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"Mastidip Liquid" a herbal post milking teat dip for prevention and control of subclinical mastitis in bovines

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ABSTRACT

Udder is a productive organ of dairy animals; hence for better production it should be healthy. Post milking teat dip is probably the most important and effective management strategy udder sanitization and disinfection. The present investigation was conducted to evaluate the efficacy of post milking herbal teat dip Mastidip Liquid (*supplied by m/s Ayurvet Ltd, Baddi, India*) in subclinical mastitic cows on the basis of restoration of altered milk pH, SCC and milk yield. 15 cows screened positive for subclinical mastitis on the basis of mastrip test, somatic cell count and bacteriological examination were selected as treatment group T1. One additional group of 10 normal healthy cows free from subclinical mastitis was taken as normal control group (T0). Both the groups were treated with herbal teat dip post milking in 1:2 dilution twice daily immediately after milking for a period of one month. The milk samples were collected for SCC and pH before initiation of teat dipping (day 0) and on 5th, 14th, 21th and 30th day post application of teat dip. The milk yield (kg/day) of all the cows was recorded for a period of 60 days of experiment. After application of herbal teat dip post milking the pH and SCC of milk was significantly ($P<0.01$) improved in treated group T1. The milk-yield in treated group increased to the extent of 4.1% at day 14th and 17.3% by day 60, post dipping after initiation of dipping. The milk pH, SCC and milk yield was with the normal range in control group T0 and there was no incidence of new intramammary infection. Post milking teat dipping with Mastidip Liquid is found to be efficacious in reducing the incidence of subclinical mastitis and occurrence of new intramammary infection in dairy cows.

Key words: Antisepsis**,** intramammary, herbal, mastitis, sanitizer, teat dip, udder.

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1. INTRODUCTION

India has 221.900 millions cattle population which is almost 16.15% of the overall population of world-cattle. Although, India ranks first in the world for milk production, mastitis causes the huge economical loss (Bhikane and Kawitkar, 2000). Mastitis is the most common multifactorial disease in lactating cows (Halasa et al., 2007). Mastitis leads to major changes in milk; including change of color, consistency and number of leukocytes and also a series of events in mammary gland (Chakrabarty, 1997). The characteristic features of mastitis are swelling hot, redness, pain and disturbed functions of udder (Bhikane and Kawitkar, 2002). During a mastitis episode, defense cells migrate from the blood to the mammary gland to combat the infectious agents, which increases milk SCC (Rainard and Riollet, 2006). Inferior udder health results in economic losses to both dairy farmers and milk processors, depressing milk yield (Kelly, 2009) and increasing costs (Huijps et al., 2008). Udder is a productive organ of dairy animals; hence for better production it should be healthy. Because of its anatomical position are subject to outside influences and are prone to both inflammatory and non inflammatory conditions (Sudhan and Sharma, 2010). Considering the potential of the area and the economic significance of dairy production to the local community there have been repeated efforts for various aspects of mastitis treatment and control (Tiwari et al., 2013). The prevention of bovine mastitis is the most important component of a mastitis control programme and both pre and post milking teat antiseptics are the most effective management strategy for preventing new intramammary infections in dairy cows. Teat disinfection after milking is one of the five plans of mastitis control by National Institute for Research into Dairying (NIRD). Dipping or spraying the teats has been practised for many years (Maiti et al., 2004). Post milking teat dip is probably the most important and effective management strategy for mastitis control and to reduce the new intramammary infection rate in dairy cows. The aim of post-milking dipping is to remove any contagious mastitis-causing pathogens that may have been deposited on the teat surface - including any present just inside the opened teat canal - that are transferred during milking from infected milk residues, before they have chance to colonise and infect the teat (Woolford, 2001). Teat disinfection helps keep teat skin healthy and heal skin lesions, and these actions may be its most important contribution to mastitis control (Hillerton, 1997). Many field experiments have shown that effective post-milking teat disinfection lowers new infection rates of the cow-associated mastitis bacteria (*Staph aureus* and *Strep agalactiae*) by 50% or more (Bramley, 1992). The past decade has seen a significant increase in the use of herbal medicine due to their minimal side effects, availability and acceptability to the majority of the population. Even WHO has emphasized on the use of medicinal plants, as they are safer and cost effective than the synthetic drugs. Therefore present study is designed to evaluate efficacy of herbal teat dip "Mastidip liquid" in sub-clinical mastitis in bovines.

