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Research Article

Status of Micro Mineral Deficiency in Cattle in Kashmir Valley

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ABSTRACT

The main objective of the present study was to evaluate the prevalence of micro mineral deficiency in soil, fodder and cattle of Kashmir valley. For this purpose 200 soil samples, 232 fodder samples and 136 serum samples from cattle were collected from three districts of Kashmir valley viz. Budgam, Pulwama and Srinagar. Micro mineral estimation was done by atomic absorption spectrophotometry in Clinical Medicine Laboratory at IVRI. Overall prevalence of copper, iron, zinc and cobalt deficiency in soil was 23.50%, 14.50%, 38.00% and 24.00% respectively. Mean prevalence of copper, iron, zinc and cobalt deficiency in fodder was 24.13%, 17.67%, 34.05% and 24.13% respectively. Mean prevalence of copper, iron, zinc and cobalt deficiency in cattle was 34.55%, 16.17%, 38.97% and 24.26% respectively. Among cattle, calves showed higher copper (46.42%) deficiency whereas pregnant cattle showed higher zinc (44.73%) and cobalt (31.57%) deficiency. Iron deficiency was lower in all groups (16.17%). From this study it can be concluded that the cattle of Kashmir valley are predisposed to mineral deficiency. Hence supplementation of cattle with mineral supplements is imperative under prevailing feeding systems.

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INTRODUCTION

Livestock health and production are dependent on the quality and quantity of nutrients present in the feed and fodder and the soil in which these fodders are grown. A deficiency or imbalance in either may render animal inefficient both in health and production. Mineral disorders severely inhibit grazing livestock health and production in developing tropical countries and are often of significant consequences than are the infectious diseases (Mc Dowell, 1985). Micro mineral imbalances and deficiencies have been increasingly implicated in heatlh problems of dairy animals (Sharma *et al*., 2003). Mineral deficiency is an area specific problem (McDowell, 1985). In our country micro mineral deficiency status has been evaluated in different states (Sharma *et al*., 2003 and 2006, Kumar *et al*., 2004) but such study is lacking in Kashmir valley.

MATERIALS AND METHODS

Three blocks from each of the three districts of Kashmir valley *viz.* Budgam (Chadoora, Chrari-Sharief, Khansahab), Pulwama (Pulwama, Pampore, Kaka Pora) and Srinagar (west, south and central zone), were selected. Soil samples (n=200) were collected with the help of auger, up to 15 cm depth. Collected soil samples were dried for overnight in hot air oven at temperature 100±5°C. The samples were ground and stored in airtight polythene packets to analyze mineral content. Various fodder samples (n=232) that were being fed to animals were collected and fodder sample were collected from the same field where soil samples were taken. These included paddy straw, wheat straw, rice bran, wheat bran and mustard oil cake,. Collected fodder samples were dried in a hot air oven at temperature 100±5°C overnight ground and stored in airtight polythene packets for laboratory analysis. During the survey blood samples (n=136) were collected from cattle (Table 1). The detail of blood samples distribution has been given in Table 2.

From jugular vein about 10 ml blood was collected by Teflon needle in a sterilized test tube without any anticoagulant. Tubes containing blood were kept at room temperature (20°–22°C). Clot appeared within 2 h and that was broken with the help of pasteur pipette within one hour. Serum

Table 1 : Total number of soil, fodder and blood/serum samples collected from three districts of Kashmir valley.

District	Block	No. of samples		
		Soil	Fodder	Blood/serum
Budgam	Chadoora	30	48	16
	Chrari-sharief	20	24	19
	Khansahab	20	12	16
Pulwama	Pulwama	25	48	17
	Pampore	20	16	18
	Kaka Pora	20	24	12
Srinagar	West zone	20	16	14
	South zone	25	28	10
	Central zone	20	16	14
Total		200	232	136

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Table 2: Showing number of blood samples collected from three districts of the Kashmir valley.

