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Assessment and use of Potassium Permanganet as Post-Milking Teat Dip in Dairy Cattle

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ABSTRACT

Mastitis is a major and perpetual problem of the dairy sector due to failure to follow basic management practices under field conditions incurring heavy financial losses as a result of reduction in milk yield, cost of treatment, loss due to discarded milk and loss of germplasm due to culling of superior animals. Taking into cognizance all these factors, control and prevention of mastitis should be aimed so as at ensure a mastitis free farm. In present study, it was found that use of 1% potassium permanganate reduced 70.59% infected quarters from day 0 to the completion of teat dipping on day 60, mean SCC were also reduced significantly ($p<0.05$) to below normal range ($191.50\pm46.09 \times 10^3$/ml) after 30 days of completion of teat dipping trial. It was also revealed that milk yield and milk components were not affected by the use of post-milking teat dip. So, the use of post-milking teat dip helps in reduction of mastitis by preventing entry of pathogens into the teat.

HIGHLIGHTS

- Study was conducted to prevent the mastitis by using post milking teat dip.
- 1% potassium permanganate reduced 70.59% infection on quarter basis.
- Teat dip significantly decreased milk somatic cell count.

Keywords: Cattle, Teat dip, Potassium permanganate, Somatic cell count

Mastitis dates back to the times when cow was first domesticated as is suggested by the historical evidences. Due to broad range of factors responsible for aetiology of mastitis, finding a successful strategy for the control of bovine mastitis is a challenge for the veterinarians as well as the dairy farmers. Targeting the hygienic conditions the treatment regimen includes teat disinfection, antibiotic therapy, dry cow therapy etc. mostly (Rather *et al*., 2020). Moreover, the rigorous use of antibiotics has lead to development of resistant strains as well as the production of unwanted residues in the milk. Taking into cognizance all these factors, control and prevention of mastitis should be aimed so as at ensure a mastitis free farm. For this, numerous control programs have been developed over the time and despite the massive development in mastitis control techniques it still exists as hindrance to the development of dairy farmers (Bhutto *et al*., 2012). One of the mastitis control and management which has been carried out and proven to be quite effective is the teat dipping method as a form of prevention. Teat dip acts as an important aspect in prevention of this havoc rendering disease of dairy animals. Dipping of all teats after each milking has a greater impact on reduction of somatic cell counts and increased milk yields; it reduces the incidence of opportunistic and contagious mastitis (Khoramian Toosi, 2017). Thus, in this study we did the assessment of effect of teat dip on the control of mastitis.

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MATERIALS AND METHODS

Different managemental practices already practiced by farmers were recorded. On the basis of traditional managemental practices adopted by farmers, best technologies were applied to evaluate their effect on the control of mastitis, and then final most effective technology was disseminated among dairy farmers in the field conditions for the control of mastitis and milk quality. Use of potassium permanganate as post-milking teat dip was used during lactation in our study

Post-milking teat dipping

Total 12 lactating dairy cows were randomly selected from same farm and divided into two groups, viz. Group-1 as control without teat dip and Group-2 subjected for regular post-milking teat dipping with 1% Potassium permanganate (KMnO4) solution for the duration of 60 days. To study the effect of teat dip as preventive measure, milk samples were collected at 0 day, 15th day, 30th day, 60th day of teat dipping and 30th day post teat dipping. Milk samples were subjected for mCMT and analysed for milk SCC, fat, lactose, protein, ash and solid not fat (SNF) by using Lactoscan Milk Analyser (Milkotronic Ltd., Bulgaria).

RESULTS AND DISCUSSION

The effective control of subclinical mastitis can clearly result in large economic profit for dairy farmers (van den Borne *et al.*, 2010). In the survey conducted during our study, it was observed that in rural area neither anybody had any knowledge about prevention techniques for the mastitis and nor about early diagnosis of mastitis at sub-clinical stage. For the prevention of mastitis 1% solution of potassium permanganate as teat dip during lactation was used.

Post-milking teat dipping

Mastitis is a managemental disease, and it can be stated from different studies including ours that prevention would be a better option for its control as goes with the famous saying of "Prevention is better than cure". To achieve this goal, the primary concern of dairy producers should be to implement and maintain good herd hygiene by applying mastitis control program. Despite the widespread use of control programs (teat dipping, dry cow therapy and other managemental practices) among dairy herds, mastitis still makes up for a repetitive problem of herds (Rather *et al*., 2020). Teat dip constitutes as the highly recommended therapy for mastitis control program (Reyes *et al*., 2017), and can also be used widely as a simple and cost-effective procedure.

