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Effect of Post-Milking Teat Dip on Subclinical Mastitis in Crossbred Cows

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ABSTRACT

The prevalence of subclinical mastitis is currently increasing in our country and adversely affecting dairy farmers' economies. To note down the effect of post-milking teat dip on subclinical mastitis, 30 crossbred cows were randomly divided into two groups based on parity and age viz., T_o (n=15, farmer's practices - washing of milker hand and udder with water) and T_1 (n=15, with farmer's practices along with the use of post-milk teat dip of 3.5% Lactic acid) during the experimental trial of 30 days. By use of post-milk teat dip, the CMT and SCC positive cases were decreased by 71.4 % and 72.2 % respectively in T_1. The SCC and pH of milk were significantly ($p< 0.05$) reduced however, milk yield was significantly ($p< 0.05$) increased by 6.7 % in T_1 compared to T_o on 28th day. The use of post-milk teat dip is cost-effective in terms of economics and recommended for dairy farmers to prevent subclinical mastitis.

Key Words:, California mastitis test, Crossbred Cows, post milk teat dip, Subclinical Mastitis, Somatic Cell Count.

INTRODUCTION

India is the number one milk-producing country in the world having 221 million tons of milk production as per BAHS-2022. However, Krishnamoorthy *et al* (2021) revealed that subclinical and clinical mastitis prevalence in India was 45 % and 18 % respectively. Even subclinical mastitis prevalence was higher in cattle (49 % vs. 32%) than in buffalo. Mastitis is an economically hampering disease in the country (Wani *et al*, 2022; Ali *et al*, 2022).

Mastitis is an inflammation of the udder and associated structure that is caused by mainly bacteria, less common by other microorganisms namely fungi, mycoplasma, and algae (Chakrabarti, 2007). When the teats are injured, irritated, or damaged or the sphincter muscle is loose, these organisms get the opportunity to enter the teat canal damaging epithelial cells and a series of consequences lead to fibrosis causing hardening of the udder. The prevalence of mastitis is higher in the humid rainy season than in summer and winter. Mastitis may occur in clinical and subclinical forms where the presence of blood clots, change in consistency, pus may not be visible in subclinical mastitis like clinical form of mastitis. Mastitis milk is causing problems in dairy animals and deteriorating human health.

Management practices to reduce mastitis are complete drying off, intramammary infusions, feeding of the cow after milking, culling of the cow, and pre & post-milking teat dip. However, post-milk teat dip was found to be an effective practice because it reduces the microbial load from the teat surface and orifice. So, there should be awareness among dairy farmers regarding post-milk teat dip and the cleanliness of the shed. Subclinical mastitis can be precisely detected by somatic cell count (SCC) and it can be detected by various methods. One of the methods to detect subclinical mastitis is by counting the SCC which has been reported to be an index for udder health (Singh and Ludri, 2000). The present study was conducted to see the effect of post-milking teat dip on subclinical mastitis of the crossbreed cows.

MATERIALS AND METHODS

A total of 30 farmers were selected from the district of Vaishali, India. The experiment was conducted as per the guidelines of the Institute's ethical committee. Each farmer had a crossbred cow (Jersey, HF with local) in

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mid-lactation (90-100 days). So, thirty Mastrip (Ayurvet Ltd India)-positive cases of cows were randomly divided into 2 groups based on parity and ages; control (T_0), where normal farmer practices (washing of udder and milker hand with water) occur, another treatment (T_1) group where normal farmer practice along with the use of post milking teat dip of 3.5% Lactic acid. The experiment was conducted from June to July 2022. All experimental cows were tied with neck chains at farmers' fields. Cows were offered a balance ration as per the requirement ICAR (2013). The balanced ration was made up of concentrate (composition given in Table 1), green fodders maize, and wheat straw. The cost of maize fodder was 2 Rs/ kg, wheat straw 5 Rs/ kg and concentrate 20 Rs/ kg was used for economics calculation.

