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Evaluation of Vitamin E Supplementation to Control Mastitis in Crossbred Cows during Summer Season

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ABSTRACT

Mastitis is a common disease of dairy animals throughout the world. Prevalence of intramammary infections (IMI) increased due to high ambient temperatures with high relative humidity. The objective of the experiment was to evaluate the effect of vitamin E supplementation along with Iodine teat dip practices on prevalence of mastitis during the summer season. In this study, a total of 72 lactating cross bred cows of eight dairy farms of Faridkot district were randomly divided into three experimental groups (T1, T2, T3). Group T3 received 1000 IU/day of vitamin E orally along with teat dipping practice using Iodine (0.5%) after milking. In group T2, each cow received only teat dipping practice using Iodine (0.5%) after milking. T1 group was a control group. Relative risk and odds ratio was calculated using Epi info CDC 0.7. Oral administration of vitamin E with teat dipping practices was found more effective in reducing new IMI than alone teat dipping practice. Analysis revealed that group T3, T2, and T1 had 83.33, 79.16 and 66.66 per cent of no new IMI respectively, in their early lactation period. IMI was reduced by 37.57 per cent and 50 per cent in T2 and T3 groups, respectively as compared to control group. Risk of IMI was reduced by 1.6 and 2.0 times by using iodine teat dip solution and combination of iodine dip solution with Vitamin E supplementation, respectively. The findings of current investigation concluded that iodine teat dip therapy along with vitamin E supplementation in early lactating cross bred cows during heat stress period has more beneficial effect in preventing IMI in cross bred cows.

Key Words: Crossbred, Cow, Teat, Solution, Supplementation, Vitamin E.

INTRODUCTION

Mastitis leads to economical loss by reduction in potential milk production, decrease in milk quality and quantity, premature culling, treatment costs, and labour cost (Hogeveen *et al,* 2011) resulting in hampering the expected growth of the dairy sector. Sharma *et al* (2013) reported that the major problems of the small dairy farmers were cow dung management while for semi commercial and commercial farmers, mastitis was the major problem. Tiwari *et al* (2020) reported that dry cow therapy was significantly effective in the prevention of clinical and sub-clinical mastitis in dairy animals as well as against the control of pathogens. Similarly, Singh *et al* (2018) concluded that the post teat dip treatment improved quality and composition of milk along with reduction in chances of clinical and subclinical mastitis.

Clinical mastitis is easily identifiable by common signs of flakes in milk and swelling of the udder, however subclinical mastitis does not show any signs, therefore it usually gets unnoticed. Both clinical and subclinical mastitis affects the milk production. Subclinical mastitis is comparatively more prevalent than clinical mastitis (Seegers *et al,* 2003; Mdegela *et al,* 2009). Heat stress aggravates the incidence of disease in dairy animals. During

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chronic stress, cortisol secretion has been associated with immune suppression resulting in more susceptibility to disease (Ju *et al,* 2014; Jin *et al,* 2011). Heat stress may increase oxidative stress (Bernanucci *et al,* 2002) resulting in increased incidence of mastitis during heat stress period. (Jingar *et al,* 2014; Gernand *et al,* 2018). Supplementation of Vitamin E reduces the severity and duration of mastitis (Weiss *et al,* 1997). Therefore, the present study was designed to determine the antioxidative and immunomodulatory effect of vitamin E supplementation during heat stress in crossbred cows. The present study was conducted to evaluate effect of vitamin E supplementation on mastitis prevalence especially, during heat stress period in crossbred cows.

MATERIALS AND METHODS

The study was conducted in six villages namely Pakhi Kalan, Pindi Balochan, Virewala Khurd, Ghuduwala, and Kingra of Faridkot block and village Sarawan from Kotkapura block of district Faridkot during the peak of summer season (June – August) during the year 2019 and 2020. The geographic position of the study area has Latitude: 30.677 ºN, Longitude: 74.754 ºE and Latitude: 30.451 ºN, Longitude: 74.892 ºE of Faridkot and Kotkapura block, respectively with average annual rainfall 420 mm. The average day temperature is 40ºC in the summer months. Most of the dairy farms of the Faridkot district, practices tie up stall feeding.

In this study, 72 crossbred dairy cows (8 dairy farms; 9 lactating cows from each farm) were selected and divided into three feeding groups (T1, T2 and T3) using the following criteria:

1. Mean milk production of 10-20 kg/day/animal.
2. All animal should have parturiated between 4th week of April to 3rd week of May.
3. All the farms had a history of clinical mastitis cases during heat stress period in 2018.
4. Before starting of treatment, all selected animal should be negative for IMI with Bromothymol blue (BTB) card test.

Management and structure of farm

All the selected dairy farms had *pakka* barns and followed tie up stall feeding practices. Milking was done two times a day by using full hand milking technique. All the farms have the facility of rubber mats to reduce physical stress and fogger system was installed to ameliorate heat stress.

