



## COMPARATIVE EFFICACY OF LEVOFLOXACIN AND ASHWAGANDHA IN TREATMENT OF SUBCLINICAL MASTITIS IN LACTATING GOATS

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### ABSTRACT

The present study was conducted on 260 lactating goats of in and around Jabalpur for subclinical mastitis using modified California mastitis test (MCMT). In this study total positive MCMT samples was 94, out of these positive samples *E. coli* was found 38 (40.42%) after culture examination in selective media. The pre and post treatment of coliform count was found to be ranging between  $0.95 \pm 0.15$  (T5) to  $2.83 \pm 0.17$  (T1) on day 0 (Pre treatment). However on post treatment there were varied between  $0.48 \pm 0.13$  to  $2.35 \pm 0.13$  on day 3<sup>rd</sup>,  $0.85 \pm 0.08$  to  $1.66 \pm 0.15$  on day 7<sup>th</sup> and  $0.50 \pm 0.05$  to  $0.73 \pm 0.09$  on 15<sup>th</sup> day respectively. The overall results indicated significant difference in mean values of coliform count in various groups of goats. The results of study revealed that mean value of coliform count was lowest in T3 group ( $1.17 \times 10^3$  cfu/ml). Drug given in T3 group is superior over the other groups in terms of reducing the infection. MCMT score of +1, +2 and +3 in MCMT was noticed as 67.24%, 20.68 % and 12.06 % of quarter respectively in goats affected with SCM. Apparently healthy goats had a mean value of milk pH  $6.55 \pm 0.01$ . The mean value of milk pH in SCM showed a significant increase as compared to their mean control value. Apparently healthy goats had a mean value of SCC  $5.50 \pm 0.36 \times 10^5$  cells/ml. The mean value of milk SCC in SCM ( $9.50 \pm 0.46 \times 10^5$  cells/ml) showed a highly significant increase in T2 as compared to that of their mean control value. In this study SCM affected goats was divided in four groups and each groups had six goats. In these groups T1 (Inj. Levofloxacin @ 5mg/kg body weight I/M OD for 3 days), T2 (Ashwagandha\* (BD) 3gm PO for 7 days), T3 (Inj. Levofloxacin @ 5mg/kg body weight I/M for 3 days + Ashwagandha\*\* Topically (BD) for 7 days) and T4 (Ashwagandha\* 3g PO + Ashwagandha\*\* Topically BD for 7days). Results indicated that Levofloxacin and Ashwagandha given in group T3 was found to be best amongst all groups *i.e.* T2, T1 & T4 as evident by reduction in PH, SCC, Coliform count and clinical recovery.

**KEY WORDS:-** Subclinical mastitis, lactating goats, pH, Somatic cell count, coliform count, Levofloxacin and Ashwagandha therapy.

### INTRODUCTION

Mastitis is a multi-etiological complex disease which is characterized by physical, chemical and bacteriological changes in the milk and pathological changes in glandular tissues of the udder. Mastitis in dairy goats is a disease of considerable economic importance worldwide, like in dairy cows. Clinical mastitis (CM) presents significant clinical features of inflammatory signs in udder tissues and abnormal udder secretion whereas the only indicator of subclinical mastitis is higher somatic cell count in milk without any visible abnormalities in udder tissues and milk. Unlike cow milk, goat milk contains fairly high cell content because of apocrine process of the secretion. Mastitis in goat is mainly of sub-clinical type which causes reduced milk yield, kid mortality and is responsible for major economic losses. The subclinical mastitis causes more than three times loss in animals. However, in small ruminants the milk production is always presumed to be secondary so, subclinical state of mastitis has been ignored.

### MATERIALS & METHODS

A total of 260 lactating goats were tested by using Modified California Mastitis Test (MCMT) belonging to different private goat keepers, livestock Adharta farm, Amanala goat farm N.D.V.S.U., Jabalpur. On the basis of the results of MCMT, pH, Somatic Cell Count (SCC) and Coliform count, the infected lactating goats were subjected to treatment. To evaluate the therapeutic efficacy of various combinations, a total of twenty four goats affected with SCM were randomly divided into four groups and treated with different combinations of drugs by different routes using inj. Levofloxacin and Ashwagandha powder. The results of the curative therapy were judged by retesting the milk samples after completion of the therapy on day-3, 7 and 15<sup>th</sup> on the basis of MCMT, pH, SCC and reduction in coliform count (Table 01).

