The Pharma Innovation Journal 2018; 7(4): 984-987

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(4): 984-987

www.thepharmajournal.com
Received: 06-02-2018
Accepted: 10-03-2018

Saurabh Baloda
Department of Animal Nutrition, College of Veterinary Sciences, LLR University of Veterinary and Animal Sciences, Hisar, Haryana, India

Promila
Department of Animal Nutrition, College of Veterinary Sciences, LLR University of Veterinary and Animal Sciences, Hisar, Haryana, India

Correspondence
Saurabh Baloda
Department of Animal Nutrition, College of Veterinary Sciences, LLR University of Veterinary and Animal Sciences, Hisar, Haryana, India

A Review: Status of macro and micro minerals in feed, fodder, blood, and hair of buffaloes

Saurabh Baloda and Promila

Abstract
Mineral deficiencies or imbalances in forages have long been responsible for low productivity and reproductive problems in animals of tropical countries. This is because livestock are dependent largely on forages to obtain their mineral requirements. Hence to meet the requirements of animals through supplementation, scanning of available feeds and fodders for their mineral content is necessary. An effort has been made to review the concentrations of different minerals in feed, fodders, serum and hair.

Keywords: feed, livestock, deficiencies, forage

Introduction
The importance of minerals in nutrition and health of animals and plants has been greatly realized in the recent years. Their deficiency in livestock ration may lead to enormous health problems and reproductive disorders. Farm animals derive their mineral requirement mainly from the feeds and fodders offered to them under field conditions as little or no mineral mixture was supplemented. With the introduction of high yielding crop varieties, intensive cropping system and extensive fertilizes application in the new strategy of agriculture, the mineral profile in soil and thus in plants or animal feedstuffs are rapidly changing. It is, therefore, necessary to generate zone-wise information on mineral status, encompassing water, feeds, fodders and animals, so as to identify deficiency or toxicity, if any, so that a low cost balanced mineral mixture could be advocated to improve health and production.

Zinc (Zn)
The role of Zn as a cofactor of enzymes in the rumen physiological functions, somatic and sexual development, taste acuity, normal vision, wound healing and nucleic acid and protein metabolism is well established. The clinical signs of deficiency viz. decreased feed intake, loss of weight, rough coat, parakeratosis, dermatitis, cessation of spermatogenesis and testicular development are usually common among grazing tropical livestock population due to its imbalance in the soils and forages.

Zinc (Zn) in Plants and Diet
Singh (1977) [28] observed that the Zn content in wheat straw varied from 16.34 to 24.75 mg/kg. According to Rajora and Pachauri (1993) [24] the Zn content in Tarai region in fodder ranged from 15.84 to 30.22 mg/kg at three livestock farms. Mandal *et al.* (1996) [19] reported that the average Zn content in pearl millet straw and wheat straw and wheat grain were 25.08, 18.25 and 23.59 mg/kg, respectively in Mohindergarh district of Haryana state.
According to Lall *et al.* (1996) [15] the average Zn content in wheat straw and wheat flour was 23.05mg/kg and 15.63 mg/kg, respectively in Hisar district. Dhore *et al.* (2007) [7] reported that the average value of Zn in feed and fodders was less than 25.06 ppm in Western Agro Climatic Zone of Vidarbha. Garg *et al.* (2008) [10] reported that the Zinc was acutely deficient in most of the feedstuffs (average level< 26.30 ppm) in Bharatpur district of Rajasthan.
According to Malik (1991)[18] the concentration of mineral elements in the animal foodstuffs, especially the agricultural products depends upon different factors, such as genus, species or strain of plant, nature of soil on which the plant grows, the climate or seasonal conditions during growth and the stage of maturity of plant. According to Lall *et al.* (1994) [16] the Zn content of fodders grown at CIRB, Hisar farm ranged from 25-30 mg/kg in berseem and 25-30 mg/kg in jowar and oats was on much lower side against a mean value of 50 mg/kg in these crops.

Zn uptake by plants was found to be significantly and positively related to soil organic matter content and negatively to soil pH. These factors were responsible for Zn deficiency in most soil types of Haryana.

Garg *et al.* (2011) [9] reported that the levels of certain minerals such as Ca, P, S, Zn, Cu and Co were inadequate in the ration, as per the prevailing feeding practices and requirement of buffalo yielding daily 10 kg milk (6% fat) in the Central Plain Zone of Punjab. Maan *et al.* (2014) [17] reported that in Rohtak and Bhiwani district of Haryana state, dry and green fodder are deficient in Zn, Cu, Mn. Concentrates are also deficient in these minerals. Deficient also reflected in serum, hair and milk.

