Somatic Cell Counts in Marrah Buffaloes (*Bubalus bubalis*) During Different Stages of Lactation, Parity and Season

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ABSTRACT : This study was initiated in an effort to determine the normal mean and variations of the somatic cell count (SCC) in milk of buffaloes as influenced by the milking time, stage of lactation, parity and season. The buffaloes were hand milked at 13 and 11 h. interval during evening and morning respectively. On the day of milk sampling the udders were tested for mastitis by California Mastitis Test (CMT). Only those buffaloes, which were found negative in the CMT, were included in the sampling plan. The mean values for morning and evening were 1.09 (range 0.39-1.76) and 0.97 (range 0.57-2.46) $\times 10^5$ cells/ml, respectively which did not differ significantly. When data of the morning and evening values was compared on the basis of total cell secretion in milk, even then there was no statistical difference between the morning and the evening values, thereby suggesting that no diurnal variation existed in SCC of milk. Paritywise differences were not significant between the 1st to 5th lactation and above. Similarly stage of lactation effect, when tested at 30 day intervals, did not differ significantly. Significant ($p<0.05$) correlation coefficients (r) between SCC and milk yield during different stages of lactation and parity suggested that SCC per ml of milk was higher during the later stages of lactation. SCC was higher in primiparous than in multiparous buffaloes. On an average the SCC recorded was 1.0×10^5 cells/ml of milk irrespective of time of milking, parity and stages of lactation. The SCC was low during cold and hot-dry season but were high during the hot-humid season ($p<0.05$), the respective values being 0.76, 1.08 and 1.35×10^5 cells/ml. These values were lower than the SCC already reported in cows suggesting less stressful condition of the udder of buffaloes in this study. *(Asian-Aust. J. Anim. Sci. 2001. Vol. 14, No. 2 : 189-192)*

Key Words : Somatic Cell Count, Parity, Stage of Lactation, Season, Milking Interval

INTRODUCTION

Somatic cells are secreted during the normal course of lactation and are being used as an index of the condition of the udder (Haenlein and Hinckley, 1995). In addition somatic cell counts (SCC) score have been used for genetic evaluation of cattle and for management decisions (Cassel, 1994; Schutz, 1994). The secretion of these cells in milk is influenced by the number and stages of lactation, management practices and intramammary infections (Dulin et al., 1983; Kasireddy, 1983; Park and Humphrey, 1986; Randy et al., 1991; Muggli, 1995; Wilson et al., 1993; Wilson et al., 1995) and by season (Allgower, 1990; Wilson, 1994; Lee et al., 1994) in goats and in cattle (Sheldrake et al., 1983; Haenlein, 1987; Marcus and Dale, 1994; Harmon, 1994). Since buffalo is a species different from cattle, the possibility in the differential behavior in SCC secretions in milk can not be ruled out, therefore, the present study was undertaken, i) to determine the normal values of SCC and its variations during different stages of lactation, parity, seasons and also ii) to determine the effect of milking time, if any, in Murrah buffaloes.

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MATERIALS AND METHODS

The study was conducted on the lactating Murrah buffaloes maintained at the Institute's buffalo herd. To determine the diurnal variation in the secretion pattern of somatic cells, morning and evening milk samples were collected from 16 buffaloes hand milked at 11:13 hourly intervals as per the practice followed in the farm. For parity, stage of lactation and season a total of 432 milk samples were collected from buffaloes during hot-dry (May-June), hot-humid (August-September) and winter (December-January) months. The milk samples were grouped based on the stages of lactation as 0-30, 31-60, 61-90, 91-120, 121-150, 151-180, 181-210, 211-240, 241-270, 271-300 and 301 & above. The parity of the buffaloes were I, II, III, IV, and V & above. The udders were tested for mastitis using Modified California Mastitis Test (CMT) and only those milk samples which were found negative for mastitis were used in the study. Somatic cell counts in milk was counted microscopically by the method of Das and Singh (1999). An amount of 10 μl milk sample was spread on a glass slide and was stained using methylene blue dye. The analysis of the data was carried out using Least Square Analysis of variance. The mean and standard errors and the correlation's between the parameters were also calculated (Sendecor and Cochran, 1980).