Table 1. The physical composition of the concentrate mixture.

Sr. No.	Ingredient	Parts (%)
1.	Maize grain	33
2.	Barely	18
3.	Linseed Cake	20
4.	Wheat Bran	15
5.	Deoiled Rice Bran (DORB)	11
6.	Mineral Mixture	2
7.	Common Salt	1
	Total	**100**

Each quarter milk sample was tested by the California Mastitis Test (CMT). Striped 2 ml of milk in each cup of CMT Paddle, pour 3 ml of CMT reagent in each cup, and stir anti-clockwise. Somatic cell count in milk was estimated by the method of Singh and Ludri (2001). A threshold value of subclinical mastitis was considered when SCC was ≥2 lakh/ml of milk sample (NMC, 2001). The post-milking teat dip was performed for the T_1 group. Milk yield was recorded daily however, other parameters (CMT, SCC, and pH) were evaluated fortnightly. CMT kit obtained from Delaval Private Limited. A single-electrode digital pH meter was used for measuring milk pH.

STATISTICAL ANALYSIS

The diagnosed number of quarter and crossbred cows that tested positive for CMT and SCC were calculated by the percent of cases obtained from the total quarter and crossbred cows respectively shown in Table 2. The milk parameters were evaluated with the use of a T-test using SPSS 22.0 (SPSS Inc., 2013, USA). The data generated from the study were presented as mean ± standard error (S.E.). The percent of subclinical mastitis cases reduced was calculated by [{(number of positive cases before teat dip)- (number of positive cases after teat dip)}/ number of positive cases before teat dip]X 100 as per (Munoz *et al*., 2008).

RESULTS AND DISCUSSION

It is clear in Table 2 that CMT-positive cases increased by 133 % in the T_o group from the 0^{th} day compared to the 28^{th} day however, CMT-positive cases decreased by 71.4 % in the T_1 group. Similarly, Table 2 revealed that SCC increased by 133 % in the control group from the 0^{th} day compared to the 28^{th} day however, SCC decreased by 72.2 % in the T_1 group. From the beginning (0^{th} day) to the end of the experiment (28^{th} day), there was a decrease in cases of subclinical mastitis in T_1 compared to T_0. Results of the CMT cases were in agreement with Yasothai (2017), Singh *et al* (2018), and Ali *et al* (2022) who found a significant decrease in CMT cases in the antimicrobial-treated group compared to the control group. The number of CMT-positive cases was less compared to the control because of the reduction of microbes from the teat surface and teat pore area.

Somatic cell count was non-significant ($p>0.05$) on the 0^{th} day of the experiment however, on the 14^{th} and 28^{th} day of the experiment it significantly ($p=0.000$) decreased to 1.92×10^5 and 1.62×10^5 respectively in T1 mentioned in table 3. This was in agreement with Kucevic *et al* (2013) found that SCC in milk were 133,000 and 257,000 cells/ml in the treatment and control groups respectively. Ali *et al* (2022) also found a reduction in the number of SCC in treatment compared (77,000 vs 323,000 cells/ml) to the control group which shows that lactic acid sanitizer reduces the microorganism load on teat surface and pores.

From Table 3, the pH of milk on the day 28^{th} was significantly ($p=0.001$) less in post-milk teat dip treatment (6.54 vs 6.74) compared to the control group. Our findings were in agreement with Waghmare *et al* (2013), Patil *et al* (2014), and Ali *et al* (2022) who revealed in their finding that post-milk teat dip reduces and restores the milk pH compared to the control group.

When microorganisms enter the teat canal they convert lactose into lactic acid which increases the pH in the control group, Further, there is an increase in the permeability of mammary epithelial cells to blood constituents like chloride and other ions which also increases the pH of milk. However, when the concentration of microorganisms keeps on reducing from the surface then the body's immune system gets sufficient time to kill those entered microorganisms and create homeostasis inside udder tissue, and restore the pH.