Zinc in Blood

The Zn concentration in serum or plasma was the most widely used indicator of deficiency but also lacks certainty and sensitivity as a diagnostic criterion (Underwood, 1981) [30]. Zinc is a constant constituent of blood plasma, serum, erythrocytes and leucocytes. Yadav *et al*. (1994) [33] reported that the average value of Zn content was 2.76 mg/kg in blood serum of buffaloes in Rewari district. According to Mandal *et al.* (1996) [19] the average Zn content in blood serum of milch buffaloes was 2.80 mg/kg in Mohindergarh district.

Zinc in Hair

Mineral levels in hair must reflect the concentration and (or) activity of the certain minerals in other parts of the body and reflect dietary mineral status of animals (Combs *et al*., 1987) [5]. The normal level of Zn in hair was 115-135 ppm (O,Mary *et al.*, 1969) [23]. Mandal *et al.* (1996) [19] reported that the average Zn contents in buffalo hair were 150.87 mg/kg in Mohindergarh district of Haryana state. Bhanderi *et al.* (2013) [3] while surveying the Sabarkantha District of Gujarat reported that the average level of Zn in hair was 73.51 ppm.

Copper (Cu)

Cu is an activator of several enzymes and is needed for the formation of haemoglobin with iron. All over the world certain soils do not provide adequate quantities of this element to plants and in turn to livestock. Such fodders having low Cu content are liable to induce various deficiency symptoms in animals (Maynard and Loosli, 1979) [20].

Copper in plants and diet

According to Rajora and Pachauri (1993) [24] the Cu content in fodder ranged from 5.95 to 15.68µg/g at three livestock farms in Tarai region. Mandal *et al.* (1996)[19] reported that the average Cu content in pearl millet straw and wheat straw and wheat grain were 8.34, 3.56 and 9.50 mg/kg, respectively in Mohindergarh district of Haryana state. According to Lall *et al.* (1996) [15] the average Cu content in wheat straw, wheat flour and cottonseed cake was 13.6mg/kg, 9.51 mg/kg and 32.36 mg/kg, respectively in Hisar district. Garg *et al.* (2011) [9] while surveying the Amritsar, Ludhiana and Patiala districts of Punjab reported that the average copper (Cu) content was low in straws (4.46 ppm) and in concentrate feed ingredients, it was 10 ppm.

According to Malik (1991) [18] the average value of Cu in cottonseed cake was 25.8 mg/kg in Pakistan. Lall *et al.* (1994) [16] reported that Cu content was quite high in sorghum (10-16 mg/kg) compared to the requirement of this element in diet is 10 mg/kg. Bhanderi *et al.* (2013) [3] while surveying the Sabarkantha District of Gujarat reported that green roughages were good source of copper (12.31 ppm). Garg *et al.* (2008) [10] reported that the average value of Cu in green fodders is 9.68 ppm in Bharatpur district of Rajasthan. Dry roughages are mostly deficient in Cu because in most circumstances cu concentration declines as plant mature (McDowell, 1985) [21].

Rajora and Pachauri (1993) [24] found that the Cu content in concentrate mixture ranged from 15.28 to 16.36 mg/kg in Terai region. Cereal grains generally contain 4.8µg/g as reported by Davis and Mertz (1987) [6]. Arora *et al.* (1993) [2] studied on changing nutrient status of crop plants in intensive agriculture and found that over the period of study the concentrations of Zn and Fe in wheat increased noticeably but those of Cu had a tendency to decrease. A comparison of various fodders with regard to their Cu content showed that leguminous fodders contained higher amount of Cu followed by non-leguminous fodders and cereal straws.

Sawhney *et al.* (1977) [25] found mild to severe deficiency of this mineral in the locally grown fodders of Himachal Pradesh and Jammu & Kashmir states. He also reported that Cu content of berseem was 9.60 mg/kg and that of wheat bhoosa was 6.20 to 16.73 mg/kg. The Cu content in the locally available fodders of drought prone areas of Maharashtra state was found to be a limiting factor for normal growth and production in large ruminants. Yadav *et al.* (1998) [32] reported that there was deficiency of Ca, P, Zn, Mn, Cu and Fe in feeds and fodder of Rewari district of Haryana state. They reported that bajra stover, wheat straw, cottonseed and wheat grain were deficient in copper. Iron was much higher in all the ingredients than its specified level in ration. According to Anke *et al.* (1994) [1] the content of all investigated trace elements (Fe, Mn, Zn, Cu, I) decreased with increasing plant age. Wakelin (1992) [31] reviewed the methods of supplementing Cu to ruminants including pasture top dressing, oral supplement and parental administration.

