

The Relationship Between Colostrum Age and Lactation Period With Colostrum Production in Friesian Holstein (FH) Daily Cow at KPSP Setia Kawan, Pasuruan District

Sekarwangi Nassida Kian Sintang¹, Puguh Surjowardojo¹, Rifa'i²

¹Faculty of Animal Husbandry, Brawijaya University, Jl. Veterans, Malang 65145, Indonesia

²Faculty of Animal Husbandry, University of Kahuripan Kediri, Jl. Soekarno-Hatta No. 1
Palem Pare Kediri 64121, Indonesia

Corresponding author : Sekarwangi Nassida Kian Sintang

Email : sintang185@gmail.com

Abstract

This research was conducted in the dairy farming in Dairy Cattle Cooperation Setia Kawan Wonosari Village, Tukur District, Pasuruan Regency. The objective of this research was to analyze the correlation between colostrum age and lactation period with colostrum production on Friesian Holstein. The material used is 30 Friesian Holstein which is lactation, both the first lactation period to the third lactation period. The method used was the case study method and the data was collected by direct observation of dairy cows. The data is analyzed using regression analysis and correlation. The results show that the correlation between colostrum age and colostrum production has a regression equation is $Y = 9.8 + 0.75X$, where $r = 0.516$ and $R^2 = 0.266$ and the lactation period with colostrum production has a regression equation that is $Y = 11.35 + 0.16X$ with $r = 0.086$ and $R^2 = 0.007$. The highest average colostrum production in dairy cows was on the fourth day (12.61 ± 1.29 liters/head/day) and the highest colostrum production was in the third lactation (11.80 ± 1.68 liters/head/day). Based on these results it can be concluded that colostrum ages with colostrum production has a moderate positive correlation, while the lactation period with colostrum production has a very low positive correlation.

Keywords : Laction period, colostrum production, pregnant cow, Holstein friesian

Introduction

Dairy cows are a type of cow that is able to produce milk and colostrum in excess of the needs of their calves (Surjowardojo, 2011). Dairy cattle are livestock that are able to produce milk in excess of the needs of their calves and are still able to produce milk even though their calves have been weaned or are no longer suckling on their mothers. One of the most common breeds of dairy cattle is the Friesian Holstein (FH). FH dairy cattle are a breed of dairy cattle that have the highest milk production among other cattle breeds. FH cattle have the ability to produce high milk but have a lower fat content when compared to dairy cows from other breeds.

East Java is currently a national dairy cattle center because it has the largest population of dairy cows and the highest milk production in Indonesia (Mahmud, Busono, Surjowardojo, Tribudhi, 2020). Data from the Central Statistics Agency for 2022 East Java Province has a dairy cattle population of 314,385 heads or 46.97% of the total national dairy cattle population of 592,897 heads. Apart from having the largest population of dairy cows, East Java is in first place in national milk production by contributing 56.10% (543,687 tons) of the national

production of 968,980 tons (Central Bureau of Statistics, 2022). When giving birth, mammals have several signs, including enlarged udders and nipples that look full, not filled with milk but filled with colostrum.

Colostrum is the milk that is released for the first time from the udder which contains nutrients and antibodies for the calf (Surjowardojo and Susilorini, 2021). Colostrum has high antibodies (immunoglobulins) and is very good for increasing immunity or immunity in children, and children will drink colostrum from their mother's nipples. The child is not able to spend so colostrum is still left. The mother mammal will produce milk so that the remaining colostrum will be mixed. On the second to seventh day, the mother produces colostrum milk mixed with colostrum (Atabany, Suprayogi, Muladno, Satrija, Tarigan, Sugiono, Queen, 2022). Colostrum is a source of nutrition for calves that cannot yet consume feed. The characteristics of colostrum are more yellow in color, thicker in consistency, have total solids,

The productivity of dairy cows, especially milk and colostrum production, is influenced by 30% genetic factors (heredity) and 70% environmental factors. Milk production is 70% influenced by environmental factors which are divided into external and internal environment. Climate, feeding and maintenance management are factors that influence externally the livestock body or the external environment while the internal environment is a biological aspect of lactating cows such as the lactation period, lactation period, dry period, and empty period (Dwinugraha, Purwantini, Yuniastuti, 2018).