RESULTS

The data on the somatic cell counts during morning and evening milking, parity, season and of correlation analysis a has been presented in table 1, 2, 3 & 4 respectively. The changes in milk yield and the somatic cell count during different stages of lactation has been presented in figure. The mean SCC values were high ($p<0.05$) during early first lactation of 90 days (range 1.10 to 1.27×10^5 cells/ml), decreased to low value during mid-lactation 90-210 days (0.90 to 0.99×10^5 cells/ml) and increased marginally during late-lactation (0.99 to 1.07×10^5 cells/ml). Although changes in milk yield during different stages of lactation were significant ($p<0.01$), there was no effect of stage of lactation on SCC. This could be due to the dilution effect of increased milk yield during early lactation and declines of milk yield during mid and late lactation as evident from the figure. However, milk yield was negatively correlated ($p<0.05$) with somatic cell counts during different stages of lactation. The somatic cell counts were non significantly high in primiparous (1.06×10^5 cells/ml) than in multiparous buffaloes, but the changes in milk yield of primiparous and multiparous buffaloes were significant ($p<0.01$). The variation in somatic cell counts during different parity were not significant but somatic cell counts was negatively correlated ($p<0.05$) with milk yield with increasing number of lactation. Further, the interaction of milk SCC between the parity, season and stages of lactation were not significant. The mean values of SCC and milk yield during morning and evening milking was 1.15 and 0.97×10^5 cells/ml and 3.21 vs 3.81 kg and was not statistically different. The SCC changes during different seasons of the study were significant ($p<0.01$), being high during hot-humid (1.36×10^5 cells/ml) and low during hot-dry and cold season (1.08 vs 0.76×10^5 cells/ml), respectively. The milk yield was positively correlated with increasing number of lactation ($p<0.01$) while the SCC was negatively correlated ($p<0.05$). Further, the milk yield was negatively correlated ($p<0.05$) with SCC in

Table 1. Account of somatic cell count ($\times10^5$ cells/ml) and milk yield (kg) during morning and evening

Buffalo No.	Morning		Evening	
	SCC	Milk yield	SCC	Milk yield
1	1.74	2.0	0.62	3.5
2	1.13	3.0	0.88	3.0
3	1.25	3.5	1.13	3.0
4	1.12	3.5	1.24	3.5
5	1.04	2.0	0.65	3.0
6	0.79	4.9	0.77	5.0
7	0.99	3.0	2.46	2.5
8	1.39	3.5	0.71	3.5
9	1.33	2.0	0.57	4.0
10	0.59	3.0	0.93	2.0
11	1.08	3.0	1.11	0.5
12	0.39	5.0	0.95	6.5
13	1.17	4.0	1.11	6.0
14	1.91	4.0	0.66	7.0
15	0.84	4.0	0.89	4.0
16	1.76	1.0	0.79	4.0
Mean	1.15	3.21	0.97	3.81
SD	0.39	1.04	0.43	1.62
Range	(0.39 -1.76)		(0.57 -2.46)	

Table 2. Least square means and standard deviation of the somatic cell counts and milk yield during different parity

Parity	N	SCC ($\times10^5$ /ml)	SD	Milk yield	SD
I	168	1.06	0.53	3.49	1.23
II	59	0.93	0.35	4.22	1.61
III	66	0.98	0.34	4.32	1.59
IV	49	0.95	0.30	4.09	2.11
V & above	90	1.06	0.48	4.42	1.56

N=number of observations, SD=standard deviation.

Table 3. Least square means and standard deviation of the somatic cell counts during different season

Season	N	SCC ($\times10^5$ /ml)	SD	Range of cells	CD at 5%
Hot-dry	161	1.08^a	0.41	0.27-2.46	NS
Hot-humid	113	1.36^b	0.68	0.35-3.86	$p<0.05$
Cold	158	0.76^a	0.14	0.40-1.22	NS

N=number of observation, SD=standard deviation.

Table 4. Correlation analysis (r) during different stages of lactation, parity and season

Attributes	Level of significance
Season	
Hot-dry vs. hot-humid	NS
Hot-dry vs. cold	NS
Cold vs. hot-humid	0.190*
Parity	
Parity vs. SCC	NS
Parity vs. milk yield	0.232**
SCC and milk yield	-0.108*
Stage of lactation	
Stage of lactation vs. SCC	NS
Stage of lactation vs. milk yield	-0.825*
SCC vs. milk yield	-0.088*

NS=non significant, * $p<0.05$, ** $p<0.01$.