**TABLE 1:** Specific therapies for various groups of goats under study

Group	No. of animals	Drugs
T5	6	Healthy Control
T1	6	Inj. Levofloxacin @ 5 mg/kg body weight I/M OD for 3 days
T2	6	Ashwagandha* (BD) 3gm PO for 7 days
T3	6	Inj. Levofloxacin @ 5 mg/kg body weight I/M for 3 days + Ashwagandha** Topically (BD) for 7 days
T4	6	Ashwagandha* 3g PO + Ashwagandha** Topically BD for 7 days

\* I/M- intramuscular, BD.- Twice daily, PO- Per Os

\* 3gm of Ashwagandha powder was mixed with Jaggery 20gm to form a bolus.

\*\* Aquous extract of root of Ashwagandha was mixed with Vaseline jelly base to form ointment for topical application.

## RESULTS & DISCUSSION

### Milk pH

The mean value of milk pH in subclinical mastitis showed a significantly increase in all the groups as compared to their mean control value (Table 9). The mean value in T3 (6.3 ±0.04) groups was reported to be highly significant than on day 0 (7.4 ±0.03). The increased pH value is nearer to the pH 6.50 to 6.80 and 5.62, as reported by Jaurez and Ramos (1986) and Batwani *et al.* (2007) respectively. The decrease in pH due to reduction in alkalinity (resulted due to inflammation by increased number of Na<sup>+</sup>, Cl<sup>-</sup> ions in the milk) subsequently due to the treatment effect that lowered

the acidity as also reported by Ahmed (2005) and Ali and Hassan (1988). The rise in pH was due to the leakage of blood bicarbonate into the milk following damage to the mammary epithelium. Whereas, Agnihotri and Rajkumar (2007) reported the viability in pH of milk in Sirohi, Jakharana and Barbari goats as between 6.532 to 6.34 and opined that this variation might be due to the effect of breed, stage of lactation, health of animal as well as bacterial contamination in raw milk. However, Imran *et al.* (2008) reported the pH as 6.93 ±0.577. Similar observations have also been reported by Hassan (2013) as 6.73 ±0.01 (Table 02).

**TABLE 2:** Comparison of Milk pH in Pre and Post treatment groups at different interval

S. No.	Treatment	Interval				Overall
		0 day	3 day	7 day	15 day	
1.	T1	7.45 <sup>aA</sup> ±0.06	7.26 <sup>aA</sup> ±0.04	6.60 <sup>bcB</sup> ±0.10	6.36 <sup>cB</sup> ±0.04	6.92 <sup>b</sup> ±0.09
2.	T2	7.50 <sup>aA</sup> ±0.08	7.25 <sup>aAB</sup> ±0.04	7.03 <sup>aB</sup> ±0.05	7.05 <sup>aB</sup> ±0.09	7.20 <sup>a</sup> ±0.05
3.	T3	7.4 <sup>aA</sup> ±0.03	7.10 <sup>aB</sup> ±0.10	6.31 <sup>cC</sup> ±0.07	6.31 <sup>cC</sup> ±0.04	6.76 <sup>C</sup> ±0.10
4.	T4	7.31 <sup>aA</sup> ±0.09	7.25 <sup>aA</sup> ±0.06	6.68 <sup>bB</sup> ±0.13	6.75 <sup>bB</sup> ±0.04	7.0 <sup>b</sup> ±0.07
5.	T5	6.55bA±0.04	6.55bA±0.04	6.55bcA±0.04	6.55bcA±0.04	6.55 <sup>d</sup> ±0.01

Mean values with different superscript between treatment (lowercase) and between interval (Uppercase) differ significantly (P < 0.05)

**TABLE 3:** Comparison of Somatic Cell Count (SCC) in Pre and Post treatment groups at different intervals

S. No.	Treatment	Interval				Overall
		0 day	3 day	7 day	15 day	
1.	T1	14.00aA ±3.45	4.00bB ±0.45	4.50bB ±0.85	4.00abB ±0.52	6.62bc ±1.23
2.	T2	11.83abA ±0.70	8.83aAB ±0.87	10.16aAB ±0.48	7.16aB ±0.48	9.50a ±0.46
3.	T3	11.50abA ±3.50	6.83abB ±1.67	5.33bB ±0.95	2.50bB ±0.42	6.54bc ±1.15
4.	T4	8.00bcA ±0.58	7.83abA ±0.68	8.83abA ±0.95	7.83aA ±0.95	8.12ab ±0.37
5.	T5	5.50cA ±0.77	5.50abA ±0.77	5.50bA ±0.77	5.50abA ±0.77	5.50a ±0.36

Mean values with different superscript between treatment (lowercase) and between interval (Uppercase) differ significantly (P < 0.05)

### Somatic Cell Count (SCC)

SCC got increased as per the stage of lactation due to more no. of handling for milking so; due to more chances of inflammation the pH got increased.