Districts	Block	Cattle			
		Pregnant	Non Pregnant	Heifer	Calf
Budgam	Chadoora	6	3	4	3
	Chrari-sharief	5	6	5	3
	Khansahab	3	5	4	4
Pulwama	Pulwama	5	3	6	3
	Pampore	6	4	4	4
	Kaka Pora	3	4	3	2
Srinagar	West zone	4	4	2	4
	South zone	2	3	2	3
	Central zone	4	4	4	2
Total		38	36	34	28

was collected with the help of a micropipette. Centrifugation of serum was performed and it was stored in refrigerator at–4°C in labeled glass vials. Soil samples were digested as per Franeck (1992). The fodder samples were digested as per Trolson (1969). Serum samples were digested as per procedure described by Kolmer *et al.* (1951). While digestion of the soil, fodder and serum samples, simultaneous digestions of reagent blanks were also undertaken and the final volume was similarly made to 10 ml to have blank. For the estimation of minerals in the samples atomic absorption spectrophotometer (AAS) was used. Mineral sample concentration was expressed in ppm and minimum 3 standards of known concentration were used for calibration after that unknown samples were analyzed. The percent prevalence was calculated using reported critical values of corresponding minerals in soils, fodder and animal (cattle).

RESULTS AND DISCUSSION

Overall prevalence of copper, iron, zinc and cobalt deficiency in soil was 23.50%, 14.50%, 38.00% and 24.00% respectively (Table 3). Sharma *et al.* (2003) reported a prevalence deficiency of 55.26%, 6.9%, 59.12% and 7.89% of Cu, Co, Zn and Fe respectively, in soil. Lowest prevalence of copper deficiency was observed in Chari-sharief and west zone of Srinagar (15% in each) and the highest in Pulwama and south zone of Srinagar (28% in each). Prevalence of iron deficiency is highest in Khansahab (20%) and west zone (20%) of Srinagar and lowest in Pulwama (8%). Singh (1998) reported that 51.2% soil samples were deficient in zinc in north India. Prevalence of zinc deficiency is highest in Chari-Sharief and Kaka Pora (45% each) and lowest in central zone of Srinagar (30%). Ahmed *et al.* (2005) and Kirmani *et al.* (2006) reported that the soils under rice cultivation in Srinagar and Anantnag district have low to marginally low Zn content. The prevalence of cobalt deficiency was observed highest in west and central zone of Srinagar (30%) and lowest in south zone of Srinagar (16%). Sarkar *et al.* (1990) and Kumar *et al.* (2004) have also reported similar results.

Mean prevalence of copper, iron, zinc and cobalt deficiency in fodder was 24.13%, 17.67%, 34.05% and 24.13% respectively (Table 4). These findings are in corroboration with Sharma *et al.* (2003) who reported prevalence deficiency of

Table 3: Prevalence of soil minerals deficiency (%) in various districts of Kashmir valley.*

Districts	Block	No. of samples	Cu	Fe	Zn	Co
Budgam	Chadoora	30	8/30(27)	5/30(17)	10/30(33)	7/30(23)
	Chrari-sharief	20	3/20(15)	3/20(15)	9/20(45)	5/20(25)
	Khansahab	20	5/20(25)	4/20(20)	7/20(35)	4/20(20)
Pulwama	Pulwama	25	7/25(28)	2/25(8)	11/25(44)	6/25(24)
	Pampore	20	5/20(25)	3/20(15)	7/20(35)	5/20(25)
	Kaka Pora	20	4/20(20)	2/20(10)	9/20(45)	5/20(25)
Srinagar	West zone	20	3/20(15)	4/20(20)	7/20(35)	6/20(30)
	South zone	25	7/25(28)	3/25(12)	10/25(40)	4/25(16)
	Central zone	20	5/20(25)	3/20(15)	6/20(30)	6/20(30)
Overall prevalence		200	47/200 (23.50)	29/200 (14.50)	76/200 (38.00)	48/200 (24.00)

*Values in the parenthesis indicate prevalence (%)

Table 4: Prevalence of fodder mineral deficiency (%) in various districts of Kashmir valley.

