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Mastitis impairs milk yield at different stages of lactation in dairy cows

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Abstract
A study was conducted to examine the mechanism of the effects of clinical mastitis on the milk yield of dairy cows. Local farmers in Tamil Nadu's western districts provided milk samples. Milk yield was measured for each animal every 10 days before and after mastitis. A total of 54 mastitis-affected cows were selected. 18 milch cows were examined at different stages during early, mid, and late lactation. Six milch cows from each bred *viz*., Kangayam, crossbred Holstein Friesian cows, crossbred Jersey cows were selected in each stage during early lactation, mid lactation and late lactation.
Mean of highest yield of raw milk produced per day for Kangayam tract was recorded in early lactation period (1.68±0.01 L/d) and the lowest yield of raw milk produced per day for Kangayam tract was recorded in late lactation period 10 days after mastitis infection as (1.00±0.04 L/d)). Mean of highest yield of raw milk produced per day for Holstein crossbred milch cows was recorded in early lactation period (12.22±0.12 L/d)) and the lowest yield of raw milk produced per day after 10 days of mastitis affected Holstein crossbred milch cows was recorded in late lactation period (6.71±0.02 L/d)). Mean of highest yield of raw milk produced per day for Jersey crossbred milch cows was recorded in early lactation period (8.95±0.11 L/d)) and the lowest yield of raw milk produced per day after 10 days of mastitis affected Jersey crossbred was recorded in late lactation period (5.71±0.03 L/d)). The yield of raw milk produced per day of Kangayam cows, of Holstein crossbred cows, Jersey crossbred cows in early, mid and late lactation period before mastitis and 10 days after mastitis infection differed significantly ($p \leq 0.05$).

Keywords: Mastitis, milk yield, lactation period, Kangayam cattle, Holstein Friesian crossbred cows, Jersey crossbred cows

Introduction
Due to the massive increase in population, there is a growing demand for milk globally. India's milk output has been impacted by mastitis. Clinical mammary gland inflammation, one of the most costly conditions for dairy farmers, has an enormous effect on the overall quality of milk and its technological value. Mastitis usually lowers milk supply, quality, and processing potential, which lowers producers' income and in addition, farmers could have to pay more for veterinary care, manage sick livestock, and possibly replace their animals. As a result, mastitis causes significant financial losses.
The living conditions of milk cows, the presence of pathogens, and the animal's inclination all affect the risk of mastitis infection. Mastitis is very common in dairy cows with high milk production. Mastitis can cause either acute or persistent gland irritation. Fever, decreased milk supply, and a significant rise in the somatic cell count in milk are the hallmarks of mastitis. In this work, we investigated the concept that clinical mastitis has a cumulative and long-lasting impact on milk yield at various lactation phases potentially as a result of changes in alveolar permeability and the capacity of the mammary glands to secrete milk.
One of the most costly expenses for dairy farmers is the treatment of mastitis. Mastitis is still regarded as one of the main illnesses influencing the dairy sector. The connection between mastitis and milk production in dairy cattle has been investigated. Due to a reduction in milk production, mastitis causes enormous financial losses.
The findings of this study compare the milk production of dairy cows with mastitis at various lactation stages.

The goal is to better understand how mastitis affects cow yield at various lactation stages by tying together field data and experimental research. Investigating the effects of mastitis on milk yield at various lactation phases is the goal of this study.

Materials and Methods

Local farmers in the western parts of Tamil Nadu provided milk samples for the study. Each animal's milk production was measured ten days prior to and following mastitis. A total of fifty-four milk cows with mastitis were chosen. Eighteen milch cows in the early, mid, and late lactation stages participated in the study. At the early, mid, and late lactation stages, six milch cows from each breed Kangayam, crossbred Holstein Friesian cows and crossbred Jersey cows were chosen. The conditions on the farms were also considered while caring for the animals.

Oversight

The farms' pre-existing conditions were maintained for the animals.

- **Mastitis Diagnosis:** The diagnosis is based on laboratory data, pathological alterations, clinical symptoms, and anamnesis.
- **Clinical manifestations**: Swelling of the udder, redness, pyrexia and tissue damage are some of the most typical signs of mastitis. Chronic mastitis can develop into sepsis.

Estimation of milk yield

Weighing the milk collected by machine milking allowed us to calculate the volume of milk produced. Each quarter, the milking device was removed when the milk flow stopped. As soon as the milk was picked up, it was weighed. Milk samples collected at each milking were analyzed for fat, solids-not-fat, protein, and lactose using standard automated procedures described by Akers and Thompson (1987) [2].

Results and Discussion

Milk yield

The average yield of raw milk produced per day for Kangayam cow, Holstein crossbred dairy cows, Jersey crossbred dairy cow before mastitis and 10 days after mastitis infection in early, mid lactation period were recorded and tabulated in table 1 based on test-day observations for daily milk yield.

