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Short Communication

Effect of specific mineral supplementation on the blood profile of dairy cattle of Himachal Pradesh

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ABSTRACT

After initial assessment of mineral status of the animals, the selected animals were supplemented with specifically formulated mineral mixture for 30 days. Results indicated significant increase in average concentrations of Ca, P, Na and Cl whereas Mg and K levels increased non-significantly in the blood of the animals after specific mineral supplementation. The overall mean plasma Cu and Zn concentrations increased significantly from 0.59 ± 0.03 to 0.70 ± 0.04 µg/ml and from 0.81 ± 0.04 µg/ml to 0.90 ± 0.04 µg/ml respectively after mineral supplementation. Numerically the number of anoestrous animals declined after mineral supplementation but it was non-significant.

Key words: Mineral supplementation, Cattle, Blood plasma, Anoestrous

Mineral supplements should be used only as local conditions dictate. Commercial mineral mixtures often contain minerals which are already present in adequate amounts in the pasture grasses and feeds and the provision of extra minerals beyond the animal's needs is economically wasteful, confers no additional benefit and can be harmful to the animal (Underwood, 1981). Thus, the present study was conducted to assess the mineral status of animals to suggest region specific mineral supplements for improving productive and reproductive performances of animals.

The present study was conducted on cross-bred dairy cows of Panchrukhi block in Kangra District of Himachal Pradesh. After initial assessment of mineral status in 100 animals, the animals found deficient in one or more mineral elements were supplemented with mineral mixture which was formulated as per the general deficiency status observed. From amongst the deficient animals, a total of 30 animals (6 animals from each village) were selected from five villages of Panchrukhi block *viz.* Tanda, Deogran, Andretta, Mollichak and Ladoh for mineral supplementation of mineral mixture @ 50g/ animal/day for 30 days. Approximately 10 ml of blood was collected from these animals on day 0 and day 30 post supplementation for assessment of plasma mineral status. Sodium and Potassium were analyzed by flame photometer, Model Mediflame 127*. Calcium, Magnesium, Zinc, Copper and Iron were estimated by Atomic Absorption Spectrophotometer (AAS),

Model 3100, Perkin Elmer (USA) as described in Perkin Elmer analytical methods manual (1982). Phosphorus and Chloride were estimated by Blood Chemistry Analyzer, Photometer 5010 using analytical kits of Bayer Diagnostics**. The results obtained in the study were analyzed using paired t-test with the help of GraphPad Instat software given by Russel (1990).

The overall mean plasma calcium concentration increased significantly ($p<0.01$) from 8.85 ± 0.26 to 9.56 ± 0.18 mg/dl after supplementation of minerals for a period of one month. The overall mean plasma phosphorus concentration increased non-significantly from

* M/s Systronics India Limited
** M/s Bayer Diagnostic India Ltd., Baroda, Gujarat, India

4.60 ± 0.11 mg/dl to 4.74 ± 0.10 mg/dl after supplementation of minerals. There was a non-significant change in the mean plasma magnesium concentration in the animals of all the villages under study except in Deogran village where it increased significantly ($p<0.05$) from 2.23 ± 0.18 mg/dl to 2.48 ± 0.15 mg/dl. The overall mean plasma magnesium concentration increased non-significantly from 2.19 ± 0.04 mg/dl to 2.26 ± 0.05 mg/dl after supplementation of minerals (Table 1). The overall mean plasma sodium concentration increased significantly ($p<0.001$) from 138.80 ± 1.33 mEq/L to 144.80 ± 1.01 mEq/L. A non-significant increase in the overall mean plasma potassium concentration from 4.18 ± 0.08 mEq/L to 4.37 ± 0.09 mEq/L was recorded after supplementation. The overall mean plasma chloride concentration increased significantly ($p<0.01$) from 94.54 ± 1.88 mEq/L to 101.60 ± 1.35 mEq/L (Table 2). Sharma (2004) in a study on anoestrous cows found similar results. The overall mean plasma copper concentration increased significantly ($p<0.01$) from 0.59 ± 0.03 to 0.70 ± 0.04 µg/ml after supplementation of specific deficient minerals. Davies *et. al.*, (2003) reported that supplemental copper administered in a variety of ways increased liver and plasma copper concentration. The overall mean plasma zinc concentration increased significantly ($p<0.05$) from 0.81 ± 0.04 µg/ml to 0.90 ± 0.04

Table 1. Average plasma concentration of Calcium, Phosphorus and Magnesium before and after mineral supplementation (mg/dl).