There was also an increase (6.7%) and decrease (5.3%) in milk yield from the beginning to the end of the experiment in the treatment and control group respectively. On the 0th day and 14th day, there were no significant (P>0.05) differences in milk yield however, on the 28th of the experiment there was a significant(P=0.03) difference in milk yield of the treatment and control group. Our findings were in support with Waghmare *et al* (2013), Patil *et al* (2014), and Singh *et al* (2018), who also found a significant (p<0.05) increase in the milk yield of post-milking teat dip group compared to the control group. Patil *et al* (2014) recorded a 17.3 % increase in milk yield, whereas Waghmare *et al* (2013) found a 19.25 % hike in the post-milk teat dip group compared to the control group. The reason behind the decrease in milk yield in the control group was damage to the secretory mammary epithelial cells which might contributed to the total milk output decrease. When teat dip with lactic acid sanitizer is applied it reduces the different harmful microorganisms that enter through teat pores and any damage to the teat surface.

The economics of milk production and the cost of treatment are shown in Table 4. Total feed cost (115 Rs/animal/day) was similar in both groups. However, the cost of lactic acid (3.5%) with teat dip was 5.2 Rs/day/animal in the treatment group. The gross income on milk selling @ 50 Rs/liter is higher (180.80 vs 168.50 Rs /animal/day) in the treatment group compared to the control group. The benefit-cost ratio (BCR) was also higher (1.5 vs. 1.46) in the treatment over the control group. Our findings also support the finding of Wani *et al* (2022) whose losses were 105-123 Rs/ day high since those were high-producing cows.

Table 2. Number of the quarter and crossbred cows that test positive for CMT and SCC .

Parameter	Group	Quarter				Animal			
		No. of teats	0th day	14th day	28th day	No. of animal	0th day	14th day	28th day
CMT	To	60	18 (30%)	24 (40%)	42 (70%)	15	12 (80%)	13 (86.6%)	15 (100%)
	T1	60	21 (35%)	16 (26.6%)	6 (10%)	15	13 (86.6%)	7 (46.6%)	3 (20%)
SCC	To	60	18 (30%)	24 (40%)	42 (70%)	15	12 (80%)	13 (86.6%)	15 (100%)
	T1	60	22 (36.6%)	16 (26.6%)	6 (10%)	15	14 (93.3%)	7 (46.6%)	3 (20%)

Table 3. Milk parameters and SSC (x 10^5 /ml) of crossbred cows.

Parameter	0th day		14th day		28th day	
	To	T1	To	T1	To	T1
SSC (x 10 ^{5} /ml)	2.0±0.05	2.05±0.03	2.39±0.04	1.92±0.03	2.59±0.03	1.62±0.04
p-value	0.49		0.000		0.000	
pH	6.52±0.05	6.58±0.03	6.71±0.03	6.62±0.04	6.74±0.03	6.54±0.04
p-value	0.32		0.10		0.001	
Yield (kg)	5.79±0.21	5.80±0.25	5.73±0.20	6.07±0.25	5.48±0.21	6.19±0.24
p-value	0.97		0.29		0.03	

Table 4. Economic of milk production and cost of treatment

Economic of trial	To	T1
Total feed cost (Rs/animal/day)	115	115
Cost of lactic acid with teat dip	0	5.2
Total expense (Rs/animal/day)	115	120.2
Average daily milk yield (Liter/ animal/day)	5.67	6.02
Cost of milk production (Rs/L)	20.282	19.96
Gross income on milk sold (Rs /animal/day) @50 Rs/liter	283.5	301
Profit (Rs/day)	168.50	180.80
BCR	1.46	1.50

CONCLUSION

The present study revealed that the use of post-milk teat dip was one of the effective preventives as well as curative measures for the control of subclinical mastitis in crossbred cows with cost-effectiveness. This technology was recommended for dairy farmers so that economic as well as human health loss can be minimized.

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