Mean of highest yield of raw milk produced litres per day for Kangayam tract was recorded in early lactation period (5.68±0.01)and the lowest yield of raw milk produced per day for Kangayam tract was recorded in late lactation period 10 days after mastitis infection as (5.05±0.04).

Mean of highest yield of raw milk produced litres per day for Holstein crossbred cows was recorded in early lactation period (12.22±0.12) and the lowest yield of raw milk produced per day after 10 days of mastitis affected Holstein crossbred cows was recorded in early lactation period (6.71±0.02).

The average yield of raw milk produced per day for Kangayam breedmilch cow, Holstein crossbred milch cows, Jersey crossbred milch cow before mastitis and 10 days after mastitis infection in early, mid and late lactation period differed significantly. ($p \leq 0.05$). The average yield of raw milk was lower in milk from cows infected with mastitis as compared to milk from uninfected cows in early, mid and late lactation period. The present finding was compared favorably with (Reis *et al.*, 2011).

The physical appearance and supply of milk from clinically afflicted quarters were abnormal. In the early stages of the disease, the overall amount of milk produced decreased by roughly 10 to 15%. This decline was especially pronounced in late lactation and chronic instances. Initially pendulous, the udder eventually became fibrous. In certain situations, lactating females' teats became obstructed and shrunk in size. Milk extracted from these areas was thin, watery, and occasionally laced with blood. A few atrophied and blind teats were observed. Data about cows' decreased milk output as a result of mastitis. The results closely agree with the findings of Seegers *et al.* (2003) [16].

The average yield of raw milk produced per day for Kangayam tract, Holstein crossbred milch cows, Jersey crossbred milch cow before mastitis and 10 days after mastitis infection in early, mid lactation period were recorded and tabulated in table 1.

Mean of highest yield of raw milk produced per day for Kangayam tract was recorded in early lactation period (1.68±0.01 L/d)and the lowest yield of raw milk produced per day for Kangayam breed was recorded in late lactation period 10 days after mastitis infection as (1.01±0.04 L/d).

Mean of highest yield of raw milk produced per day for Holstein crossbred milch cows was recorded in early lactation period (12.22±0.12 L/d) and the lowest yield of raw milk produced per day after 10 days of mastitis affected Holstein crossbred milch cows was recorded in early lactation period (6.71±0.02 L/d).

Mean of highest yield of raw milk produced per day for Jersey crossbred milch cow was recorded in early lactation period (8.95±0.11 L/d) and the lowest yield of raw milk produced per day after 10 days of mastitis affected Jersey crossbred was recorded in late lactation period (5.71 ±0.03 L/d) Table 1.

Regardless of the time of occurrence during the lactation, mastitis had a long-lasting effect on milk yield; cows with mastitis did not reach their premastitis milk yields during the remainder of the lactation after onset of the disease.

The average yield of raw milk produced per day for Kangayam cow, Holstein crossbred milch cows, Jersey crossbred milch cow before mastitis and 10 days after mastitis infection in early, mid and late lactation period differed significantly. ($p \leq 0.05$). (Table 1; Figure 1).The average yieldof raw milk was lower in milk from cows infected with mastitis as compared to milk from uninfected cows in early, mid and late lactation period. The present finding was compared favourably with (Reis *et al.*, 2011).

One of the most prevalent diseases harming the dairy business and its profitability is mastitis, or inflammation of the mammary gland (Aghamohammadi *et al.*, 2018) [1].

Previous knowledge regarding the relationship between mastitis and milk yield in dairy herds is limited and were retrospective in nature, the study animals were limited to cows with or without a history of mastitis as determined by examination of herd records, and the severity of mastitis was not investigated. This research revealed a positive association between mastitis and milk yield on a milch cows at dairy farms. Cows that developed mastitis produced lower milk yield compared to other unaffected cows. During diagnosis and treatment of mastitis, milk yield was reduced thereafter.

Milk obtained from clinically affected quarters was abnormal in physical appearance and less in yield. There was about 10 to 15% drop in total milk production during early stages of

the disease. This decrease was more marked in chronic cases and late lactation period. The udder was pendulous in the beginning of mastitis disease occurrence and turns into fibrous later. In certain cases the teats became blocked and smaller in size in lactating females. Milk drawn from such quarters was watery, scanty and sometimes blood mixed. Few teats were seen blind and atrophied. The data regarding milk yield of cows reduced due to mastitis. The results closely agree with the findings of Seegers *et al.* (2003) [16]. The positive association between mastitis and milk yield during early lactation suggested that high production was a risk factor for mastitis. The study revealed a negative effect of mastitis on milk yield on milch cows irrespective of breed maintained in the farm and also the stage of lactaion.