Villages of Panchrukhi Block	CA		P		MG	
	0 day	30 day	0 day	30 day	0 day	30 day
Tanda	7.75±0.50	8.71±0.17	4.41±0.27	4.65±0.16	2.19±0.05	2.22±0.07
Deogran	8.23±0.49	9.14±0.47	4.49±0.15	4.46±0.11	2.23±0.18	2.48*±0.15
Andretta	9.65±0.87	10.31±0.47	5.04±0.37	5.32±0.30	2.26±0.07	2.23±0.12
Mollichak	8.99±0.31	10.00*±0.22	4.84±0.17	4.71±0.17	2.13±0.09	2.17±0.08
Ladoh	9.63±0.35	9.79±0.33	4.25±0.15	4.56±0.15	2.16±0.08	2.19±0.10
Mean	8.85±0.26	9.56**±0.18	4.60±0.11	4.74±0.10	2.19±0.04	2.26±0.05

* Significant difference ($p<0.05$) when compared with 0 day value.
** Very significant difference ($p<0.01$) when compared with 0 day value.

Table 2. Average plasma concentration of Sodium, Potassium, and Chloride before and after mineral supplementation (mEq/L).

Villages of Panchrukhi Block	Na		K		Cl	
	0 day	30 day	0 day	30 day	0 day	30 day
Tanda	147.33±2.29	150.00±1.16	4.33±0.17	4.47±0.23	91.31±3.98	102.52*±3.75
Deogran	137.00±1.77	143.67±1.20	3.82±0.14	4.40±0.29	94.63±6.24	106.50±2.22
Andretta	135.33±2.17	146.67*±1.98	4.55±0.16	4.58±0.10	95.01±5.10	101.05±2.88
Mollichak	138.33±2.65	142.67±2.81	4.15±0.22	4.52±0.18	92.76±2.36	96.10±2.10
Ladoh	136.00±3.50	141.00±1.98	4.03±0.14	3.88±0.05	99.00±3.01	101.85±2.32
Mean	138.80±1.33	144.8***±1.01	4.18±0.08	4.37±0.09	94.54±1.88	101.60**±1.35

* Significant difference ($p<0.05$) when compared with 0 day value.
** Very significant difference ($p<0.01$) when compared with 0 day value.
*** Extremely significant difference ($p<0.001$) when compared with 0 day value.

Table 3. Average plasma concentration of Copper, Zinc and Iron before and after mineral supplementation (µg/ml).

Villages of Panchrukhi Block	Cu		Zn		Fe	
	0 day	30 day	0 day	30 day	0 day	30 day
Tanda	0.61± 0.04	0.66± 0.05	0.82± 0.50	0.93± 0.06	1.80± 0.11	1.91*± 0.11
Deogran	0.51± 0.07	0.66*± 0.05	0.95± 0.11	1.00± 0.10	1.72± 0.22	1.91*± 0.25
Andretta	0.65± 0.07	0.92*± 0.14	0.83± 0.05	0.88± 0.09	2.46± 0.13	2.15± 0.18
Mollichak	0.53± 0.05	0.62*± 0.05	0.71± 0.08	0.78± 0.08	2.09± 0.26	2.00± 0.19
Ladoh	0.63± 0.07	0.64± 0.04	0.75± 0.09	0.88± 0.11	2.03± 0.13	2.13± 0.33
Mean	**0.59± 0.03**	**0.70******± 0.04**	**0.81± 0.04**	**0.90*± 0.04**	**2.02± 0.09**	**2.02± 0.10**

* Significant difference ($p<0.05$) when compared with 0 day value.
** Very significant difference ($p<0.01$) when compared with 0 day value.

µg/ml after mineral supplementation. Khandaker (1989) also reported a significant increase in plasma zinc concentration in suckling lambs after supplementation of zinc for few days. The change in overall mean plasma iron concentration after mineral supplementation was non-significant (Table 3). Similar findings have been reported by Sharma (2004) in anoestrous cows/heifers treated with mineral mixture. A considerable decline in number of anoestrous animals was observed as a result of return of cyclic activity in some animals which may be due to improvement in plasma macro and micro mineral status of these animals. Mineral deficiencies have long been held responsible for low production and reproduction among tropical animals (Abdel Rehman *et. al.*, 1998). The minerals that affect reproduction in cattle are generally found within the trace element group, although deficiencies of calcium and phosphorus can also affect fertility (Boland, 2003). Sharma (2004) has also reported onset of oestrus in 71.43% anoestrous cows after treatment with mineral mixture for 60 days. Similar results have also been reported by Lall *et. al.* (2000) in anoestrous buffaloes after mineral supplementation, clearly indicating the role of mineral supplementation in curing the problem of anoestrous. The supplementation of specifically formulated mineral mixture resulted in considerable reduction in macro and micro mineral deficiencies. Therefore, strategic mineral supplementation is advisable not only to prevent mineral deficiencies but also to improve production and reproduction in animals.

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