Treatment protocol

Each cow in the group T3 received 1000 IU/day alpha tocopheryl acetate orally for 3 months (June to August) along with teat dipping practices using 6 parts Iodine (0.5%) solution + 1part Glycerin after milking. In teat dipping technique, teats were dipped to at least 50% of the teat length as soon as possible following hand milking. In group T2, each cow received only teat dipping practices using 6 parts Iodine (0.5%) solution + 1part Glycerin after milking along with supplementation of 1g of area specific mineral mixture per day orally (prepared by Guru Angad Dev Veterinary and Animal Science University, Ludhiana,).T1 group control group, teat dipping and supplementation of vitamin E were not practiced, but 1g area specific mineral mixture was supplemented per day to blind the farmer. Farmers and workers of the farms were guided by research team, regarding the treatment procedure to be followed before initiation of trials.

Detection of Intra mammary infection (IMI) using BTB card

All the cows were cross checked for IMI at 10 days difference from the day of initiating the treatment protocol (1st June) using BTB card during milking time. Following squirting, first few streams of milk, a small portion milk sample were screened by BTB card; change in color form yellow to green/ blue depicts mastitis. Farmers and workers of the farms were trained for data collection and diagnosis of mastitis. When a farmer noticed a mastitis case, he/she contacted directly the emergency service of the research team. Within 24 hours, the farm with

Table 1. Odd ratios (OR) and confidence intervals (CI) of factors having significant effect on IMI in crossbred cows during heat stress period.

Independent variable	Category	OR	95% CI	P-value (X^2)
Parity	1–2	0.86	0.29, 2.51	0.07
	3-5	1.16	0.39, 3.39	
Udder quarter localization	Front quarter	0.93	0.31, 2.78	0.013
	Rear quarter	1.06	0.35, 3.17	
Milk yield (L/day)	10-14 L	0.84	0.27, 2.5	0.096
	15-20 L	1.19	0.39, 3.58	

the diseased cow was visited by a veterinarian and the diagnosis of mastitis was confirmed and treatment was started by veterinarian.

Statistical analysis

The data generated from this experiment was entered in Microsoft Excel (2007) worksheet, organized and processed for further descriptive analyses by using Epi info CDC 0.7. Frequency tables on prevalence of IMI by groups were prepared, and the Mantel–Haenszel v2 test within groups was used to analyze the statistical significance of treatment on IMI cure. Relative risk ratio and odd ratios for control and treatment groups were calculated. Apparent and true prevalence of IMI was estimated for all three groups using win episcope 2.0 and percentage of increases or decrease in treatment groups was calculated in respect to control group.

Ethical approval

This study was approved by scientific advisory committee and all relevant international, national and institutional guidelines for the care and use of animals were followed.

RESULTS AND DISCUSSION

In this investigation, oral administration of vitamin E with teat dipping practices was found more effective in reducing new IMI, rather than alone teat dipping practice. Screening of IMI with BTB card test revealed that in group T3, 20 cows out of 24 (83.33%) had no new IMI in their early lactation period, while 79.16 per cent and 66.66 per cent cows in group T2 and T1, respectively, were found negative for new IMI. True prevalence of IMI in T1, T2 and T3 were 50.72, 23.55 and 14.49 per cent, respectively by taking in account sensitivity (56%) and specificity (90%) of BTB card test (Marschke and Kitchen, 1985). According to apparent prevalence, Intra mammary infection was reduced by 37.57 per cent and 50 per cent in T2 and T3 groups, respectively in comparison to control group. Risk of IMI was reduced by 1.6 and 2.0 times by using iodine teat dip solution and combination of iodine dip solution with Vitamin E supplementation respectively, in contrast to control group. In support to this study some previous researches proved that, use of iodine dip solution can reduce the IMI infection (Foret *et al,* 2005) and Supplementation or injection of α-tocopherol and selenium were reported to be supportive for mammary gland immune system (Bouwstra *et al,* 2010; Cengiz and Bastan, 2015), while their deficiencies could be associated with increased prevalence of IMI (Qureshi *et al,* 2010). Combination of both practices showed reduction in IMI in cross bed cows during heat stress. In current study, it was found that IMI were 1.16, 1.06 and 1.19 odds associated with 3-5 parity, rear quarter teats and high yielder (15-20 L) cross bred cows respectively (table 1). This study was in line with (Hoque *et al,* 2016).

CONCLUSION

The findings of our current investigation concluded that iodine teat dip therapy in early lactating cross bred cows during heat stress period has more beneficial effect in preventing intra mammary infection. However, the supplementation of vitamin E along with iodine teat dip solution appears to be the best effective therapy in reducing the prevalence of new IMIs in cross bred cows.

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