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RESEARCH ARTICLE

ALTERNATE TO ANTIBIOTICS: A NEW APPROACH OF DRY COW MANAGEMENT

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Abstract

40 milking as well as pregnant Surti buffaloes were randomly allotted to four different treatment groups. The animals of group T1 (n=10) were kept as untreated control. The animals of group T2 (n=10) were treated with Mastilep gel (M/s Ayurvet Limited) applied twice daily continuously for 3 days at the time of drying off and before parturition. The animals of group T3 (n=10) were treated with Mastilep gel (M/s Ayurvet Limited) applied twice daily continuously for 5 days at the time of drying off and before parturition. In group T4 animals (n=10), two injections of long acting Enrofloxacin (10mg/kg body wt.) were given intramuscularly with 72 hrs interval at the time of drying off. During the study period the parameters viz. somatic cell count, bacterial culture examination, california mastitis test and milk yield were studied. Analysis of results revealed that Mastilep gel therapy was effective and economical for dry cow therapy. Mastilep gel found safe for usage.

Introduction:-

India is the largest milk producer in the world, but the per capita availability of milk still remains half of the world average. One of the reasons for low productivity is poor animal health, particularly, infectious diseases like mastitis. Bovine mastitis is a large-scale infectious disease with significant impact on the economy of milk production (Halasa *et al.*, 2007; Awale *et al.*, 2012). Despite decades of research and steady progress, mastitis remains the most costly infectious disease affecting dairy herds. Mastitis can appear in a clinical and subclinical form, the latter being commonly found in most herds (Gruet *et al.*, 2001). Over 137 different organisms have been identified as being causative agents of bovine mastitis, including bacteria, viruses, mycoplasma, yeasts and algae (Watts, 1988; Crispie *et al.*, 2004). Due to continue losses and a lack of complete understanding of this disease, research has led to certain procedures proven effective in reducing the incidence of mastitis. Dry cow therapy, the intramammary infusion of antibiotics immediately after the last milking of lactation, is one such practice. The relationship of the dry period with the level of mastitis in dairy herds resulted in the development of dry cow therapy as a necessary component of mastitis control to both eliminate existing infections and prevent new ones (Berry and Hillerton, 2002). Experimental evidences suggest that dry cow therapy is effective in controlling the intra mammary infections (Janosi and Huszenicza, 2001), But antibiotics cost and withholding time add cost to the farmer. As because of appearance of residues in the milk, milk is normally withheld for a period of time following calving, with associated economic losses (Craven, 1987). Milk products containing specific levels of antibiotic residues cannot be sold for human consumption. On other hand usage of antibiotics for dry cow therapy contribute to increased antimicrobial resistance (Oliver and Murinda, 2012). The continued use of antibiotics in prevention of mastitis in dry cows will continue to

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be scrutinize. Thus there is a significant increase in the use of herbal medicine due to their minimal side effects, availability and acceptability to the majority of the population. According to World Health Organization (WHO), medicinal plants would be the best source to obtain a variety of drugs. Therefore, such plants should be investigated to better understand their properties, safety and efficacy (Nascimento *et al.,* 2000). Even WHO has emphasized on the use of medicinal plants, as they are safer and cost effective than the synthetic drugs. Therefore, present study was conducted to evaluate the therapeutic efficacy of a herbal topical formulation Mastilep gel as an alternative to antibiotic in dry cow therapy in Surti buffaloes.

Materials and Methods:-

The present study was conducted at the Livestock Research Station, Navsari Agricultural University, Navsari, Gujarat, India in Surti breed of buffaloes. The study was conducted from 1st June, 2014 to 31st July, 2015. A total of 40 milking as well as pregnant Surti buffaloes were selected and randomly allotted to four different treatment groups consisting of 10 animals in each group. The animals of group T1 were kept as untreated control. The animals of group T2 were treated with Mastilep gel *(M/s Ayurvet Limited)* applied twice daily continuously for 3 days at the time of drying off and before parturition. The animals of group T3 were treated with Mastilep gel *(M/s Ayurvet Limited)* applied twice daily continuously for 5 days at the time of drying off and before parturition. In group T4 animals two injections of long acting Inj. Enrofloxacin @10mg/kg body wt. were given intramuscularly with 72 hrs interval at the time of drying off. Somatic cell count (SCC) on day 0, and post-calving milk samples on day 7th, day 14th and day 21st was recorded in all the groups. Milk yield of current lactation and for three months of previous lactation was also recorded.

