

# Correlation between teat length and lactation periods on the level of subclinical mastitis occurrence in Sappy Valley Farm

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**Abstract.** This study aims to determine the correlation between dairy cattle teat length at several lactation periods and subclinical mastitis profile. This study used 43 dairy cattle at several lactation periods. The lactation periods of the cows studied were lactation periods 1, 2, and 3. Subclinical mastitis testing used IPB-1 Mastitis Test, and teat length was measured using a measuring tape (cm). The data is taken and then analyzed using the average and described. The results showed that the average teat length of 5.11 cm did not experience subclinical mastitis, while the average teat length was 5.48 cm, 6.09 cm, and 7.28 cm, respectively, had subclinical mastitis. The highest incidence of subclinical mastitis is influenced by teat length and lactation period. The length of the teat and the lactation period, the higher the severity of subclinical mastitis. These findings are essential for a practical clinical diagnostic approach in dairy cattle with subclinical mastitis.

## 1. Introduction

Cow's milk is one of the animal products consumed by Indonesian people. Indonesian people's consumption of cow's milk products is still very low compared to other developing countries. Consumption of cow's milk for the people of Indonesia only reaches 8 liters/capita/year. This value also includes processed products containing milk. Domestic fresh cow's milk production contributes about 25% of the national milk demand. Most of the national milk needs are still met from imported milk, either as raw materials or as processed products [5].

Efforts to meet milk needs in Indonesia are carried out on dairy farms. Sappy Valley Farm is one of the dairy farms in Bogor Regency. Sappy Valley Farm is a dairy farm with a population of 111 dairy cows. The dairy cattle population owned by the farm are calves, heifers, lactating cows, dry cows, and bulls. Sappy Valley Farm can produce approximately 500 liters of milk per day. The milk production is considered not good enough compared to the ideal milk production. Dairy cow's milk production is influenced by cage conditions, lactation period, weather, and disease [2].

Many factors cause milk production to be less than optimal, one caused by disease. The disease that dairy cows often experience is inflammation of the udder or mastitis. Currently, mastitis is still a significant problem in smallholder farms in Indonesia [21]. Mastitis can cause considerable losses in dairy farms due to poor milk quality, decreased milk production, increased costs of drugs and veterinary services, high numbers of cattle abandoned prematurely, and sometimes death from the disease [15]. Mastitis is inflammation of the internal tissues of the udder. Mastitis is divided into 2, namely clinical mastitis and subclinical mastitis [36]. Clinical mastitis causes clinical symptoms in the form of changes in quality and decreased milk production [43,27].

The incidence of subclinical mastitis in Indonesia reaches 80% and causes a decrease in milk production by 20% [6]. Subclinical mastitis is caused by bacteria [16]. Subclinical mastitis in cattle farming is like an iceberg phenomenon. Mastitis in a farm is influenced by animal and environmental factors. Predisposing factors also affect the prevalence of mastitis in dairy cows. Predisposing factors for subclinical mastitis in dairy cows are influenced by the condition and shape of the udder and the animal's age. The shape of the udder, one of which is length. Subclinical mastitis does not cause clinical symptoms. This occurrence in subclinical mastitis is like an iceberg phenomenon. This means that the incidence is high but not marked by physical changes in the udder, making it difficult to detect it [34]. Research by [22] states a relationship between nipple diameter and the level of mastitis infection. Other studies have also shown a relationship between nipple length and the rate of mastitis infection [4]. Research on the relationship between nipple length and lactation period has been reported by

Septiani [28], but the data are still minimal. Based on this, it is necessary to review the relationship between the length of the nipple and the incidence of mastitis in various lactation periods. This study aims to determine the correlation of the length of the cow's nipples at various periods of lactation with the incidence of subclinical mastitis.

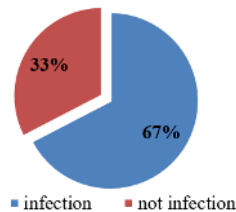
## 2. Materials and Methods

The study was conducted from January 15 to February 14, 2019, at the Sappy Valley Farm cattle farm, Bogor Regency. The tools used in this study were a paddle, measuring tape (cm), cloth, and stationery. The materials used were IPB-1 Mastitis Test reagent and quaternary milk samples.