The quality and quantity of colostrum is also heavily influenced by hygienic milking and the content of antimicrobial substances in colostrum, individual characteristics, breeds, feed consumed during the dry period, lactation period, length of the cage dry period, colostrum collection time after calving, and BCS also have an effect. on the quality and quantity of colostrum. At the beginning of milking, the amount of active compounds in the colostrum of dairy cows is quite high, such as bioactive compounds, such as lactoferrin, which is an antimicrobial substance. As milking time progresses from day 2 to day four or third, it starts to decrease (Khotimah, 2013). The lactation period has a relationship with the size of the udder volume while the age of colostrum has an attachment to the frequency of milking which will affect the stimulation of the udder to increase colostrum production. If based on the description above, to determine the relationship between colostrum age and lactation period with colostrum production in FH dairy cows, it is necessary to conduct research.

Materials and Methods

The study was conducted for 3 months at the KPSP Setia Kawan dairy farm, Jl. Raya Nongkojajar, Wonosari Village, Tutur District, Pasuruan Regency, East Java from 20 August – 20 November 2022.

The research material used in the study was 30 FH dairy cows which were in period 1-3 lactation. Colostrum is obtained from the milking of dairy cows on day 1 to day 4. The material needed is colostrum from FH dairy cows while the tool used in this study is the Lctoscan Milk Analyzer with the MCC W V1 brand which will later be used to test colostrum samples with the aim of knowing changes in protein and lactose levels so that it can be determined on what day colostrum starts to stop being excreted .

The method used is an observational case study. Samples were taken by purposive sampling, namely the samples were selected deliberately using certain criteria, namely FH cows who were pregnant and approaching parturition. Primary data collection was carried out by collecting colostrum production data starting with the first milking (about \pm 30 – 45 minutes after the cow gave birth) and subsequent milking, the cows were milked 2 times, morning at 05.00 – 07.00 and afternoon at 15.00 – 17.00. Cows are milked manually by hand and then measured using a standard 1 liter measuring cup, so that individual milk production can be determined.

Research variable

The independent variables used were colostrum age (X1) and lactation period (X2) while the constant variable was colostrum production (Y).

Data analysis

The analysis used is correlation using a simple linear regression equation to determine the correlation coefficient (r) and the coefficient of determination (R²), which is assisted by the application of SPSS ver. 26.0. With the correlation formula:

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{n(\sum X^2) - (\sum X)^2} \sqrt{n(\sum Y^2) - (\sum Y)^2}}$$

Research Stages

The preparation for the research was to record cows approaching the time of parturition according to the required criteria. Livestock that meet the criteria are recorded for their cow number to facilitate data collection. Prior to sample selection, the sample collection container was previously sterilized with hot water to minimize bacterial contamination of the sample. Followed by the data collection stage, data collection is carried out for 1 month, sampling is carried out from the first milking, which is around ± 30 – 45 minutes after the cows give birth. In the next milking, the cows are milked 2 times, in the morning at 05.00 – 07.00 and in the evening at 15.00 – 17.00. Samples were collected for 8 consecutive milkings with the number of samples taken was 100 ml. Milking is done manually which is collected in a bucket of milk while for sampling it is taken directly from the mother's milk emission. To prevent colostrum from being damaged, the sample is frozen in the refrigerator. The colostrum samples were then tested for quality using a Lactoscan Milk Analyzer at the KPSP Setia Kawan laboratory

