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Somatic cell count and major elements in milk during lactation in buffaloes

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In bovines, somatic cell count (SCC) is usually used as an inflammatory indicator to diagnose mastitis. A decrease in bulk milk SCC is an indicator of the success of management and hygienic control programme. A high somatic cell count means loss of milk production, hence loss of revenue (Fadlelmoula *et al.* 2008).

Amongst the important metabolites, minerals occupy a unique position because though they do not furnish energy or nitrogen they are essential for the utilization of other metabolites and for the biosynthesis of various biomolecules. The present investigation studies the somatic cell count and concentrations of Ca, P, Mg, Cl, Na, K, Fe, Cu, Mn and Zn in milk of buffaloes representing different stages of lactation.

Apparently healthy Murrah buffaloes (18) from private dairy farm, were selected and divided equally into early (0–100 days), mid (101–200 days) and late (200 days onwards) lactation stages. About 40–50 ml of milk samples were collected from each buffaloes for 3 consecutive days and morning and afternoon milk samples were pooled. Milk smears were prepared, dried and stained with Modified Newman stain.

The analysis of milk samples for Ca, P, Mg, Na, K, Fe, Cu, Mn and Zn was done by atomic emission spectrometer. Model ARCOS, Germany. To 5 ml of milk sample in a beaker 6 ml of concentrated nitric acid was added and heated at 70–80°C on hot pad. While heating the solution 1 ml perchloric acid was added drop by drop. After addition, the milk sample was kept on hot pad for 5–10 min. Digested milk samples were diluted to 25 ml by addition of deionised water and this diluted digested milk samples were used for analysis of elements Estimation of chloride was done by Whitehorn's titration method.

The results of somatic cell count, Ca, P, Mg, Na, K, Fe, Cu, Mn, Zn and Cl of milk during early, mid-and late lactation in buffalo are presented in Table 1. The mean value of somatic cell count was highest in late lactation and lowest in mid lactation buffaloes. The difference in somatic cell count amongst early, mid and -late lactation were highly ($P< 0.05$) significant. The results of the present study fall in agreement with findings of Harmon (1994) who reported a modest rise in the somatic cell count of the uninfected quarters at end of lactation which is in fact a dilution effect. Barlett *et al.* (1990) observed increased somatic cell count in older cattle and/or at the end of lactation due to increased prevalence of infection and permanent glandular damage from previous infections. The milk somatic cell counts increasing towards the end of lactation may be because of the higher prevalence of mastitis, normal involution of the udder and decreased milk production, which causes less dilution of the milk leucocytes (Ostensson 1993).

Table 1. Mean ± SE of milk somatic cell count, calcium, phosphorus, magnesium, sodium, potassium, chloride, iron, copper, manganese and zinc during early, mid and late lactation in buffalo

Stages of lactation	Somatic cell count $\times 10^5$ Cells/ml	Ca mg/ 100ml	P mg/ 100ml	Mg mg/ 100ml	Na mg/ 100ml	K mg/ 100ml	Cl mg/ 100ml	Fe (ppm)	Cu (ppm)	Mn (ppm)	Zinc (ppm)
Early	1.09^a ± 0.11	58.09^b ± 2.32	19.44^b ± 0.97	4.30 ±0.43	4.76^b ± 0.40	15.53^b ± 0.48	112.77 ± 7.04	1.17 ± 0.16	0.01 ± 0.00	0.01 ± 0.00	2.15 ± 0.22
Mid	0.66^b ± 0.15	76.02^a ± 4.97	22.89^{ab} ± 1.68	4.21 ± 0.46	6.01^a ± 0.34	20.49^a ± 1.04	102.77 ± 6.31	1.71 ± 0.33	0.01 ± 0.00	0.01 ± 0.00	2.84 ± 0.47
Late	1.37^a ± 0.09	77.54^a ± 2.79	25.31^a ± 0.77	4.96 ± 0.25	6.86^a ± 0.41	21.92^a ± 1.11	136.10 ± 13.50	1.88 ± 0.22	0.02 ± 0.00	0.01 ± 0.00	3.07 ± 0.39

Means with at least one common superscript do not differ significantly ($P < 0.05$).

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The Ca and P concentrations in milk increased with progress of lactation. The negative Ca and P balance occurs during the first part of the lactation period when milk flow is greatest and replenishing of the stores occurs during the latter part of the lactation period and during the dry period (Mackenzie *et al.,* 1998).

The milk Mg concentration throughout during lactation did not differ significantly. It was observed that the magnesium concentration in milk was high during early lactation, then decreased during mid lactation and again increased during late lactation which is in agreement with Singh *et al.* (1984) in cows.

The mean value of Na was lowest in early lactating buffaloes which increased significantly ($P< 0.05$) in mid-lactation. Further it increased non-significantly from mid- to late lactation. The mean value of K was lowest during early lactation. It increased significantly ($P< 0.05$) during mid lactation and remained almost similar through late lactation. The Na levels increase with the progressive increase in lactation and showed an upward trend at the termination of lactation. There is usually a constant percentage of lactose, sodium and potassium in milk. These constituents plus chloride maintain osmotic equilibrium in milk. Milk fluid arises by a continuous synthesis of lactose and other constituents within the cell and a movement of water into the cell to maintain osmotic equilibrium until a fairly constant ratio of secretory to intracellular fluid is obtained, when the cellular contents are expelled into the alveolar lumen (Rehman 1990).

The milk Fe, Mn, Cu and Cl did not show any significant difference among early, mid and late lactation buffaloes. The Fe concentration increased as lactation advanced. This trend may be due to the essential role of iron in immune function (Gallego *et al*. 2006). Similarly the Zn concentration increased with advancement of lactation which may be due to the essential role of zinc in immune function and a stable supply of this mineral might be important to the health. The rapid increase in Cl content towards the end of lactation may be due to pregnancy in animals in late lactation, which tends to negate the increase in titratable chloride.

SUMMARY

Apparently healthy Murrah buffaloes (18) were divided equally into early, mid-and late lactation stages. The difference in somatic cell count amongst three stages of lactation were statistically highly significant. The milk somatic cell counts increased towards the end of lactation because of the higher prevalence of mastitis, normal involution of the udder and decreased milk production, which causes less dilution of the milk leucocytes. The milk Cl and Mg concentration were higher in late and lower in mid lactation. Milk Ca, P, Na, K, Fe, and Zn increased in buffaloes at advanced stage of lactation, while milk Cu remained almost same during early and mid-lactation but increased during late lactation. The Mn remained constant throughout lactation.

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