]	5.31 ^a	4.68	0.35
Water consumption (liter/head/day)	1.56	1.75 ["]	2.11 ^a	2.01	0.21
Milk production (litre/head/day)	0.51	0.37 ^o	0.87 ["]	0.62	0.055
Total solid of the milk (kg/head/day)	0.07	0.05	0.11 ["]	0.09	0.0045
Milk composition (%)					
Total solid	14.36	13.93 ^o	13.26	14.48	0.67
Total solid fat free	9.34 ^a	8.94	8.23	9.23	0.47
Ash	0.64	0.65 ^a	0.70 ^o	0.69 ^o	0.06
Fat	5.02	4.99	5.03 ^o	5.25	0.33
Lactose	5.28	4.97 ^o	4.18	4.54 ["]	0.44
Crude Protein	3.42	3.32	3.35	4.00 ^o	0.43

Note:

A1B1= milked onced and one hour excercises daily

A1B2 milked onced and two hours excercises daily

A2B1 milked twice and one hour excercises daily

A2B2= milked twice and two hours excercises daily

There was a positive relationship between milk production and dry matter consumption ($R^2= 0.42$). The goats consumed higher amount of feed tended to produce more milk (Figure 1).

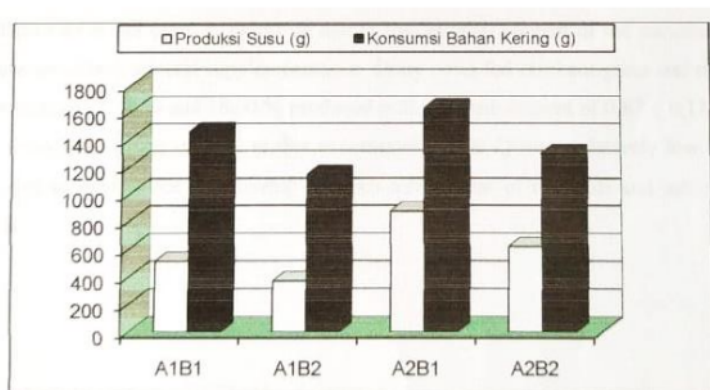


Figure 1. Milk production and dry matter consumption of PE as affected by milking frequencies and duration of exercises.

Milk Composition

Milk compositions were not affected by treatments. The average content (%) of dry matter, fat, protein, lactose and ash of PE's milk were 13.73 ± 1.37 ; 5.07 ± 0.50 ; 3.52 ± 0.71 ; 3.35 ± 0.83 and 0.62 ± 0.13 respectively. However, total solid production of goats milked twice and given one hour exercises a day higher than other treatments in accordance to daily milk production. The content of total solid of goat's milk in this experiment was in line with those reported by Sadia et al. (2003) who found the content of total solid of milk of local goats producing 0.217 ± 0.064 kg/day to be 13.96 ± 1.22 %, but lower than those of dairy goats in India as reported by Devendra dan Burn (1994). Nevertheless, this milk component was slightly higher than those of cow's milk showed in different reports (Adnan, 1984; Bath et al., 1978; Lampert, 1975; Resang dan Nasotion, 1981) and much higher than Standart Nasional Indonesia (SNI) which is only 11.2 %. These differences might be due to different breed and managements.

The average total solid non fat content of milk produced in this experiment was 8.69 ± 1.27 %, slightly lower than those found in different reports as reviewed by Sadia, et al. (2004) but still in a range of Standar Nasional Indonesia (SNI).

The average of ash content of milk of produced by crossbred Ettawah was 0.67 ± 0.07 %, lower than those reported by Adnan (1984), Bath et al (1978), Eckles (1980), Lampert (1975), Gesang end Nasution (1981) for cow's milk and those of goat's milk as reviewed by Sadia et al. (2004), but still in a range of SNI % (Riyadi dan Kisworo, 2003). The reason of these differences is not clear. It might be due to low mineral content of the concentrate diets which were no adding mineral supplementations. Dairy cows fed elephant grass and rice bran with ash contents of 15.10 % and 18.60 % produced milk with ash content of 0.87 ± 0.11 % (Asih, 2007), whereas ash content of diets in this experiment (Table 2) were relatively low. Further study is needed to explain the relationship between ash content of the diets and ash content of goat's milk.

Table 2. The composition of feed used in this experiment

Feedstuffs	Dry Matter (%)	Ash (%)	Fat (%)	Fibre (%)	Crude Protein (%)	N-Free Extract (%)
Field grass	35	9,7	1,8	34,2	6,7	47,6
Rice bran	85,0	9,9	9,0	13,8	13,0	54,3
Coconut meal	90,0	6.4	15,5	15,8	20,5	41,8

Overall, the content of other components such as lactose, fat, and protein of PE's milk was in a range of SNI and higher than those of cow's milk (Table 1).

CONCLUSION

1. Increasing the frequency of milking from once to twice a day significantly ($P < 0.01$) increased milk production of crossbred Ettawah (PE).
2. Increasing length of exercises from one hour to two hours a day significantly ($P < 0.01$) reduced milk production.

3. The highest milk production of the does was achieved on combination of milking twice and giving one hour exercise a day.
4. The milk composition was not affected by the frequencies of milking and duration of daily exercises.

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