Results and Discussion

Colostrum Period Limit Determination

Calves receive colostrum from their mothers on days 1-4, this is comparable to the statement of Abdillah and Surjowardojo (2018), cows that have just given birth will secrete milk called colostrum, the milk is yellowish in color, thicker than normal milk, and comes out from the mother's udder on the first day to the fourth day, whereas according to Atabany, et al. (2022) which states that on the second to seventh day the mother will produce colostrum milk which is mixed with colostrum. Milk that has no colostrum or can be called pure milk is the milk produced by the mother cow on the 8th day. This is in accordance with the statement of Khotimah and Farizal (2013) which states that colostrum is excreted by lactating cows after parturition for approximately 24 to 168 hours or the equivalent of 1-7 days and the quality of colostrum is heavily influenced by the hygiene of the milking process and the microbiological content in it. colostrum. The content of colostrum in milk can be determined by testing the protein and lactose content of colostrum. The protein and lactose content of colostrum can be used as a determinant of when the milk has turned into pure milk.

Table 1. The nutritional content of colostrum based on colostrum age

Parameter	Colostrum Age			
	H-1	H-2	H-3	H-4
Proteins (%)	9,3	8,5	4,8	4,3
Lactose (%)	2,1	2,8	3,4	4,3

Source: Field Result Data

The parameters used were protein and lactose, in Table 1 it can be seen that the lactose and protein content on day 4 had not yet been included in the pure milk group because the protein content was not below 3.5% and the lactose was still below the lactose level of pure milk, namely 3.8%.

This is supported by the statement of Sanam, Swacita, Agustina (2014) which states that cow's milk consists of minerals (0.07%), water (87.20%), protein (3.50%), fat (3.70%))

and lactose (4.90%). This is also supported by the statement of Rahmawati, Naim, Nurhidayat, Irham (2020) which states that the main constituents of cow's milk in general are water (87.10%), lactose (4.8%), fat (3.9%) which are dominated by saturated fat, milk protein (3.4%), and ash content (0.72%).

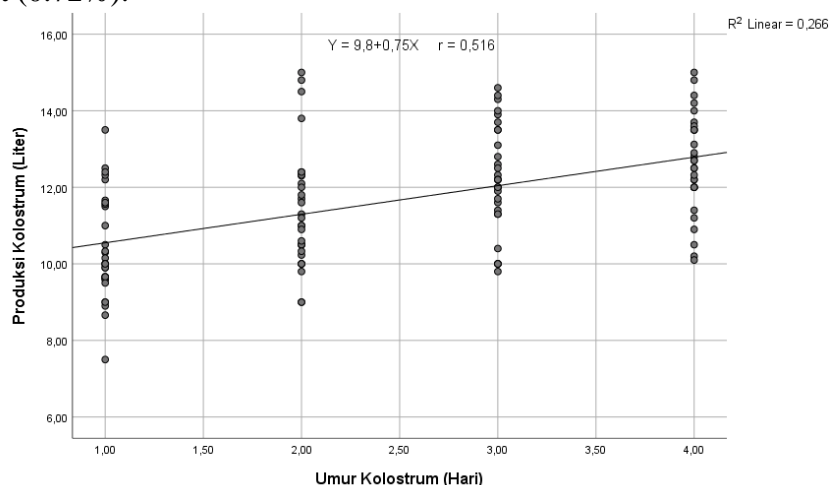


Figure 1. The relationship between colostrum age and colostrum production.

Colostrum Age Relationship with Colostrum Production

Production is the sum of morning milking and evening milking. The colostrum sample used was the sum of morning and evening milking, and only 100 ml per day was collected from the total morning and evening milking. Newly delivered cows already have colostrum and are not producing much milk yet. The mother cow will produce increasing colostrum and colostrum milk from the first day to the 4th day.

Colostrum production is influenced by the age of colostrum where cow colostrum production will increase along with the growth of colostrum age. The average colostrum production results based on colostrum age can be seen in Table 2.

Based on Table 2, colostrum production continues to increase from the first to the fourth day. The production of colostrum has similarities in increasing milk production according to the research of Adi, et al (2020) which states that the average milk production in weeks 1-3 after parturition increases, which is around 17.17 – 19.17 l/head/day, after it decreased in week 4, which was around 18.75 l/head/day.