Statistical Analysis:-

The results were analyzed as per standard statistical procedures.

Results and Discussion:-

Somatic cell count (×10^3/ml):-

Somatic cell count (SCC) is commonly referred to as a Leucocyte count. Somatic cells are considered to be the cells of udder tissue (epithelial cells) and also cells coming from the blood like neutrophil, macrophages, lymphocytes. SCC could be considered as a main trait of udder health and milk quality (O´Brien *et al.,* 2001). SCC of individual buffalo milk samples was studied. On day 0 the SCC (× 10^3/ml) in all groups was high and varied from 748.50 to 665.60 (pre calving) (Table 1). After treatment the SCC reduced in all treated groups in comparison to untreated control group. Post calving on day 7, after treatment the SCC was low in treatment groups T2 (448.10), T3 (413.20) and T4 (405.20) in comparison of untreated control group T1 (526.40). On day 14 and day 21 post calving, SCC was effectively reduced in Mastilep gel (bid for 5 days) treated Group T3 (319.20 and 250.60, respectively) followed by antibiotic treated Group T4 (337.40 and 271, respectively) and Mastilep gel (bid for 3 days) treated Group T2 (370.10 and 296.90, respectively) in comparison to untreatment control group T1 (420.50 and 343.10, respectively) (Table 1). Anti-inflammatory and Anti-bacterial properties of Mastilep gel ingredient herbs viz. *Cedrus deodara*, *Eucalyptus globules*, *Curcuma longa* (Shinde *et al.,* 1999; Chopra *et al.,* 2004; Bachir and Benali, 2012; Jurenka, 2009; Kim *et al.,* 2005) resulted in reduction of Somatic cell count.

Table 1:- Mean SCC (× 10^3/ml) in different treatment groups (pretreatment and post-calving) of Surti buffaloes

Time interval	T1	T2	T3	T4	Overall	F value
0 day	748.50 ± 32.47	683.00 ± 34.05	665.60 ± 45.02	713.10 ± 30.24	702.55 ± 17.97	1.027
7th day	526.40 ± 41.24	448.10 ± 37.66	413.20 ± 40.97	405.20 ± 32.21	448.23 ± 19.89	2.100
14th day	420.50^{a} ± 29.73	370.10^{ab} ± 31.55	319.20^{b} ± 15.18	337.40^{b} ± 21.48	361.80 ± 13.65	3.072*
21st day	343.10 ± 37.01	296.90 ± 30.69	250.60 ± 13.97	271.00 ± 22.97	290.40 ± 14.34	2.100

Means with different superscript along a row differ significantly at $p<0.05$

Prevalence of subclinical mastitis:-

Bacterial culture examination:-

Post calving on day 7 according to bacterial culture examination the quarter-wise prevalence of sub-clinical mastitis was: 5 quarters in T1 (12.50%), 2 quarters in T2 (5%), 2 quarters in T3 (5%) and 1 quarter in T4 (2.50%). Considering bacterial culture examination as gold standard, not a single quarter was found infected in T3 (Mastilep gel bid for 5 days) on day 14 and 21. Post calving on day 14 and day 21 in antibiotic treated group T4 the sub-clinical mastitis percentage prevalence was 2.50% (1) followed by 5% (2) in Mastilep gel (bid for 3 days) treated group T2 and 7.50% (3) in untreatment control group T1 (Table 2). The clean milk production promotion among the farmers helps to decrease the prevalence of SCM in dairy animals.

California Mastitis Test (CMT):-

CMT is based upon reaction of a reagent with the amount of cellular nuclear protein present in the milk sample (Badiuzzaman *et al.*, 2015). Post caving on day 7 Quarter-wise prevalence of sub-clinical mastitis according to CMT was: 8 quarters in T1 (20%), 7 quarters in T2 (17.50%), 7 quarters in T3 (17.50%) and 7 quarter in T4 (17.50%). On day 14, post calving quarter-wise prevalence of sub-clinical mastitis was: 4 quarters in T1 (10%), 2 quarters in T2 (5%), 2 quarters in T3 (5%) and 2 quarter in T4 (5%). On day 21, post calving quarter-wise prevalence of sub-clinical mastitis was: 3 quarters in T1 (7.50%), 2 quarters in T2 (5%), 2 quarters in T3 (5%) and 1 quarter in T4 (2.50%) (Table 2).