2. MATERIAL AND METHODS

The present study was conducted in the bovine cases presented in the Dept. of Veterinary Medicine, Veterinary College, Bidar, Karnataka, India.

2.1. Experimental design

Fifteen cows in mid lactation positive for subclinical mastitis on the basis of mastrip test, somatic cell count and bacteriological examination were treated with herbal teat dip Mastidip post milking in 1:2 dilution twice daily immediately after milking for a period of one month (group T1). Additionally Ten healthy cows in mid lactation free from subclinical mastitis (ascertained by somatic cell count, bacteriological examination & mastrip test) were kept as a normal healthy control group T0 treated with herbal teat dip Mastidip post milking in 1:2 dilution (one part concentration solution + Two part clean water) twice daily immediately after milking for a period of one month. The product Mastidip liquid (supplied by M/S Ayurvet Limited, Baddi, H.P., India) comprises of herbs viz, *Berberis lyceum, Curcuma longa, Eucalyptus globulus* and many others in a fixed concentration.

2.2. Parameters estimated

Milk pH (by digital pH meter), Somatic cell count (SCC) (Schalm et al., 1971) were recorded on day 0, 5, 14, 21 and 30 post dipping. Cultural examination of milk (Ananthnarayan and Panikar, 1997) was done in all the milk samples. Milk yield (kg/day) of all the animals was recorded on day 0, 5, 14, 21, 30, 45 and 60 post dipping.

2.3. Statistical Analysis

The data was analyzed statistically by using Factorial Completely Randomized Design (FCRD) as described by Snedecor and Cochran (1994).

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Table 1

Average values of milk pH and SCC (x10^5cells/ml of milk) in normal healthy and subclinical mastitis group at different intervals

Groups	Parameter	0th day	5th day	14th day	21st day	30th day
T0	SCC	3.27 ± 0.13^{aA}	3.05 ± 0.19^{aA}	2.87 ± 0.19^{aA}	2.88 ± 0.19^{aA}	2.80 ± 0.19^{aA}
	pH	6.69 ± 0.07^{aA}	6.63 ± 0.07^{aA}	6.59 ± 0.07^{aA}	6.61 ± 0.07^{aA}	6.62 ± 0.07^{aA}
T1	SCC	6.15 ± 0.15^{aB}	4.05 ± 0.15^{bB}	3.33 ± 0.15^{bA}	2.95 ± 0.15^{bA}	2.93 ± 0.15^{bA}
	pH	7.32 ± 0.06^{aB}	6.72 ± 0.06^{bA}	6.68 ± 0.06^{bA}	6.69 ± 0.06^{bA}	6.69 ± 0.06^{bA}

Values with different superscripts in a row differ significantly at P<0.01

Table 2

Average milk yield (liters/day) in different groups

	0^{th} day	5^{th} day	14^{th} day	21^{st} day	30^{th} day	45^{th} day	60^{th} day
Group T0	6.76^{aA}	6.86^{aA}	6.80^{aA}	6.80^{aA}	6.82^{aA}	6.84^{aA}	6.87^{aA}
Group T1	4.10^{aB}	4.11^{aB}	4.27^{bA}	4.36^{bA}	4.45^{bA}	4.63^{cA}	4.81^{cA}

Values with different superscripts in a row differ significantly at P<0.01

3. RESULTS AND DISCUSSION

An experimental study was conducted as per the experimental design and the results were assessed on basis of effect on pH, milk yield, somatic cell count (SCC) and cultural examination of milk.

3.1. Milk pH

The average values of pH of milk in two groups of cows before (day 0) and 5, 14, 21 and 30th day post dipping are presented in Table 1. The average milk pH in healthy control group T0 before treatment was 6.69±0.07 and there was no change in the milk pH upto day 30 (6.62±0.07) indicating non-occurrence of new intramammary infection in healthy udders. However the milk pH of subclinical mastitic group T1 was significantly high (7.32±0.06) before treatment. The critical differences and mean comparison indicated significant decrease (P<0.01) in pH during the subsequent period of experiment and pH of milk restored to normal (6.68± 0.06) on 14^{th} day post dipping (Table 1) indicating effectiveness of herbal teat dip in restoring raised pH to normal. Similar, findings were also recorded by Kolte et al., (1999); Waghmare et al., (2002); Diami, (2004).