Table 2. Average colostrum production based on colostrum age

Colostrum Age (days)	Quantity (sample)	Colostrum Production (liters/head/day)
1	30	10.40 1.35±
2	30	11.42 1.56±
3	30	12.24 1.37±
4	30	12.61 1.29±
Total	120	

Source: Field Result Data

Based on Table 2, it shows that the first day of colostrum has a lower average colostrum production compared to the average production the next day. On the first day the cows only produce milk as much as 10.40 1.35 liters/head/day, this is lower when compared to the second, third and fourth days which each produce 11.42 1.56 ; 12.24 1.37 ; 12.61 1.29 liters/head/day. This can be caused by several factors such as feed content, body weight, milking frequency, and others. This is comparable to the statement of Santosa et al. (2014) which states that milk

production in early lactation is influenced by several factors including feed content, livestock weight and maintenance management.

The results of the linear regression analysis in Figure 1 show that there is a relationship between colostrum age and colostrum production $Y = 9.8 + 0.75X$, meaning that each additional 1 day of age will increase colostrum production by 0.75 liters. The correlation value obtained was 0.516 indicating a moderate positive relationship between the age value of colostrum and colostrum production. This moderate relationship indicates that colostrum age has a moderate effect on increasing colostrum production in FH cattle at the study site. This can be seen in the mean value or coefficient of determination (R^2) of 0.266, meaning that colostrum age has a 26% effect on colostrum production and 74% is influenced by other factors.

In Figure 1 above it can be seen that the older the colostrum is, the higher the colostrum production will be. This is because the increasing age of colostrum, the milking time will also increase. This increase in milking time allows for an increase in the number of secretory cells and their supporting tissues and extends the ducts and lumens formed to develop optimally. Residual colostrum from the previous milking can also be the cause of increased colostrum production on subsequent milking.

However, the increase in colostrum production is not matched by an increase in colostrum protein and lactose. Colostrum components will decrease with increasing age colostrum. Factors that cause the quality of the first milking colostrum in addition to the content of protein, fat, vitamins, minerals, first milking colostrum also contains lactoferrin, which is an antimicrobial compound that maintains and protects the quality of colostrum from damage by microorganisms. This is in accordance with the statement of Khotimah, et al (2013), at the beginning of milking colostrum contains a bioactive compound (lactoferrin) which is an antimicrobial compound. As colostrum ages, the protein content in colostrum will decrease due to the decreased content of antimicrobial compounds so that it is possible for the number of bacteria in colostrum to increase.

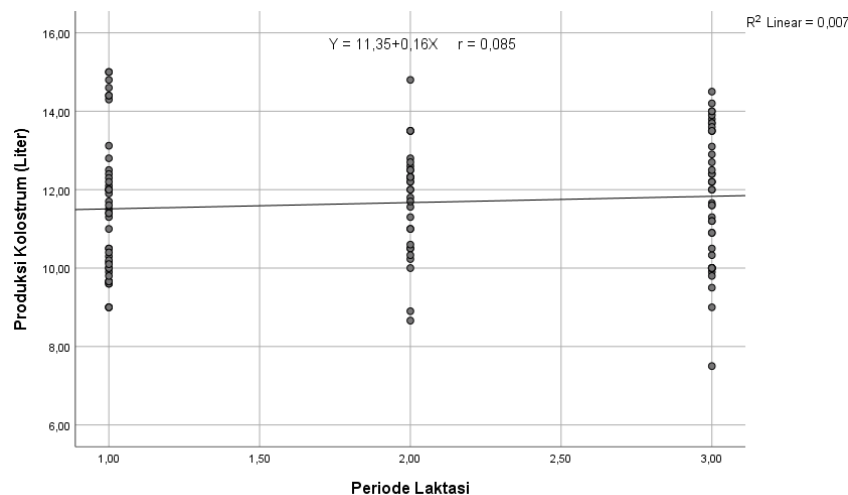


Figure 2. The relationship between the lactation period and colostrum production.