Districts	Block	No. of samples	Cu	Fe	Zn	Co
Budgam	Chadoora	48	14/48(29)	6/48(13)	17/48(35)	11/48(23)
	Chrari-sharief	24	5/24(21)	5/24(21)	8/24(33)	6/24(25)
	Khansahab	12	2/12(17)	5/12(41)	2/12(17)	3/12(25)
Pulwama	Pulwama	48	13/48(27)	4/48(8)	18/48(38)	13/48(27)
	Pampore	16	3/16(19)	4/16(25)	6/16(37)	3/16(19)
	Kaka Pora	24	5/24(21)	5/24(21)	8/24(33)	6/24(25)
Srinagar	West zone	16	3/16(19)	6/16(37)	2/16(13)	5/16(31)
	South zone	28	8/28(29)	4/28(14)	11/28(39	5/28(18)
	Central zone	16	3/16(19)	2/16(13)	7/16(44)	4/16(25)
Mean		232	56/232 (24.13)	41/232 (17.67)	79/232 (34.05)	56/232 (24.13)

*Values in the parenthesis indicate prevalence (%)

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60.64%, 6.7%, 61.22% and 11.37% of Cu, Co, Zn and Fe respectively, in fodder. The prevalence of copper deficiency was recorded highest in Chadoora and south zone of Srinagar (29% each) and lowest in Khansahab (17%). The highest prevalence was observed in Khansahab (41%) and lowest in Pulwama (8%). Prevalence of zinc deficiency in fodder was highest in central zone (44%) and lowest in west zone of Srinagar (13%). Ahmed *et al*, (2005) reported zinc deficiency but adequate copper, iron and manganese in fodders in Anantnag district of Kashmir valley. The average value of cobalt deficiency in fodder of Kashmir valley was observed to be 24.13%. The highest was observed in west zone (31%) and lowest in south zone (18%) of Srinagar. Tiwari *et al.* (2007) and Kumaresen *et al*. (2010) have also reported mineral deficiency in fodder in hilly areas.

Mean prevalence of copper, iron, zinc and cobalt deficiency in cattle was 34.55%, 16.17%, 38.97% and 24.26% respectively. Similar findings were made by Das *et al*. (2009) and Kumar *et al*. (2008). Highest overall prevalence of copper deficiency in cattle was observed in Chadoora (43.75%) and lowest in Khansahab (18.75%). Highest prevalence was observed pregnant cattle of central zone of Srinagar (75%) and lowest in Pampore (16.16%). Sharma *et al*. (2009) have reported similar results. Highest prevalence was observed in non-pregnant cattle of Pampore and west zone of Srinagar, 50% each and lowest in that of Chrari-sharief (16.66%). Heifers in Kaka Pora showed highest prevalence (66.6%) while those in Pulwama showed lowest prevalence of 16.6%. Chadoora, Chrari-sharief and Pulwama recorded a prevalence of 66.66% each in calves where as Pampore, west zone and central zone recorded a prevalence of 50%. Khansahab recorded lowest 25% and south zone of Srinagar recorded 33.33% prevalence (Table 5)

Table 5: Prevalence of copper deficiency (%) in Cattle in various districts of Kashmir valley

Districts	Block	Cattle				
		Pregnant	Non pregnant	Heifer	Calf	Overall deficiency
Budgam	Chadoora	3/6(50)	1/3(33.3)	1/4(25)	2/3(66.6)	7/16(43.75)
	Chrari-sharief	2/5(40)	1/6(16.16)	1/5(20)	2/3(66.6)	6/19(31.57)
	Khansahab	1/3(33..3)	1/5(20)	0/4(Nil)	1/4(25)	3/16(18.75)
Pulwama	Pulwama	2/5(40)	1/3(33.3)	1/6(16.6)	2/3(66.6)	6/17(35.29)
	Pampore	1/6(16.16)	2/4(50)	1/4(25)	2/4(50)	6/18(33.33)
	Kaka Pora	1/3(33.3)	1/4(25)	2/3(66.6)	0/2(Nil)	4/12(33.33)
Srinagar	West zone	1/4(25)	2/4(50)	0/2(Nil)	2/4(50)	5/14(35.14)
	South zone	1/2(50)	0/3(Nil)	1/2(50)	1/3(33.33)	3/10(30)
	Central zone	3/4(75)	1/4(25)	2/4(50)	1/2(50)	7/14(50)
Mean		15/38(39.47)	10/36(27.77)	9/34(26.47)	13/28(46.42)	47/136(34.55)

*Values in the parenthesis indicate prevalence (%).