The average milk SCC reported by Okada (1960) as 7.50 x10<sup>5</sup> cells/ml and by Deutz *et al.* (1990) as 8.80x10<sup>5</sup>cells/ml. The increased in SCC can also be attributed to increase polymorph nuclear cells and neutrophils Kitchen (1981).

Whereas, on post treatment there was gradual reduction in SCC in all the treatment groups but significant reduction (2.50 to 0.42 cells x 10<sup>5</sup> cells/ml) was obtained in T<sub>3</sub> groups indicated reduction of inflammation as a result of treatment drastically as also reported by Singh (2009),Raikwar (2012). The rise in SCC is higher during mid lactation (July-Aug) may be due to the stress induced by high ambient

temperature and the beginning of reproductive season Moroni *et al.* (2005) (Table 03).

#### Coliform count

The pre and post treatment of coliform count was found to be ranging between  $0.95 \pm 0.15$  (T5) to  $2.83 \pm 0.17$  (T1) on day 0 (Pre treatment). However on post treatment there were

varied between  $0.48 \pm 0.13$  to  $2.35 \pm 0.13$  on day 3<sup>rd</sup>,  $0.85 \pm 0.08$  to  $1.66 \pm 0.15$  on day 7<sup>th</sup> and  $0.50 \pm 0.05$  to  $0.73 \pm 0.09$  on 15<sup>th</sup> day respectively. The overall results indicated significant difference in mean values of coliform count in various groups of goats (Table 04).

**TABLE 4:** Mean value of coliform count ( $10^3$ CFU/ml) in various groups of goats

S. No.	Treatment	Interval				Overall
		0 day	3 day	7 day	15 day	
1.	T1	2.83aA±0.17	1.18bB±0.03	1.21abB±0.20	0.58aC±0.08	1.34b±0.15
2.	T2	2.81aA±0.21	2.35aA±0.13	1.51aB±0.17	0.66aC±0.15	1.83a±0.19
3.	T3	2.26bA±0.15	1.08bB±0.16	0.85bBC±0.08	0.50aC±0.05	1.17b±0.14
4.	T4	2.45abA±0.09	2.15aAB±0.15	1.66aB±0.15	0.70aC±0.90	1.74a±0.15
5.	T5	0.95cA±0.15	0.48cAB±0.13	0.16cB±0.03	0.73aA±0.09	0.58C±0.08

Mean values with different superscript between treatment (lowercase) and between intervals (Uppercase) differ significantly ( $P < 0.05$ ).

In this study the mean pre treatment milk pH, SCC and Coliform count values in goats affected with SCM showed significantly increase when compared to that of their respective control values. After treatment they decreased significantly when compared to their respective pre treatments values approaching their respective control values in T3, T1, T4 and T2 In rest of group's pre treatment values of pH, SCC and Coliform count did not decrease significantly after treatment.

The results obtained under the therapeutic study revealed that, out of all groups under study, T3 ( Inj. Levofloxacin @ 5 mg/kg body weight I/M for 3 days +Ashwagandha Topically (BD) for 7 days) was found to be superior as also observed by Rasool and Varalaxmi (2006) in goats. They have also reported the immunomodulatory role of root powder of Ashwagandha as 2% aqueous solution @ 1g/kg B.wt orally and its aqueous extract topically (5-10%) in ointment base. However, the immunostimulant property of Ashwagandha resultant in recovery of mastitis @ 50g orally for 5 days. Vitamin and mineral mixture in lactating buffaloes Gangwar (2008).

Further, Levofloxacin was reported to be the best treatment in black Bengal goats (Ram *et al.* 2011). On the other hand, Mohanty *et al.* (2011) found the efficacy of Levofloxacin as 96.66% and Enrofloxacin as 83.33% in bovine.

So, in view of the overall results i.e decreased pH, decreased somatic cell count and decreased in mean value of coliform count, obtained in the group T3 ( Inj. Levofloxacin @ 5 mg/kg body weight I/M for 3 days +Ashwagandha Topically (BD) for 7 days) was found to be best amongst all the groups under study.

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