Data is obtained by observation, examination of subclinical mastitis and interviews with farmers. The study was conducted on 43 lactating cows owned by Sappy Valley Farm. Determination of the sample is based on cows in normal lactation conditions. Measurements were carried out in each udder quarter after the cow was bathed. The nipple length was measured using a measuring tape. These measurements are expressed in centimeters (cm). Subclinical mastitis testing using IPB-1 Mastitis Test reagent [32]. The method of examining subclinical mastitis with IPB-1 reagent is a Paddle filled with 2 ml of cow's milk. IPB-1 Mastitis Test reagent was added to the sample in a ratio of 1:1. Samples and reagents were homogenized horizontally for 15-30 seconds. The reaction that occurs is observed. According to [32], if the reaction is adverse, the milk and reagents remain homogeneous, a positive reaction forms a thin mucus, a positive reaction two forms thicker mucus, and a positive reaction three mucus is very thick like a gelatinous mass. The test principle of the IPB1 Mastitis Test is that the reagent will bind to DNA from the somatic cell nucleus to form a thick mass like gelatin. The thicker the mass, the greater the amount of somatic cell nuclear DNA that binds to the IPB-1 Mastitis Test reagent. Data analysis was carried out quantitatively and qualitatively. Quantitative data is calculated using percentages. The data are qualitatively described descriptively and supported by literature studies.

## 3. Results and Discussion

The subclinical mastitis test at Sappy Valley Farm showed that 29 of the 43 dairy cow population during lactation were positive for subclinical mastitis. The prevalence of subclinical mastitis at Sappy Valley Farm from January 15 to February 14, 2019, was 67% (Figure 1).



**Fig. 1.** Presentation of Subclinical Mastitis in Lactating Cattle at Sappy Valley Farm

The prevalence of subclinical mastitis in Sappy Vally Farm is lower than that of subclinical mastitis in cattle farms in Indonesia. The prevalence of subclinical mastitis in Indonesia until 2008 reached 85% [25]. The prevalence of subclinical mastitis in the Bogor KUNAK area is 81.4% [1]. According to [7], the prevalence of subclinical mastitis in other parts of Indonesia, namely East Java, reaches 80%-86%.

The prevalence of subclinical mastitis in Sappy Valley Farm occurred in the first, second, and third lactation. The predisposing factors for subclinical mastitis in dairy cattle were the condition and shape of the udder and the animal's age. The udder hangs very low, the nipple hole is too large, and the presence of sores (blisters) makes it easier for microorganisms to enter [35]. The animal's age also determines whether or not an animal is easily infected with subclinical mastitis [20]. The older the cow, the more sensitive it is to mastitis. This is because the mechanism of closing the nipple hole is decreasing, and healing is slower [11].

There is a relationship between subclinical mastitis and udder conditions [28]. The udder condition of cows susceptible to subclinical mastitis is seen from the udder anatomy, milk production capacity, and nipple length [8]. Subclinical mastitis can be influenced by nipple length, ligament attachment, feed, weather, lactation period, and genetic quality of cattle [14]. The study results on the length of the cow's nipples at Sappy Valley Farm showed that the length of the cow's nipples ranged from 4-8 cm. The study results of the relationship between nipple length and the severity of subclinical mastitis at Sappy Valley Farm can be seen in Table 1.

**Table 1.** Correlation of Nipple Length with Subclinical Mastitis Rate at Sappy Valley Farm

No	Degree of Subclinical Mastitis	Minimum nipple length (cm)	Maximum nipple length (cm)	Average nipple length (cm)
1	-	4	6	5.11
2	+	5	7	5.48
3	++	5	7	6.09
4	+++	7	8	7.28