Copper in Blood

The lower critical value of Cu in serum has been reported as 0.6 ppm (Underwood, 1981) [30]. Yadav *et al.* (1994) [33] reported that the average value of Cu content was 0.47 mg/kg in blood serum of buffaloes in Rewari district. According to Mandal *et al.* (1996) [19] the average Cu content in blood serum of milch buffaloes was 0.67 mg/kg in Mohindergarh district. Chauhan and Nderingo (1997) [4] reported the Cu content ranged from 0.64 to 0.75 mg/kg in Tanzama. Sharma and Prasad (1983) [27] found the Cu content in blood of lactating buffaloes with average of 1.21 mg/kg. According to Nasser (1995) [22] the most important symptoms of Cu deficiency were anaemia, unthriftiness, hair looseness and discoloration, nervous manifestations and diarrhea. Diseased cows had very low blood and liver concentrations of Cu.

Cooper in Hair

Cu level in hair below 8 ppm was associated with deficiency in cattle (Underwood, 1977) [29]. Mandal *et al*. (1996) [19] reported that the average copper contents in buffalo hair were 10.55 mg/kg in Mohindergarh district of Haryana state. Bhanderi *et al.* (2013) [3] while surveying the Sabarkantha District of Gujarat reported that the average level of Cu in hair was 6.28 ppm. Combs *et al.* (1987) [5] found that concentrations of Ca, P and Cu in hair were not affected by dietary intake of these minerals.

Iron (Fe) in Plants and Diet

Rajora and Pachauri (1993) [24] while surveying Tarai region

reported that the iron content in fodder and concentrate mixture ranged from 173.30 to 500.77 mg/kg and 531.40 to 777.45 mg/kg, respectively at three livestock farms in Terai region. According to Mandal *et al*. (1996) [19] the average Fe content in wheat straw was 377.8 mg/kg in Mohindergarh district of Haryana state. According to Lall *et al.* (1994) [16], the Fe content in sorghum was about 200 mg/kg in Hisar district. Garg *et al.* (2011) [9] while surveying the Amritsar, Ludhiana and Patiala districts of Punjab reported that the average Fe content was very high in green roughages (>500 ppm).

According to Malik (1991) [18] the average value of iron in cotton seed cake was 158.0 mg/kg in Pakistan. Garg *et al*. (2008) [10] reported that the Fe contents were adequate in the diet of animals, with traditional feeding system in Bharatpur district. According to Kadiyan (1985) [14] the average Fe content in wheat flour was 119.0 mg/kg in Haryana. Garg *et al*. (2008) [10] reported that the Fe contents were adequate in the diet of animals, with traditional feeding system in Bharatpur district.

According to Lall *et al*. (1994) [16] the Fe content varied from 200-340 mg/kg in berseem and about 200 mg/kg in jowar and oats. It was sufficiently high to meet the requirement (50 mg/kg). Henry and Miller (1995) [13] reviewed the Fe bioavailability and found that citrate, fumerate and gluconate forms of iron had been found to be equal in bioavailability to ferrous sulphate. Fe as ferrous chloride was well utilized whereas ferric chloride was less available.

Iron in Blood

Iron occurs in blood as haemoglobin in the erythrocytes and as transferring in the plasma in a ratio of nearly 1000:1. Yadav *et al.* (1994) [33] reported that the average value of Fe content was 1.45 mg/kg in blood serum of buffaloes in Rewari district. According to Mandal *et al.* (1996) [19] the average Fe content in blood serum of milch buffaloes was 2.18 mg/kg in Mohindergarh district. Sharma (1991) [26] observed Fe content in serum under different levels of mineral feeding were 1.47, 1.64 and 1.69 mg/kg in three different treatments, respectively. Intake of Fe was very high due to high content in feed and fodders but its level in serum was within the reported range of 1.1 to 2.5 ppm (Georgievskii *et al*., 1982) [11].

Iron in Hair

The lower critical value of Fe in hair is 40 ppm (Underwood, 1977) [29]. According to Gupta and Chaudhari (1984) [12] the cattle poll hail iron content ranged from 5.25 to 248.81 mg/kg in the hilly tracts of Darjeeling. Mandal *et al*. (1996) [19] reported that the average Fe contents in buffalo hair were 82.55 mg/kg in Mohindergarh district.

Manganese (Mn) in plants and diet

Rajora and Pachauri (1993) [24] while surveying Tarai region reported that the Mn content in fodder and concentrate mixture ranged from 22.68 to 40.88 mg/kg and 24.40 to 30.29 mg/kg, respectively at three livestock farms in Terai region. According to Mandal *et al*. (1996) [19] the average Mn content in wheat straw was 59.50 mg/kg in Mohindergarh district of Haryana state. Lall *et al*. (1996)[15] reported that the average Mn content in wheat straw and wheat flour was 18.5mg/kg and 17.66 mg/kg, respectively in Hisar district. Bhanderi *et al.* (2013) [3] while surveying the Sabarkantha District of Gujarat reported that dry roughages were good source of Mn (47.88 ppm). Garg *et al*. (2008) [10] reported that the manganese contents were adequate in the diet of animals, with traditional feeding system. In Bharatpur district.