Table 2:-Quarter-wise prevalence (post-calving) of subclinical mastitis in different treatment groups of Surti buffaloes

Parameters	Time interval	No. of quarters in each group	Prevalence of subclinical mastitis (No. of quarters affected)				Chi-square value
			T1	T2	T3	T4	
Bacterial Culture	7^{th} day	40	5 (12.50%)	2 (5%)	2 (5%)	1 (2.50%)	2.933
	14^{th} day	40	3(7.50%)	2 (5%)	--	1 (2.50%)	
	21^{st} day	40	3(7.50%)	2 (5%)	--	1 (2.50%)	
CMT	7^{th} day	40	8(20%)	7 (17.50%)	7 (17.50%)	7 (17.50%)	0.992
	14^{th} day	40	4 (10%)	2 (5%)	2 (5%)	2 5%)	
	21^{st} day	40	3(7.50%)	2 (5%)	2 (5%)	1 (2.50%)	

The efficacy of bovine mastitis treatment depends on the cause, clinical manifestation, antibiotic susceptibility of etiological agent and the efficiency of immune system (Sylejmani *et al.*, 2015). The abusive or incorrect use of antimicrobials has been outlined as the major selective pressure for the development of resistance (Levy, 2002). Anti-bacterial and immunomodulatory properties of Mastilep gel ingredient herbs i.e. *Glycyrrhiza glabra*, *Paederia foetida* might be resulted the reduction in bacterial load and boost the local immunity (Irani *et al.*, 2010; Upadhyaya, 2013; Mazumder *et al.*, 2012).

Milk yield (liters):-

First three month's milk production recorded during previous lactation of buffalo in each treatment group was compared with current lactation**.** Previous and Current lactation yield in different groups was: Group T1 (470.54 and 447.23 liters, respectively), Group T2 (403.68 and 402.47 liters, respectively), Group T4 (479.78 and 456.28 liters, respectively). Only in Mastilep gel (bid for 5 days) treated group T3 current three months lactation yield (494.15 liters) was comparatively higher than previous lactation yield (468.45 liters) (Table 3) and current lactation yield was decreased in all other treatment groups. According to a study by Dekkers *et al.,* (1996) efforts to reduce bulk milk SCC resulted in substantial extra milk revenues. According to publication by University of Arkansas Cooperative Extension Service (FSA4002-PD-2-12RV), if SCC reduces from 600,000 to 200,000 cells/ml, can results decrease in milk production losses by 600 pounds per cow per year. In a 100-cow herd, these losses amount to $7,500/year if milk is valued at $12.50/cwt (Looper, 2012). Decisions on cost-effective treatment should be made on individual cow level, depending on quarter infected state at drying off. Dry cow Mastilep gel therapy remains a cost-effective measure compared with no treatment at all.

Table 3: Comparison of initial 3 month's milk yield of Surti buffaloes in different treatment groups

Milk yield (liters)	T1	T2	T3	T4	Overall
Previous lactation	470.54 ± 29.16 (10)	403.68 ± 28.11 (10)	468.45 ± 28.72 (10)	479.78 ± 37.14 (10)	466.50 ± 14.19 (40)
Current lactation	447.23 ± 19.36 (10)	402.47 ± 16.59 (10)	494.15 ± 23.76 (10)	456.28 ± 50.88 (10)	439.15 ± 16.77 (40)
t value	2.224	2.655	-1.371	0.563	--

Figure in parenthesis indicates no. of animals

Conclusion:-

Somatic cell count reduced and milk yield was increased in Mastilep gel treated groups. It can be concluded that dry cow therapy with Mastilep gel continues to lower significantly the rate of new dry period intramammary infection in herds with elevated somatic cell counts and a high prevalence of infection. Mastilep gel applied twice daily continuously for 5 days at the time of drying off and before parturition is effective and economical solution for dry cow therapy.

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