Relationship between Lactation Period and Colostrum Production

Measurement of the lactation period is a condition in which dairy cows have experienced parturition and are producing milk. The lactation period is calculated from the parturition cow to the dry period. Colostrum itself will be produced by the mother who has just given birth for a few days before the mother will only release pure milk.

According to Nugroho (2015) cattle in Indonesia can produce 8-10 liters of milk/day or 2,400-3,000 liters/head/lactation. One of the factors that affect colostrum production is the lactation period. This is similar to what happens to milk production which is also influenced

by several factors, one of which is the lactation period. The milk production of dairy cows will follow a performance that increases with increasing age of the lactating cow. The average results of colostrum production based on the lactation period can be seen in Table 3.

Table 3. Average colostrum production based on lactation period

Lactation Period	Quantity (tail)	Colostrum Production (liters/head/day)
1	11	11.48 ± 1.75
2	8	11.75 ± 1.35
3	11	11.80 ± 1.68
Total	30	

Source: Field Result Data

Based on Table 3, colostrum production continues to increase from the 1st lactation period to the 3rd lactation period. This colostrum production has similarities with the increase in milk production according to research by Rahman, et al. (2015) which states that starting from the first lactation milk production will increase until adulthood.

The lactation period is related to udder volume. The udder is a gland that functions to secrete milk for food for their children after birth. The udder grows during gestation and begins to secrete milk after lambing. The volume size of the udder in each livestock is different, the size of the udder is influenced by the age of the livestock, the lactation period, genetic factors, and the amount of milk in it (Febriana, Harjanti, Sambodho, 2018). The udder volume determines the amount of milk produced, a larger udder volume visually has a higher milk production. This is because the large udder has large secretory cells which are also used to secrete milk (Habib, Suprayogi, Sambodho, 2014).

This is also supported by the statement of Pribadiningtyas et al. (2012) in Solecah, et al. (2019) stated that a long and deep udder has an increasing number of secretory cells in it to synthesize milk which is formed by epithelial cells in the lumen of the alveoli. A large and normal udder can reflect its holding capacity for milk produced through milk biosynthesis. According to Salama et al. (2003) in Solecah, et al. (2019) stated that a physically large udder has a large volume as well so that milk production is high.

Based on Table 3, it shows that the first lactation period has a lower average colostrum production when compared to the average colostrum production in periods two and three. During one lactation period, FH dairy cows in the first lactation period only produced colostrum production of 11.48 ± 1.75 liters/head/day. This is lower when compared to the second and third lactation periods, each of which produces 11.75 ± 1.35 ; 11.80 ± 1.68 liters/head/day. This is because during the lactation period a heifer that has just produced milk has young udder glands, so the cells responsible for producing milk in the udder have not developed optimally.

Underage young cows, their production is still low because they are still in the growth process, on the other hand after passing the productive age, their milk production begins to decrease. This is comparable to the statement of Filian et al. (2016) which states that the lactation period is closely related to the age of dairy cows because the lactation period increases as the age of dairy cows increases. As well as statements from Purwanto, et al. (2013) who said that milk production is related to parity and age factors related to the lactation period.

The results of the regression analysis in Figure 2 show that the relationship between the lactation period and colostrum production is $Y = 11.35 + 0.16X$, meaning that every increase of 1 lactation period will increase colostrum production by 0.16 liters. The correlation value obtained was 0.086 indicating a very weak positive relationship between the value of the lactation period and colostrum production. This very weak relationship indicates that the lactation period has a very low effect on increasing colostrum production in FH dairy cows at the study site. This can be seen from the average value or coefficient of determination (R^2) of

0.007, which means that the lactation period only has an effect of 0.7% on colostrum production and the remaining 99.3% is influenced by other factors.

Conclusion

Based on the results of the study it can be concluded that there is a positive relationship between colostrum age and lactation period with colostrum production in FH dairy cows, where from the first to the fifth day there is an increase in colostrum production. In the future, breeders are expected to pay more attention to the condition of pregnant cows so that colostrum production can be optimal.

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