Effect of milking time on milk production and milk quality of dairy cow fed with fermented corn cob

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Abstract. Many factors affected the milk production and milk quality of dairy cattle, such as the breed, age, type of feed, months of lactation, time milking and others. The purpose of this study was to determine the differences in milk production and milk quality in the morning and afternoon milking of dairy cows given corn cobs fermented. The study was carried out for one month, using eight lactating cows, divided into two groups each consisting of four cows. P1= complete feed + 40% of elephant grass, P2= complete feed + 20% of elephant grass + 20% of fermented corn cobs. Data analysis was displayed in chart form, the average and standard deviations and analyzed descriptively. The results showed that milk production in the morning milking treatment P1 was 18.36 %, higher than in the afternoon milking and P2 milking morning treatment was 11.56%, higher than in the afternoon milking or the second average morning milking treatment 14.96 % higher than afternoon milking. The milk production of group P1 which not given corn cobs fermented was 8.54 ± 2.78 L/h/d in the morning which was higher than the afternoon milking with average milk production 5.89 ± 1.89 L/h/d, while in the cattle group (P2) which gets fermented corn cobs, milk production in the morning milking was 8.40 ± 1.68 L/head/day, higher than with the afternoon milking with an average milk production of 6.65 ± 1.59 L/h/d. The quality of milk at morning milking was showed from the protein content (3.26%) and fat (3.37%) lower than in afternoon milking with the protein content of 4.03%, and fat content 3.79%. In conclusion, the research showed that milking in the morning has higher milk production than milking in the afternoon, while milk quality in the afternoon milking is higher than in the morning milking.

1. Introduction
The contribution of national dairy products can only meet 20% of the total needs of nearly 5 million tons per year and the rest is imported from foreign countries. Various factors affect the productivity of dairy cattle businesses in the tropics both directly and indirectly. Factors limiting dairy cattle business, especially smallholder (ownership of dairy cows around 3-5 cattle) in developing countries were long calving intervals, the age of first giving birth over three years and less milk production with an average of eight liters [1,2]. Hilmia [3] stated that environmental factors influence Friesian Holstein (FH) dairy cattle fertility more. Dairy cow milk production depends on various factors such as the breed's cattle (genetic) and environmental [4], milking interval and how milking increases milk production. Milking interval affected the production and quality of milk, the longer milking interval tends to be higher milk production but solids can be different. The time for milking in the morning at 05.00 is longer (14 hours) compared to the time for milking in the morning at 15.00 for only 10 hours. Characteristics of milking have a direct relationship with the production and quality of milk produced and this is important to know because it illustrates the level of maintenance management.
that will indirectly affect the level of income and welfare of farmers [5]. The use of automatic milking systems will reduce the quality of milk compared to conventional milking or by hand [6]. Opperman [7] stated that there are five indications of milk quality in dairy cows, the first is seen from the total number of aerobic bacteria present in milk, the second is the number of somatic cells in milk (SCC), the third number of bacteria that can survive after 30 minutes pasteurizes, fourth the number of original bacteria originating from feces or contaminated milk from the surrounding environment and the fifth number of cold bacteria living in milk. According to [8], there are five main parameters in determining the quality of milk water, i.e. milk fat content, milk protein content, freezing point, somatic cell count (under 400,000) and the total number of bacteria is less than 100,000. Quality requirements or quality of fresh milk according to [9] based on characteristics which include specific gravity of milk fat content of at least 3%, dry matter content without fat 7.8%, the minimum protein content of 2.8%. Milk production and quality based on morning and afternoon milking time are not known with certainty. The purpose of this study is to determine the magnitude of the difference in the production and quality of milk from dairy cows in the morning and afternoon in small scale livestock (smallholder farms).