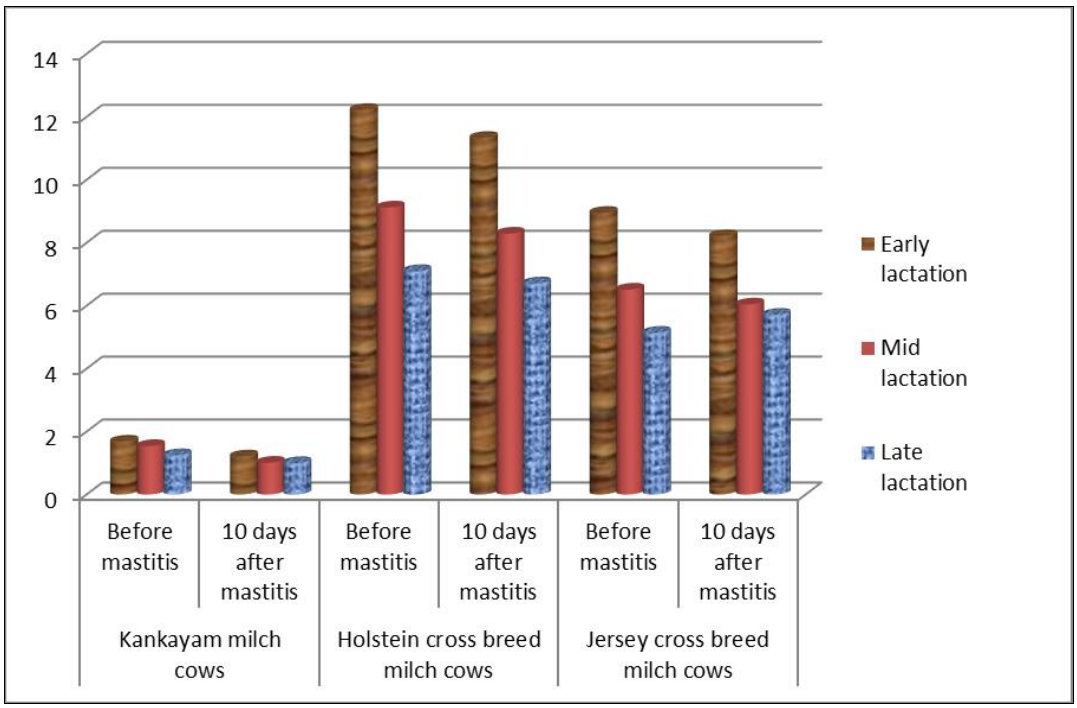

Fig 1: Pictorial representation of Milk yield on affected animals before and after 10 days during early, mid and late lactation in Kangayam, Holstein crossbred and Jersey crossbred milch cows (Litre/day)

Table 1: Milk yield on affected animals before and after 10 days during early, mid and late lactation in Kangayam, Holstein crossbred and Jersey crossbred milch cows (Litre/day)

Milk components	**Kangayam milch cows**		**Holstein crossbred milch cows**		**Jersey crossbred milch cow**	
Yield (Litre/day)	Before mastitis	10 days after mastitis	Before mastitis	10 days after mastitis	Before mastitis	10 days after mastitis
Early lactation	1.68±0.01 ^{a}	1.21±0.21 ^{bb}	12.22±0.12 ^{a}	11.33±0.12 $^{a\,b}$	8.95±0.11 ^{a}	8.21±0.02 ^{bb}
Mid lactation	1.54 ±0.02 ^{a}	1.01±0.06 ^{bb}	9.12±0.12 ^{a}	8.29±0.02 $^{b\,a}$	6.51±0.06 ^{a}	6.04 ±0.01 ^{bb}
Late lactation	1.25±0.01 ^{a}	1.00±0.04 ^{bb}	7.10±0.18 ^{a}	6.71±0.02 $^{b\,a}$	5.14±0.04 ^{a}	5.71 ±0.03 ^{b}

Conclusion

Mastitis as important disease for the dairy industry in the study area. Bred, milk yield, housing and feeding was important risk factors precipitating occurrence of mastitis. Clinical mastitis was observed at higher prevalence at dairy farms. Mastitis was not as such an important cause for deterioration of chemical composition of milk in the study area. In contemporary dairy production, it can be difficult to accurately diagnose mastitis, particularly the subclinical form, and it commonly occurs that a clinical case may be ignored or documented late by the farmer or veterinarian for a variety of reasons. Age and mastitis both degrade epithelial integrity, causing a lifetime progressive decline in milk production in dairy cows.

Therefore, individuals, and governmental and nongovernmental institutes working on dairy production should give emphasis on control of mastitis. Furthermore, improvement of milk production by providing native and crossbred heifers with systemic mastitis control and prevention is very important. Even though the current and previous studies showed importance of mastitis, the economic impact is not well addressed; therefore, further study involving different risk factors, economic impact and ways to improve milk yield of local breeds by overcoming risk factors other than breed can be included in future.

Conflict of interest: Not available

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