COMPARATIVE EVALUATION OF ORAL SUPPLEMENTATION OF UNCOATED AND COATED TRI-SODIUM CITRATE IN SUBCLINICAL MASTITIS IN COWS

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ABSTRACT

Background: Use of antibiotics in sub clinical mastitis is of little benefit, since pathogenic organisms get resistance rapidly and a threat of passing residues in milk and causing a public health issue. Hence an alternative approach to minimize the ill effects of sub clinical mastitis is imperative and needs to be explored further. One such alternative is supplementation of plain Tri-sodium citrate. Several scientists reported the efficacy of tri sodium citrate to cure sub-clinical mastitis in cows and buffaloes.

No: of Tables: 2 **No of Graphs: 2** **No: of References: 16**

Key words:- survey of prevalence sub clinical mastitis, California mastitis ring test, Methylene blue reduction test, plain and coated Tri sodium citrate, percentage of cure.

INTRODUCTION

Many incidences of mastitis are directly indicated only by a high individual cow Somatic Cell Count through milk recording schemes or via California Mastitis Testing; the cow herself displaying no obvious clinical symptoms of the illness and no visible changes to the composition of her milk. These cases of mastitis are termed sub-clinical, and can be up to 40 times more common than clinical cases of the illness. (AHDB 2016)

The annual loss due to bovine mastitis at present is estimated to the tune of Rs. 71651.5 millions/year (Sudhan and Sharma, 2010). Research presented at the 2015 National Mastitis Council Annual Meeting concluded the cost of subclinical mastitis often is greater than that of clinical mastitis (Kirkpatrick.2015)

The review of various reports evidenced that the average prevalence of mastitis in sixties to early nineties was not more than 30%. However, afterwards the prevalence increased to even more than 60%. Two decades ago, the average incidence of clinical mastitis in India was 1-10% with sub-clinical mastitis ranging from 10-50% in cows and 5-20% in buffaloes. More than 100 recent studies spread over 32 states of India indicate that the overall prevalence of mastitis ranges from 25-97% with an average prevalence of 45% (Joshi and Gokhale, 2006)

To improve milk quality, cows with subclinical mastitis are sometimes treated with antimicrobials during lactation. However, such an approach may not be economically sound on either a short or long-term basis. Therefore, it is important to evaluate the circumstances when such treatment has value. In addition, routine antimicrobial treatment of subclinical mastitis in herds with a high SCC will lead to increased use of antimicrobials, which may in turn increase the development of bacterial resistance against antimicrobials and also have a negative impact on the environment. An important part of the strategy to reduce the use of antimicrobials in dairy production is to refrain from treating cases of mastitis when the prognosis is poor. (Hallen Sandgren et.al .2007)

In a study with a large number of subclinical mastitis cases , the overall bacteriological cure rate for antimicrobial treatment was 75% and that for no treatment 68% (Wilson et al. 1999) Studies on treating cows based on high somatic cell counts have generally shown that no effect on milk production has been achieved (Hallen Sandgren et al..2008)

Cows with subclinical mastitis maintain a reservoir of infection within the herd an increase exposure of healthy cows to contagious pathogens. Somatic cells are the epithelial (25%) and leukocytes (75%) cells secreting through milk. If inflammation i.e., mastitis occur, somatic cells number also become higher and it is due to migration of more neutrophils in the milk which is around 90% (Harmon, 1994). Measurement of somatic cell in the milk samples are referred as Somatic Cell Count (SCC).

The California Mastitis Test (**CMT**) is a simple cow-side indicator of the somatic cell count of milk. It operates by

disrupting the cell membrane of any cells present in the milk sample, allowing the DNA in those cells to react with the test reagent, forming a gel. (David et al 2005). It provides a useful technique for detecting subclinical cases of mastitis.
Continued use of antibiotics in sub clinical mastitis; the pathogens are becoming resistant to antibiotics, passing residues through the milk and becoming a public health concern to consumers. Scientists are searching suitable and effective alternatives to contain sub clinical mastitis. Several authorities tried Tri sodium Citrate @ 30 mg/kg body weight daily for ten-day and found satisfactory results (Dhillon, et al. 1989 and 1995, Renu Gupta1 et al., 2013 and Ram Bahal Rai et al.2013).
In the present study an attempt is made to find out the efficacy of coated Tri sodium citrate over un-coated one, with regard to percentage of cure and milk quality, fat and yield with the help of California mastitis test on cows belonging to members of co-operative societies of Bangalore Milk union, Bangalore (BAMUL).

Materials and Methods:

The procurement and input department of Bangalore Milk Union Ltd., Bangalore under took the study of prevalence of sub-clinical mastitis in 10365 cows belonging to members of 1918 dairy co-operative societies in two faces with the help of California Mastitis Reagent Test. The pathogenic load of milk was assessed with the Methylene blue reduction test. The reacted cows were administered plain and coated tri sodium citrate for 10 days twice. The percentage of cure, the pathogenic load and milk fat were estimated.