2. Materials and methods
The study was conducted in the Panetta sub-district, Enrekang Regency, South Sulawesi Indonesia. Panetta is one area that is comfortable for cattle with minimum temperatures of 21°C and a maximum of 27.2°C. The number of animals used in these studies was eight lactating cows, divided into two treatments. Group (P1) using complete feed without the additional fermented corn cob + 40% grass and treatment (P2) using complete feed + fermented corn cob 20% + 20% grass. The complete feed consisted of rice bran, corn bran, cassava flour, coconut cake, soybean meal, and Gamal leaves. The research lasted for 30 days, 7 days and 23 days premium period of data collection (collecting). Drinking water is given ad-libitum or always available at all times.

Measurement of milk production was done twice a day, the time interval milking morning at intervals during the 14 hours to do the hours 05.00 and a second milking later in the day with 10-hour milking intervals performed at 15.00. Milk production was measured by using a liter. At the end of the study period taken milk samples of 25 g each milking in the morning and afternoon of each treatment to determine the quality of milk and analyzed in Chemical Feed Laboratory, Faculty of Animal Science, Universitas Hasanuddin, Makassar.

2.1. Data analysis
Data were analyzed descriptively statistics and presented as graphical figures, percentage differences, averages, and standard deviations.

3. Results and discussion
3.1. Milk production results from morning and afternoon milking
There are some fundamental problems faced by dairy farmers, especially small scale farmers, for the sustainability of their dairy cattle business in tropical and developing countries, especially in South Sulawesi. First is the problem of feed that does not support both in terms of quality and quantity, second is the problem of reproduction where the cows are difficult to get pregnant so many farmers sell their cattle as beef cattle, third is the problem of labor, where the interest of young people to work in dairy cattle business is very less and fourth, the difficult marketing problems of milk and processed products, where the purchasing power of people in rural areas is low. On the other hand, more than 80% of the national milk demand is imported from foreign countries because domestic milk products are only able to meet the needs of the community of around 20%. The consumption of Indonesian people's milk only reaches 13.1 kg/capita/year [10] which is the lowest in Southeast Asia and is mostly in urban areas while in rural areas it consumes less milk.
Table 1. Average milk production (L) in the morning and afternoon milking of FH dairy cows

| Treatment                  | Morning | Afternoon | Total    |
|----------------------------|---------|-----------|----------|
| P1 (without corn cob)      | 8.54 ± 2.78 | 5.89 ± 1.89 | 14.43 ± 2.20 |
| P2 (20% corn cob)          | 8.40 ± 1.68 | 6.66 ± 1.75 | 15.06 ± 1.60 |
| **Average**                | 8.47 ± 2.22 | 6.28 ± 1.82 | 14.47 ± 1.89 |

Table 1 showed the average milk production results of milking in the morning are higher than the results of the afternoon milking both treatment P1 (control) as well as treatment P2 (with 20% corn cob). Milk production in the morning milking treatment P1 is higher 18.36% compared to the afternoon milking, while in treatment P2 with the provision of the corn cob fermentation 20% of milk production in the morning milking has higher 11.56% than afternoon milking. The average difference in milk production in the morning and afternoon milking was 14.96%. The average total production of milk in the morning milking treatment P2 was higher (15.06 ± 1.60 L/head/day) than treatment P1 was (14.43 ± 2.20 L/head/day). The diversity of milk production is mainly caused by environmental factors [11]. When compared to the milk production of dairy cows, the results of [12] are in the range of this study. The adaptation of FH dairy cattle in the tropics shows a pretty good performance in terms of its production and reproduction aspects [12]. Interestingly, in P2 treatment on afternoon milking, milk production is higher than in P1 on afternoon milking, while morning milk production in P1 treatment milk is slightly higher than in milk production P2 treatment.

