The Effect of Parity on Colostrum Quality of Friesian Holstein Crossbred Cows in Indonesia

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**Abstract.** A study was conducted to figure out the colostrum quality at first milking from various parity of Friesian Holstein crossbred cows in rural area of Ngantang, Malang Regency, East Java. Colostrum quality was determined using Brix Refractometer (%). Thirty cows from first to fifth parity were used in this study. Each parity consisted of 6 cows. The colostrum samples were taken from first milking of each teat of the cows. The experimental method was using a Nested in Completely Randomized Design with parity as the treatment and teats position were nested to the parity. The data was analyzed using analysis of variance (ANOVA) and if there was a significant difference in the averages it was continued by Duncan’s Multiple Range Test (DMRT). The results showed that parity had a significant effect (P< 0.01) on the colostrum quality, in which the higher the parity, the better the colostrum quality, from second parity (26.88 ± 1.20% Brix) to fifth parity (29.46 ± 1.68% Brix). However, that of first parity (28.92 ± 1.46% Brix) was higher than second parity. While the teats position were not significantly affect the colostrum quality, but there was a tendency that the rear teats had better colostrum quality than the front teats.

1. Introduction
The success of small scale dairy farms does not only depend on the quantity and quality of milk yield but also the availability of well grown calves as a replacement stock that can guarantee the sustainability of milk yield, as well as population in the dairy farms. Mortality rate of calves in small scale dairy farms in Java reaches 19.6% [1]. This figure is in agreement with Moran [2] that the average mortality rate of calves in the tropical dairy farms ranged 15-25%. This figure is still quite high as the ideal calf mortality rate must be lower than 5%.

Mortality rates can be reduced by ensuring calves to consume as soon as possible sufficient quantities of high quality colostrum [3]. However, many factors affect the colostrum quality, such as cow breed, dry period, disease and parity. In general, first calving heifers produce lower colostrum quality, total immunoglobulin (Ig) content and IgG concentrations than the second and higher parity number of cows. Cows at second parity produce colostrum with lower IgG concentrations than third parity [4]. Generally, older cows have better colostrum quality [5]. Research on colostrum quality of Friesian Holstein cows has been widely carried out in subtropical countries. However, there has been not many information about the colostrum quality of Friesian Holstein crossbred in Indonesia. It is therefore, necessary to investigate the effect of parity on colostrum quality of Friesian Holstein crossbred in Indonesia.
2. Materials and methods
Thirty cows from first to fifth parity were used in this study. The cows were grouped into 5 based on parity, each group consisted of 6 cows. The colostrum samples were taken from first milking of each teat. Colostrum quality was determined using Brix Refractometer (%). Table 1. shows the estimation of IgG content in colostrum related to value scale (%Brix) of the refractometer.

Table 1. Level of colostrum quality based on Brix Refractometer scale (Chuck et al 2017)

| Level     | IgG (mg/ml) content | Brix Refractometer scale (%Brix) |
|-----------|---------------------|---------------------------------|
| Very good | 60 mg/ml            | >22%                            |
| Good      | 50 mg/ml            | 22%                             |
| Poor      | 30 mg/ml            | <22%                            |

The experimental method was a nested in Completely Randomized Design with parity as the treatment and teat positions were nested to the parity. The data was analyzed using analysis of variance (ANOVA) by Microsoft Excel and if there was a significant difference in the averages it was continued by Duncan’s Multiple Range Test (DMRT) [6]. The study was carried out in small scale dairy farms in the district of Ngantang, Malang Regency, East Java. The farmers are member of the dairy farm cooperative KUD "Sumber Makmur", so the environmental climates, diseases, feed and other rearing management that might influence the quality of colostrum could be eliminated.

3. Result and discussion
The results of statistical analysis of the effect of parity on colostrum quality based on value % Brix Refractometer is presented in Table 2. Parity had a significant effect (P<0.01) on the colostrum quality. The lowest colostrum quality was observed in second parity by value of 26.88 ± 1.20%, while the highest quality was in fifth parity by 29.46 ± 1.68%.

Table 2. Average colostrum quality based on parity

| Parity number | Number of cows | Average value (%Brix) |
|---------------|----------------|-----------------------|
| 1st           | 6              | 28.92 ± 1.46<sup>a</sup> |
| 2nd           | 6              | 26.88 ± 1.20<sup>ab</sup> |
| 3rd           | 6              | 29.08 ± 1.40<sup>bc</sup> |
| 4th           | 6              | 29.17 ± 1.34<sup>bc</sup> |
| 5th           | 6              | 29.46 ± 1.68<sup>bc</sup> |
| Total         | 30             |                       |

Note: Different superscript letter (a-c) in the same column shows the significantly (P<0.01) different effect on the average values.

Parity is a number of parturitions experienced by the dam. In previous studies, there were various opinions about the importance of parity on the colostrum quality. Morrill et al. [7] and Maunsell [3] stated that the older cows will produce better colostrum quality, but it depends on the individual of animal itself; colostrum from first calving heifers have lower mean production and IgG concentrations than second or higher parity number. However, some heifers produce very good quality colostrum and farmers should not automatically discard heifer’s colostrum, but should test and keep high quality colostrum from a cow of any parity.

The average colostrum quality in first parity (28.92% Brix) was significantly higher than in second parity (26.88% Brix) and subsequently increased to its peak in fifth parity. Gulliksen et al. [8] stated that first parity is not always have lower colostrum quality than second, third and higher parity. Therefore, it should not be guaranteed that first parity has automatically lowest colostrum quality. Yaylak et al. [9] added that lower colostrum quality in second parity than first parity might be due to
farmer’s experience in rearing management, such as feeding management and improper length of dry period of the cows.

Table 2. shows that the colostrum quality has increased from second to fifth parity. The best colostrum quality is in fifth parity with a value of 29.46% Brix. The higher colostrum quality in fifth parity is due to the older cows that are more likely to have chances to be exposed to the diseases than the young cows, therefore the body's immune level of the older cows is higher than the young cows [10]. The results of this study indicated that all samples observed has category of very good colostrum quality. This very good category of colostrum quality in small scale dairy farms was probably due to higher infectious disease rates compared to the industrial scale farms that may have maintained the cleanliness and health control for their livestock.

### Table 3. Average colostrum quality based on teats position

| Teats position | 1st (%)Brix | 2nd (%)Brix | 3rd (%)Brix | 4th (%)Brix | 5th (%)Brix | Average (%)Brix |
|---------------|------------|------------|------------|------------|------------|-----------------|
| Front right   | 29.67      | 26.33      | 27.83      | 28.33      | 29.00      | 28.23           |
| Front left    | 28.50      | 27.33      | 28.50      | 28.50      | 27.67      | 28.10           |
| Rear right    | 29.17      | 26.67      | 30.17      | 29.67      | 30.83      | 29.30           |
| Rear left     | 28.33      | 27.17      | 29.83      | 30.17      | 20.33      | 29.17           |

Colostrum quality based on teats position shows various results (Table 3). In general, the colostrum quality of the rear teats tended to be better than the front teats in all parities (28% vs. 29%). This might be due to the rear teats that are usually closer to the ground so they were vulnerable more to the bacteria caused infections, brought about having higher colostrum Ig.

### 4. Conclusion

It could be concluded that the best colostrum quality was in fifth parity with an average value of 29.46% Brix. Parity had a significant effect (P< 0.01) on the colostrum quality, in which the higher the parity number, the better the colostrum quality. While the teats position were not significantly affect the colostrum quality, but there was a tendency that the rear teats had better colostrum quality than the front teats.

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