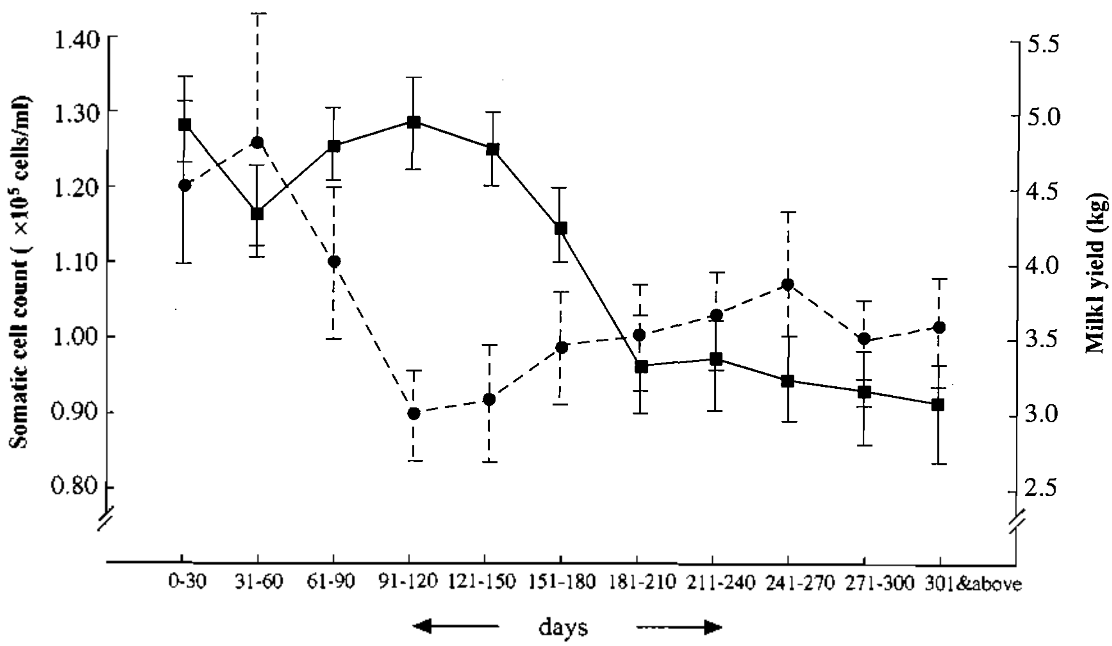

Figure 1. Somatic cell count (●———●)and milk yield (■———■) during different stages of lactation

different stages of lactation.

DISCUSSION

The non-significant changes in SCC counts during morning and evening hours of milking indicated that no diurnal variation exists in SCC of milk of buffaloes. The effect of milking interval has been reported in cattle (Dohoo and Meek, 1982) but in this study the effect of milking interval on somatic cell counts was not found possibly due to more udder capacity of buffaloes compared to cattle and milking of buffaloes at equal hourly intervals. However, the changes in somatic cell counts during different seasons were significant ($p<0.01$). The high somatic cell count observed in this study during the hot-humid season could be due to harsh climatic condition of high humidity and ambient temperature leading to stress condition and an increase in the susceptibility to infection (Dohoo and Meek, 1982; Hogan et al., 1989). Some of the earlier observations in cattle has suggested a positive relationship between the stress of high summer environmental temperatures and high somatic cell counts in milk (Nelson et al., 1967; Nelson et al., 1969). Alternatively high values of SCC during hot-humid conditions might be due to great exposure of teat ends to pathogens rather than the temperature humidity stress. Similarly in hot-dry season, the high somatic cell count could be due to environmental stress condition as the buffaloes were free from udder infections and no incidence of mastitis was found in milk samples. But various forms of stress like confinement of animals in hot condition, mammary pathogens and injections of ACTH could also lead to abnormally high somatic cell counts in milk (Roussel et al., 1969, 1969a; Whittlestone et al., 1970). Nelson et al. (1969) reported a positive relationship between high summer environmental temperature and SCC in milk. The low counts of somatic cells during cold season were probably due to the better feeding and congenial environmental conditions leading to minimal stress on the buffaloes.

In the present study, an effect of parity on the SCC was not seen which indicates that, with increasing number of lactation's, the secretion of somatic cell in the milk does not change. However, SCC significantly changes by parity being high during the 2nd than in later lactation's and high after calving with a rapid decrease to day 30 of lactation and an increase towards the end of lactation (Randy et al., 1991; Muggli, 1995). The negative correlation ($p<0.05$) of milk yield with somatic cell counts observed in this study were reported earlier in cows (Raubertas and Shook, 1982; Fetrow et al., 1988; Fox et al., 1985). In goats total and differential somatic celll counts varies significantly ($p<0.05$) with the stage of lactation (Miller et al., 1991; Das and Singh, 1999). Due to the variation in somatic cell counts of different cows at various stages of lactation, a single maximum standard of somatic cell counts all the year are taken (Haenlein and Hinckley, 1995). The counts of somatic cells observed in this study are lower than those of crossbred cows under similar set of management condition which may be due to the more udder capacity of buffaloes leading to less stress of udder in buffaloes compared to th cattle (Harmon, 1994;

Anonymous, 1985). At similar stages of lactation the udder capacities of buffaloe were greater than those of crossbred cows. In both the species physical capacities of udder declined as the lactation progressed. However, in late lactation the capacities relative to daily yields were more than in early lactation (Anonymous, 1985).

CONCLUSIONS

In the present study it was found that there was no difference in the somatic cell counts of morning and evening milk thereby suggesting that no diurnal variation existed in somatic cell secretion in milk of buffaloes milked at equal intervals during morning and evening hours. Number and stages of lactation did not affect the somatic cell counts but season has a significant effect on the milk somatic cell counts. The milk yield has a negative and significant correlation with somatic cell count during different stages of lactation and parity.

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