Constituents of milk responsible for pH are casein, citrate, phosphate, dissolved CO_2 and bicarbonates which are balanced with permeability of udder cells to the blood capillaries. In mastitis due to mammary gland infection, increased permeability of the udder tissue to blood components viz., bicarbonate ions, results higher value of pH in the milk (Schalm et al., 1971; Rao, 1990). Joshi et al., (1976) suggested that the increase in chloride concentration might be responsible for increase in pH of milk in subclinical mastitis.

3.2. Somatic Cell count

The average values of somatic cell count in different groups of cows before (day 0) and 5, 14, 21 and 30^{th} day post dipping are presented in Table 1. The SCC (x10^5cells/ml of milk) in healthy control group T0 was within the normal range before (3.27±0.13) and after treatment upto day 30^{th} (2.80±0.19) indicating that there was no development of any new intramammary infection. The SCC in subclinical mastitic group was 6.15±0.15 at day 0, which was somewhat towards the higher side of subclinical mastitis (transitory phase). After application of herbal teat dip, the SCC of milk decreased significantly (P<0.01) at different intervals and restored to normal (3.33±0.15) on 14^{th} day and day 30^{th} (2.93±0.15) post dipping. These findings are in accordance with the findings of Sharma et al., (2000); Mukharjee and Das, (2002); Diami, (2004). The increase in SCC in subclinical mastitis might be due to shift of leukocytes to the udder following inflammatory changes in the mammary gland as a protective mechanism against infection (Murcus et al., 1994).

The most significant subclinical abnormality of the milk is the increase in somatic cell count. Milk somatic cells consist of several cell types including neutrophils, macrophages and a smaller percentage of epithelial cells (Jones, 2006). In the healthy lactating mammary gland, total somatic cell count is < 10^5 cells/ml of milk and considered to be normal. During intramammary infection, total somatic cell count increases to > 10^5 cells/ml of milk. An increase in

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number of leukocytes in milk causes increase in the number of somatic cells and indicates inflammatory reaction of udder tissues. Thus, somatic cell count has been used extensively as an indicator of degree of intramammary infection. Somatic cell count plays a protective role against infection in bovine mammary gland as a normal part of defense mechanism.

3.3. Milk Yield

The major economic losses due to subclinical mastitis have been attributed with the loss of milk yield. In the present investigation milk-yield (liters/day) of all the animals under experiment were recorded up to 60th day (Table 2). The milk yield in healthy control group (T0) was 6.76 before treatment and there was no variation in the milk yield upto day 60 (6.87). However in subclinical mastitic group T1 the average milk yield before treatment was only 4.10 and there was significant increase in the milk yield from day 14th (4.36) upto 60th day (4.81) post treatment. Overall there was an increase of 4.1% at day 14 and 17.3% at day 60 after herbal teat dipping.

3.4. Microbial isolation

No microbial isolation could be made from healthy control animals T0. However from the subclinical mastitic group T1 Staphylococcus *aureus* (07), *Bacillus* spp. (03), *Streptococcus agalactiae* (03) and *Escherichia coli* (02). After teat dipping with Mastidip liquid no microbial isolation was found in the milk samples of treatment group T1. The results of the present study are in accordance with the earlier findings of Waghmare et al. 2013 and Vala et al. 2013, who observed similar results in term of improved milk pH, SCC and milk yield in subclinical mastitic cows treated with Mastidip Liquid. The constituent herbs of Mastidip liquid viz. *Berberis lycium, Curcuma longa and Eucalyptus globulus* are well known to possess antimicrobial, anti-inflammatory and immunomodulatory activities (Mukhopadhyay, 1982; Sharma, 2003; Bachir et al., 2008; Liju et al., 2011). These properties may be responsible for normalizing the SCC and pH of the milk, thus leading to increase milk yield in subclinical mastitic animals.

4. CONCLUSION

Post milking teat dip is probably the most important and effective management strategy to reduce the new intramammary infection rate in dairy cows. The present trial results revealed that application of herbal teat dip product was efficacious in maintaining the normal udder health in healthy animals. Post milking herbal teat dip "Mastidip Liquid" is probably the most important and effective management strategy to reduce the new intramammary infection rate in dairy cows & "Mastidip Liquid" may be recommended after each milking for control and prevention of new mammary gland infection in dairy herd as teat dipping would reduce or eliminate organisms from the teat skin or orifice after milking.

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