In present study, it was found that the use of 1% potassium permanganate reduced the number of infected quarters from 17 on day 0 to 12 up to the completion of teat dipping on day 60, while number of infected quarters gradually increased in the control group (Table 1). On day 0, the mean SCC was higher than normal ($\leq 2 \times 10^3$/ml) in the both groups. Teat dipping effectively controlled somatic cell counts of milk from day 0 ($957.50 \pm 174.52 \times 10^3$/ml) to day 60 ($208.17 \pm 44.53 \times 10^3$/ml) in cows, showing a significant ($p < 0.05$) reduction, further plunging under normal range ($191.50 \pm 46.09 \times 10^3$/ml) after completion of teat dipping of 30 days. Whereas, in control animals, milk SCC was seen increasing constantly from day 0 ($729.33 \pm 176.06 \times 10^3$/ml) to day 60 ($3402.20 \pm 509.16 \times 10^3$/ml) of the trial (Table 1). Negative impact of teat dipping was neither found on milk composition nor on milk constituents such as fat, lactose, protein etc and they were seen to increase significantly after day 30 onwards in the teat dipping group on comparison to control group (Table1). Present findings are in the accordance with the recent reports (Sukumar *et al*., 2019; Yasothai, 2017). Bilal (2003) found that positive cases decreased up to 57% in buffaloes but in control quarters there was an increase of 50% by using 1% solution of $KMnO_4$. The same pattern was exhibited by cows (Sukumar *et al*., 2019). Post-milking teat dip has been used mainly in highly infected herds (Contreras *et al.*, 2003). The findings of this study revealed that new udder infections can be checked appreciably following teat dipping with 1% potassium permanganate solution as post-milking teat dip. Failure to post-dip has been seen to correspond with a 45% increase in Bulk tank SCC (Reyes *et al*., 2017).

Proper control of mastitis in dairy herd is considered as an indispensable process to ensure both animal health and food (milk) safety. For this, numerous control programs have been developed over the last few decades (Fetrow *et al.*, 1991), and despite the massive development in mastitis control techniques, mastitis still constitutes the main

Table 1: Effect of teat dipping with 1% Potassium permanganate on mastitis status and milk quality of dairy cows (Mean±SD)

Groups	Days of sampling	No. of mCMT positive quarters	SCC (x10^3/ ml)	Fat (%)	Lactose (%)	Protein (%)	Ash (%)	SNF (%)
Group-1	0	16	729.33^{Aa}±176.06	3.43^{Aa}±0.24	4.82^{Aa}±0.05	3.59^{Aa}±0.18	0.75^{Aa}±0.03	8.84^{Aa}±0.30
	15th	16	1238.20^{Aa}±292.55	3.37^{Aa}±0.20	4.73^{Aa}±0.06	3.52^{Aa}±0.12	0.74^{ABa}±0.04	8.66^{Aa}±0.33
	30th	18	2538.80^{Ba}±544.10	3.18^{ABa}±0.12	4.55^{Aa}±0.08	3.42^{Aa}±0.12	0.72^{Ba}±0.04	8.59^{Aa}±0.44
	60th	20	3402.20^{Ca}±509.16	3.02^{Ba}±0.12	4.53^{Ba}±0.12	3.42^{ABa}±0.07	0.70^{Ba}±0.03	8.45^{Aa}±0.44
	90th	20	3863.51^{Ca}±754.71	2.92^{Ba}±0.26	4.60^{Ba}±0.10	$3.41^{B\ a}$±0.08	0.67^{Ba}±0.03	8.19^{Aa}±0.64
Group-2	0	17	957.50^{Ab}±174.52	3.45^{Ab}±0.15	4.71^{Ab}±0.13	3.58^{Ab}±0.09	0.71^{Ab}±0.03	8.71^{Ab}±0.36
	15th	16	816.67^{Ab}±138.32	3.53^{Ab}±0.14	4.70^{Bb}±0.13	3.67^{Ab}±0.61	0.73^{ABb}±.02	8.89^{Ab}±0.25
	30th	14	491.00^{Bb}±185.70	3.82^{Bb}±0.16	4.72^{Bb}±0.09	3.83^{Ab}±0.87	0.73^{ABb}±0.03	8.88^{Ab}±0.20
	60th	12	208.17^{Cb}±64.53	3.90^{Bb}±0.18	3.93^{Bb}±0.06	3.68^{Bb}±0.78	0.75^{BCb}±0.04	9.00^{Ab}±0.15
	90th	10	191.50^{Cb}±46.09	3.88^{Bb}±0.19	4.84^{Cb}±0.08	3.94^{Cb}±0.82	0.77^{Cb}±0.02	9.01^{Ab}±0.23

Group-1: Control without teat dipping; Group-2: Post-milking teat dip with 1% Potassium permanganate. Teat dipping with Potassium permanganate was done upto 60 days.

A, B means with different superscripts within columns differs significantly ($p < 0.05$) within group at different time intervals.

a,b means with different superscripts within columns differs significantly ($p < 0.05$) between the groups.

problem of dairy production (Bhutto *et al.*, 2012). Among these controlling regimes, teat dipping has acquired great importance as an essential mastitis preventive tool (Hassan *et al.*, 2009). Teat dipping has been demonstrated to be highly effective at preventing new intramammary infections with different mastitis pathogens (KHoramian Toosi, 2017). In cows, post-milking teat dip reduces SCC and had no adverse reaction or teat irritation (Sukumar *et al*., 2019) as was also observed by Yasothai (2017).

CONCLUSION

Present study suggested and advised the farmers that potassium permanganate ($KMnO_4$) solution (1%) post milking teat dip is a cheapest and easily available in the market, or even use of any commercially available post milking teat dip solutions, used immediately after milking prevents the entry of pathogen into the teat and thus helps in prevention of mastitis. Farmers were also advised for proper pre-milking washing of udder with clean water to control contamination of milk with pathogenic bacteria.

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