Table 6: Prevalence of iron deficiency (%) in Cattle in various districts of Kashmir valley

Districts	Block	Cattle				
		Pregnant	Non pregnant	Heifer	Calf	Overall deficiency
Budgam	Chadoora	1/6(16.16)	1/3(33.33)	0/4(Nil)	0/3(Nil)	2/16(12.5)
	Chrari-sharief	1/5(20)	1/6(16.66)	1/5(20)	0/3(Nil)	3/19(15.72)
	Khansahab	0/3(Nil)	0/5(Nil)	1/4(25)	1/4(25)	2/16(12.5)
Pulwama	Pulwama	1/5(20)	1/3(33.33)	1/6(16.16)	1/3(33.3)	4/17(23.52)
	Pampore	1/6(16.66)	0/4(Nil)	0/4(Nil)	1/4(25)	2/18(11.11)
	Kaka Pora	1/3(33.3)	0/4(Nil)	0/3(Nil)	0/2(Nil)	1/12(8.33)
Srinagar	West zone	0/4(Nil)	1/4(25)	0/2(Nil)	1/4(25)	2/14(14.28)
	South zone	1/2(50)	1/3(33.33)	1/2(50)	0/3(Nil)	3/10(30)
	Central zone	1/4(25)	0/4(Nil)	1/4(50)	1/2(50)	3/14(21.45)
Mean		7/38(18.42)	5/36(13.88)	5/34(14.70)	5/28(17.85)	22/136(16.17)

*Values in the parenthesis indicate prevalence (%).

Table 7: Prevalence of zinc deficiency (%) in Cattle in various districts of Kashmir valley. *

Districts	Block	Cattle				
		Pregnant	Non pregnant	Heifer	Calf	Overall deficiency
Budgam	Chadoora	4/6(33.33)	1/3(33.33)	1/4(25)	2/3(66.66)	8/16.(50)
	Chrari-sharief	3/5(60)	2/6(33.33)	2/5(40)	1/3(33.33)	8/19(42.10)
	Khansahab	2/3(66.66)	4/5(80)	2/4(50)	1/4(25)	9/16(56.25)
Pulwama	Pulwama	2/5(40)	1/3(33.3)	1/6(16.66)	1/3(33.3)	5/17(29.42)
	Pampore	1/6(16.16)	1/4(25)	2/4(50)	1/4(25)	5/18(27.77)
	Kaka Pora	1/3(33.3)	1/4(25)	1/3(33.33)	0/2(Nil)	3/12(25)
Srinagar	West zone	1/4(25)	1/4(25)	0/2(Nil)	1/4(25)	3/14(21.42)
	South zone	1/2(50)	1/3(33.33)	1/2(50)	1/3(33.33)	4/10(40)
	Central zone	2/4(50)	3/4(75)	3/4(75)	0/2(Nil)	8/14(57.14)
Mean		17/38(44.73)	15/36(41.66)	13/34(38.23)	8/28(28.57)	53/136(38.97)

*Values in the parenthesis indicate prevalence (%)

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Table 8: Prevalence of cobalt deficiency (%) in Cattle in various districts of Kashmir valley.*

Districts	Block	Cattle				
		Pregnant	Non pregnant	Heifer	Calf	Overall deficiency
Budgam	Chadoora	3/6(50)	1/3(33.33)	0/4(Nil)	1/3(33.33)	5/16(31.25)
	Chrari-sharief	2/5(40)	2/6(33.33)	1/5(20)	2/3(66.66)	7/19(36.84)
	Khansahab	1/3(33.33)	0/5(Nil)	0/4(Nil)	1/4(25)	2/16(12.55)
Pulwama	Pulwama	0/5 (Nil)	0/3(Nil)	0/6(Nil)	2/3(66.66)	2/17(11.76)
	Pampore	5/6(83.33)	1/4(25)	0/4(Nil)	1/4(25)	7/18(38.88)
	Kaka Pora	0/3(Nil)	0/4(Nil)	1/3(33.33)	1/2(50)	2/12 (16.66)
Srinagar	West zone	1/4(25)	0/4(Nil)	0/2(Nil)	2/4(50)	3/14(21.42)
	South zone	0/2(Nil)	0/3(Nil)	0/ 2(Nil)	1/3(33.33)	1/10(10)
	Central zone	0/4(Nil)	2/4(50)	1/4(25)	1/2(50)	4/14(28.75)
Mean		12/38(31.57)	6/36(16.66)	3/34(8.88)	12/28(17.85)	33/136(24.26)