The California mastitis kits and uncoated Tri Sodium citrate were purchased from Nice chemicals, Cochin. Coated Tri sodium citrate was obtained from Rathna Biotech, Palamaneru.

Methylene Blue Dye Reduction Test, commonly known as MBRT test is used as a quick method to assess the microbiological quality of raw and pasteurized milk. This test is based on the fact that the blue color of the dye solution added to the milk get decolorized when the oxygen present in the milk get exhausted due to microbial activity. The sooner the decolourization, more inferior is the bacteriological quality of milk assumed to be.

With technical guidance of National Dairy Development Board Bengalore, the Bangalore milk union limited, Bengalore, has undertaken mastitis control program in 1918 milk societies. The study was conducted in two phases. Each phase was again divided into two parts. In first phase of first part, 1005 dairy cooperative societies were selected and 48477 and milk samples were screened for sub clinical mastitis with California mastitis test. The reacted cows were supplemented with 10 grams of tri sodium citrate for 10 days. The reacted cows were again screened for CMT. And the positive cows were again supplemented with10 grams of uncoated tri sodium citrate for 10 days. The supplemented cows were again subjected to California mastitis test. (CMT)

In the 2nd phase 913 societies were involved in the study. Number of milk samples screened
in the first part, were 44041. The positive cows were supplemented with 20 grams

of coated tri sodium citrate for 10 days and in the second part, after 10 days of supplementation were rescreened With CMT.

Results and Discussion:

We noted in the present study (Table-2 and Figure-2) the MBRT test results reveal that milk of cows supplementation with coated Tri sodium citrate is highly significant but only qualified as Fair grade. The grade can be upgraded to Good grade by increasing supplementation rate and duration

Oral administration of tri sodium citrate resulted in decline of bacterial count and replenishment of milk citric acid (Dhillon et al., 1995) the result of the administration of tri sodium citrate at 30mg/kg body weight once daily, orally in 250 ml distilled water continued for 10days, gradually decreased the milk pH. It was recorded 7.18± 0.07 in case of sub clinical mastitis cows and 7.23 ± 0.09in clinical mastitic cow. The cases were treated with Tri sodium citrate and pH of milk was found normal from third day. (Ved Prakash et al 2013) The level of citric acid in mastitic milk was significantly lower than that of milk from non mastitic animals. (Renu Gupta et al**)** Since normal milk pH is considered unsuitable for the growth of common bacterial pathogens and mastitic milk has an alkaline pH. It was hypothesized that administration of tri sodium citrate orally might correct/optimize milk pH. Prakash and Sharma (1994) also recorded a gradual decrease in milk pH after the tri sodium citrate and oral therapy.

We could infer from current investigation (Table-1and Figure-1) that the percentage cure after second screening and treatment with 10 gms coated Tri sodium for 10days is highly significant offering on-label solutions for success of sub clinical mastitis treatment. The percentage of prevalence of sub clinical mastitis in current study is 68.68. More than 100 recent studies spread over 32 states of India indicate that the overall prevalence of mastitis ranges from 25-97% with an average prevalence of 45% (Joshi and Gokhale, 2006)

We observed from the experiment (Table no-2 and Figure-2), that fat percentage in animals are highly significant in both treated groups over controls. The fat content of supplemented cows with plain and coated Tri Sodium citrate was 4.18±0.12 and 4.26±0.18 over the un- supplemented ones were4.21±0.16 and 4.21±016 respectively. In the market, fat percentage is indicative of quality of milk. In sub-clinical and clinical cases, fat percentage was recorded 2.51± 0.04 and 2.56± 0.21, respectively and after treatment with Tri-sodium citrate, it was found increased 3.21± 0.04. It is in close agreement with Singh *et al.* (1998) who also observed that fat content of milk in sub-clinically and clinically infected quarters was reduced to 2.89± 0.78 and 2.78± 0.22 g/dl, respectively against normal value of 3.01± 0.78 g/dl.

The beneficial effect of lipid coated Tri sodium citrate may protect the supplement from the degradation in the rumen and facilitate the supplement to release in the intestines and make the supplement highly bio available.

Table no:1

Percentage of cure before and after supplementation of Plain and Coated Tri-sodium citrate in subclinical mastitis in cows

A	Treatment With Tri sodium citrate 1	Animals screened 1st time 2	Found +ve 3	% Cure 4	Animals screened 2nd time 5	Found +ve 6	Percentage of cure 7
		16497	11329	31.32 %	9133	1684	82 %
	Mean	1247.7	936.5		761.08	140.33	
	S D	743.62	477.1		367.34	33.77	
B	Treatment With coated Tri sodium citrate	1770	881	51.23 %	723	86	88 %
	Mean	590	293.66		241	28.66	
	S D	619.37	313.58		273.58	33.77	

1) Serial number 4over 2 in A are considered to be extremely statistically significant at 5% level. Serial number 4 over 2 in B are considered to be extremely statistically significant at 5% level. Result of First screening of Group B over A is coated to be extremely statistically significant.Result of Second screening of group B over A is considered to be extremely statistically Significant.