Based on table 2 above, shows that there is a relationship between the length of the cow's nipple and the degree of subclinical mastitis at Sappy Valley Farm. Table 2 shows that nipples with an average length of 7.28 cm are more susceptible to subclinical mastitis than nipples with an average length of 5.11 cm. Based on this, nipple length can be used as a predisposing factor for subclinical mastitis. Nipples with a mean length of 7.28 cm had a severity of subclinical mastitis at a positive level of 3 (+++). Nipples with an average length of 6.09 cm had a severity of subclinical mastitis at a positive level of 2 (++). Nipples with a mean length of 5.48 cm had a severity of subclinical mastitis at positive 1 (+). The condition of the nipple that did not experience subclinical mastitis was indicated by the nipple having an average length of 5.11 cm. Nipple length can be used as an indicator of the diagnosis of subclinical mastitis in dairy cattle. Based on the above study results, it was shown that dairy cows with a nipple length of 5.48-7.28 cm were likely to have subclinical mastitis.

The average nipple length of 6.5-7.5 cm in dairy cattle in Lembang had subclinical mastitis [28]. BIF (2011) [4], on Fresian Holstein dairy cows in Europe, stated that the ideal normal size for the front nipple is 6 cm in length with a diameter of 2.9 cm, while the rear nipple is 5 cm in length with a diameter of 2.6 cm. Cases of subclinical mastitis occur in the nipple with a length of 7–9 cm. Long nipples will facilitate the entry of microorganisms into the udder and develop in the udder tissue. This can cause an inflammatory reaction in the internal tissues of the udder. Nipples with a concise size will cause impaired milking and incomplete emptying of the udder, and the alveoli are not capable of selective power, thus triggering inflammation [19]. Short nipples can also complicate the milking process so that the alveoli do not secrete milk completely and cause subclinical mastitis [35].

The lactating dairy cows at Sappy Vally Farm consist of cows from the first to the third lactation period. The higher the lactation period, the older the cows. The effect of the lactation period on the level of subclinical mastitis can be seen in Figure 2. The percentage of the severity of mastitis levels positive one and positive two seems to decrease from lactation period one to the third lactation period. In contrast to the severity of mastitis level positive three, the percentage increased from the second lactation to the third lactation period.

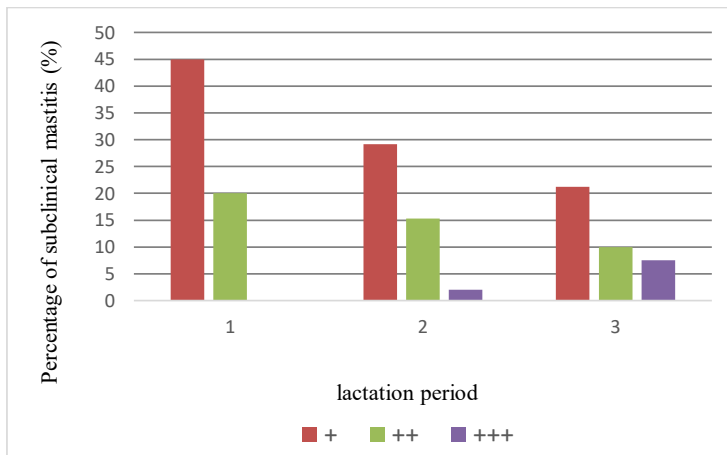
**Fig.2.** Percentage of incidence of subclinical mastitis

Figure 2 shows that the longer the lactation period, the more cows are at risk of being infected with subclinical mastitis. Following [31] statement, the incidence of subclinical mastitis will increase until approximately eight years of age cattle and continue to increase from the first lactation period until it reaches a peak, namely in the third and fourth lactation periods decrease according to the next lactation period. The older the cow and the higher the milk production, the more relaxed the nipple sphincter will be. Microorganisms will easily infect nipples with loose sphincters. The higher the milk production of a female cow, the longer it takes for the sphincter to close completely [35]. Figure 2 shows that during the first lactation period, the percentage of

the severity of subclinical mastitis was the greatest compared to the second and third lactation. This was because the first lactating dairy cows had a high level of aggressiveness, so teat dipping did not go well.

#### 4. Conclusion

Based on the study results, it was shown that dairy cows with a nipple length of 5.48-7.28 cm were likely to have subclinical mastitis. The severity of subclinical mastitis infection is influenced by nipple length and lactation period. The longer the nipple and the longer the lactation period, the higher the severity of subclinical mastitis.

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