Figure 1. Average milk production during morning and afternoon milking

The milk production of this study is higher than the milk production in the city of Hossana Ethiopia, where the average milk production is only 8.38 ± 0.47 L/head/day. Even milk production in general studies the average ranges from 14-15 L/head/day still exceeds is average peak production in Ethiopia that only around 12.30 ± 0.16 L and 12.15 ± 0.82 L/head/day [1]. Furthermore [1] has reported his research that lactation short, the peak of the low milk production, milk production per lactation is low, calving a long interval and age at first calving over three years. FH cow milk production is 21.1 ± 0.53 kg/d higher than Jersey milk production and F1 hybrid FH X Jersey. The highest FH cow milk production was in the second lactation period and thereafter in the third and fourth lactation [13]. The highest FH cow milk production in PT Naksatra Kejora in the second birth
was 16.81 ± 0.31 L /day/head as well as the highest service per conception in parity II (1.7 ± 0.27) [14].

3.2. Milk quality from morning and afternoon milking

According to [9] many criteria in assessing the quality of breast milk as the number of bacteria in milk, the presence of mastitis, cleaning, the content density, fat content and protein content of milk and others. In this study, the quality of milk only assessed based on protein and fat content (table 2).

Table 2. Chemical composition (%) of FH dairy milk from morning and evening milking

| Treatment | Milking Time | Water content | Ash | Crude protein | Crude Fat | NFE |
|-----------|--------------|---------------|-----|---------------|-----------|-----|
| P1        | Morning      | 88.01         | 0.61| 3.16          | 3.51      | 4.71|
| P1        | Afternoon    | 89.98         | 0.73| 3.84          | 3.70      | 1.75|
| P2        | Morning      | 89.01         | 0.80| 3.35          | 3.22      | 4.62|
| P2        | Afternoon    | 89.36         | 0.73| 4.21          | 3.88      | 1.82|
| Average   | Morning (P1, P2) | 88.01  | 0.71| 3.26          | 3.37      | 4.67|
| Average   | Afternoon (P1, P2) | 89.18  | 0.71| 4.03          | 3.79      | 1.79|

NFE=nitrogen free extract

Studies on quality milk of dairy cows can be seen from grade milk, fat content and specific gravity (SG), while the standard of at least 2.8% milk protein and milk fat at least 3% [9]. The quality of milk this study visits of fat and protein content of milk both treatment and milking time different is higher than the SNI standard [9]. Fat and protein of milk at afternoon milking results in both treatments (P1 and P2) higher than protein and fat content of milk at morning milking. According to [15] that the fat content of milk at intervals shorter milking 12:12 hours the higher of 1.80 kg/head/day over a long milking interval of 16:8 hours a fat content of 1.56 kg/head/day. In the grazing condition of FH cows, the milk fat content is lower than that of Jersey cows while F1 hybrid (Jersey X FH) milk fat content is between the fat content of Jersey cows and FH [16].

Generally, show that treatments P2 (20% content of fermented corn cobs) lower dry matter than without giving a corn cob fermentation. The content of milk solids from morning milking was higher (11.99%) compared to afternoon milking (10.82%) as well as the NFE content of morning milking was higher (4.67%) compared to afternoon milking (1.79%). The content of fat and protein in afternoon milking is higher than the results of morning milking; this is in line with the results of the study [15]. The NFE content of milk from the morning milking is higher (an average of 4.67%) compared to the NFE content of milking in the afternoon (an average of 1.79%). The lactose or milk sugar content of milk dairy cows according to [17] was 4.9% (ranging from 3.5-6%) higher than the results of this study with an average NFE content (mostly lactose component) of 3.23% or ranging from 1.79-4.67%). Lactose is a type of carbohydrate that gives the sweet taste of milk (1/6 times the sweetness of sucrose [17]. The ash content of the milk at milking each morning with ash content of milk at 0.71% is the afternoon milking and this figure is higher than the ash content of cow's milk is 5.23%. This difference might be due to the nation's cattle and research location [18].

4. Conclusion

The milk production without the addition of fermented corn cobs in morning milking was 18.31% higher than in the afternoon milking; likewise, milk production with the addition of fermented corn cobs in morning milking was 11.9% higher than in the afternoon milking. The milk quality seen from fat and protein in the afternoon milking was higher than in the morning milking both in with or without the addition of fermented corn cobs.
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