Figure-1

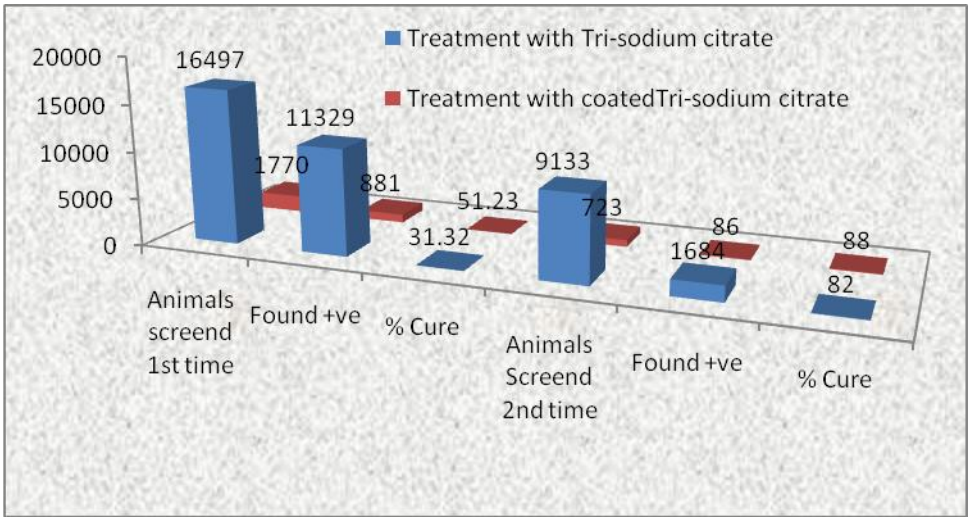


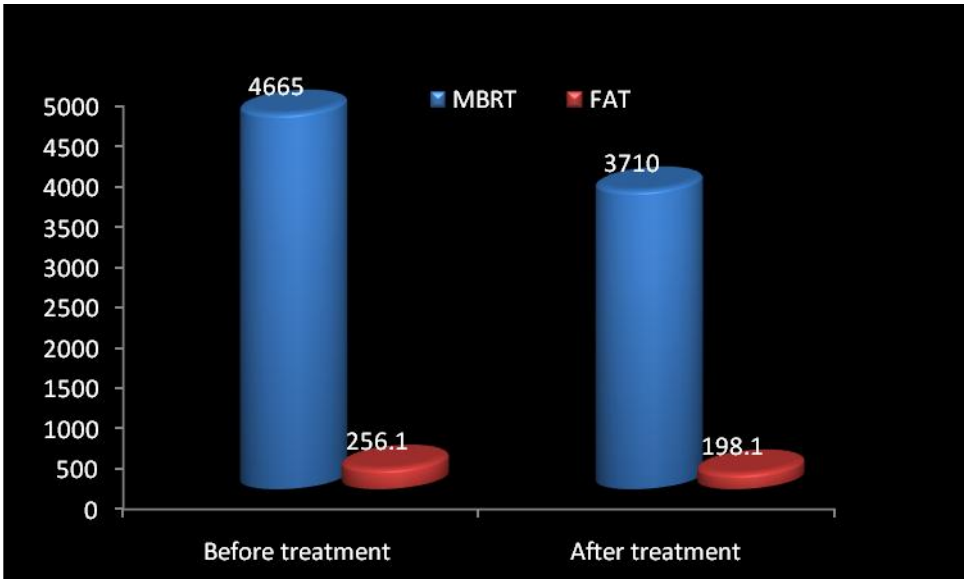
Table-2:Milk Quality before and after treatment with plain and Coated Tri-Sodium Citrate.

S.No	Treatment With 1	Sample 2	MBRT BeforeTreatment 3	Fat Before Treatment 4	MBRT After Treatment 5	Fat After Treatment 6
01	A)Tri-sodium citrate	92518	4665	256.1	5445	259.2
	Mean(μ)		75.24	4.21	87.82	4.18
	±SD		11.78	0.16	14.24	0.12
02	B) Coated Tri-sodium citrate	11200	3710	198.1	4455	200.5
	Mean(μ)		78.93	4.21	94.78	4.26
	±SD	4665	16.14	0.16	16.58	0.18

In the table,

- Serial number 5 over 3 in A Group is considered to be extremely statistically significant at 5% level.
- Serial number 6 over 4 in A Group is considered to be extremely statistically significant, at 5% level.
- Serial number 3 in B over A Group is considered to be extremely statistically significant at 5% level.
- Serial number 6 in B over A Group are considered to be extremely statistically significant are at 5% level

Figure- 2



Conclusion:

The study reviled 68.68% of prevalence of sub-clinical mastitis in cows. Supplementation of tri sodium citrate significantly minimized the pathogenic load, reduced the percentage of infection to 18%, and increased milk fat from 3.692±0.030 to 3.81± 0.026 over supplementation of plain tri sodium citrate and control.

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