*Values in the parenthesis indicate prevalence (%)

Highest overall prevalence of iron deficiency in cattle was observed in south zone of Srinagar (30%) and lowest in Kaka Pora (8.33%). Similar results were noted by Sharma *et al.* (2009). Highest prevalence was observed in pregnant cattle of South-zone (50%) and lowest in Chadoora and Pampore (16.6% each). Chadoora, south zone of Srinagar and Pulwama recorded a prevalence of 33.33% each in non-pregnant cattle where as Chrari-sharief and west zone of Srinagar recorded a prevalence of 25% and 16.66% respectively (Table 6). Highest prevalence was observed in heifers of central and south zone of Srinagar (50% each) and lowest in Pulwama 16.66%. Calves of central zone of Srinagar recorded a prevalence of 50% while those in Pulwama recorded 33.3%. In Khansahab, Pampore and west zone of Srinagar prevalence recorded was 25%. Das *et al*. (2009) and Kumar *et al*. (2008) have also reported iron deficiency in cattle.

Highest overall prevalence of zinc deficiency in cattle was observed in south zone of Srinagar (57.14) and lowest in west zone of Srinagar (21.42%). Sharma *et al* (2009) have also reported higher zinc deficiency in cattle. Highest prevalence was observed pregnant cattle of Khansahab (66.6%) and lowest in Pampore (16.16%). In Khansahab highest prevalence (80%) was observed in non-pregnant cattle where as west zone of Srinagar, Kaka Pora and Pampore recorded a prevalence of 25% each (Table 7). Heifers of Central zone of Srinagar recorded a highest prevalence of 75% while those in Pulwama recorded a lowest of 16.66%. Highest prevalence was observed in calves of Chadoora (66.66%) where as in Pampore, Khansahab and west zone of Srinagar recorded 25% each. Similar findings were made by Das *et al*. (2009) and Kumar *et al*. (2008).

Highest overall prevalence of cobalt deficiency in cattle was observed in Pampore (38.88%) and lowest in south zone of Srinagar (10%). Similar reports were made by Kumaresan *et al*. (2010). Pregnant cattle of Pampore recorded highest prevalence (83.33%) while that of west zone of Srinagar was lowest (25%). Central zone of Srinagar recorded highest prevalence (50%) in non-pregnant cattle where as Pampore recorded lowest (25%). Chari-Sharief, Central zone of Srinagar and Kaka Pora recorded a prevalence of 20% 33.33% and 25% respectively in heifers (Table 8). In district Budgam, Chari-Sharief (66.66%), recorded highest followed by Chadoora (33.33%) and Khansahab (25%) in calves. These findings are in corroboration of the findings of Das *et al*. (2009) and Kumar *et al*. (2008).

Thus, in the present study higher prevalence of zinc, copper and cobalt deficiency may be attributed to deficiency of micro minerals in fodder samples which were severely deficient in zinc, marginally deficient in copper and cobalt while iron content was adequate to high. This in turn may be attributed to deficient status of zinc, copper and cobalt in soil of the region as mineral content in plants depends on soil type, plant species, and stage of maturity, pasture management and agro-climatic conditions (Mc Dowell, 1985, Underwood and Suttle, 2001). Besides higher prevalence deficiency of copper (46.42%) in calves and zinc (44.73%) and cobalt (31.57%) in pregnant cattle may be due to the variation of micro mineral requirement in different groups of cattle (Spears, 2011). Similar findings were made by Sharma *et al.* (2004, 2006) and Khan *et al*. (2007). Iron deficiency was lower in all groups which may be due to the availability of adequate amount of iron in the soil and fodder (Yatoo *et al*., 2011).

CONCLUSION

Based on the present findings it can be concluded that the cattle of Kashmir valley are predisposed to micro mineral deficiency under the prevailing feeding system. Hence supplementation of cattle with mineral supplements is imperative.

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