According to Malik (1991) [18] the average value of Mn in cotton seed cake was 25.0 mg/kg in Pakistan. According to Kadiyan (1985) [14] the average Mn content in wheat flour was 48.6 mg/kg in Haryana. Gami *et al.* (2013) [8] while surveying Dantiwada taluka in North Gujarat region reported that the average value of Mn in concentrate mixture was 40.09 mg/kg.

Maan *et al.* (2014) [17] reported that in Rohtak and Bhiwani district of Haryana state, dry and green fodder are deficient in Zn, Cu, Mn. Concentrates are also deficient in these minerals. Deficient also reflected in serum, hair and milk. Yadav *et al.* (1998) [32] reported that there was deficiency of Ca, P, Zn, Mn, Cu and Fe in feeds and fodder of Rewari district of Haryana state. Gami *et al*. (2013) [8] reported that there was significant low level of Cu and Zn while Mn was in good amount in high yielding cattle's diet of Dantiwada taluka in North Gujarat region.

Manganese in Blood

The lower critical value of Mn in serum has been reported as 0.20 ppm (Underwood, 1981) [30]. Yadav *et al.* (1994) [33] reported that the average value of Mn content was 0.39 mg/kg in blood serum of buffaloes in Rewari district. According to Mandal *et al.* (1996) [19] the average Mn content in blood serum of milch buffaloes was 0.43 mg/kg in Mohindergarh district. Sharma (1996) observed Mn content in serum under different levels of mineral feeding were 0.59, 0.65 and 0.65 mg/kg in three different treatments, respectively.

Manganese in Hair

Underwood (1981) [30] stated that hair apparently reflects the dietary status of animals and 8 ppm was the lower critical level in adult cattle (Underwood, 1977) [29]. According to Gupta and Chaudhari (1984) [12] the cattle poll hail Mn content ranged from 1.70 to 40.76 mg/kg in the hilly tracts of Darjeeling. Mandal *et al*. (1996) [19] reported that the average Mn contents in buffalo hair were 13.72 mg/kg in Mohindergarh district. Yadav *et al*. (1994) [33] reported the average value of Mn in blood serum of buffalo was 0.39 mg/kg in Rewari district of Haryana state.

Conclusion

Minerals in feed and fodder is decreasing due depletion of minerals from soil, so it is very necessary to add mineral mixture to the diet of animal to overcome any kind of disorder due to mineral deficiency

References

1. Anke M, Groppel B, Glei M. The influence of cutting time on macro and trace element contents of forage. W)) irtschaftseigene Futter (Germany), 1994.
2. Arora CL, Brar MS, Hundal HS, Takkar PN. Changing nutrient status of crop plants in intensive agriculture. Fertiliser News. 1993; 38:47.
3. Bhanderi BM, Garg MR, Goswami A. Study on Availability of Various Macro and Micro-Minerals in Lactating Buffaloes under Field Conditions of Sabarkantha District of Gujarat. Journal of Buffalo Science. 2013; 2(1):12.
4. Chauhan FS, Nderingo NE. Seasonal variations in mineral elements of soil, pasture an blood in different phases of normal production in dairy cattle. Indian

veterinary journal. 1997; 74(1):32-4.
5. Combs DK, Goodrich RD, Meiske JC. Mineral concentrations in hair as indicators of mineral status: a review. Journal of animal science. 1982; 54(2):391-8.
6. Davis GK, Mertz W, Mertz W. Trace elements in human and animal nutrition. Trace elements in human and animal nutrition, 1987, 1.
7. Dhore RN, Udar SA. Micro mineral status of soils, feeds, fodder and serum samples of buffaloes in Western Agro Climatic zone of Vidarbha. Indian J. Anim. Res. 2007; 41(3):212-5.
8. Gami YM, Gami BI, Ahlawat AR. Mapping of minerals in common feed resources and high yielding cattle's diet of Dantiwada taluka in North Gujarat region. Veterinary Science Research Journal. 2013; 4(1):1-4.
9. Garg MR, Bhanderi BM, Gupta SK. A study on availability of various mineral elements in milch buffaloes. Anim Nutr Feed Tech. 2011; 11:91-102.
10. Garg MR, Bhanderi BM, Sherasia PL. Assessment of macro and micro-minerals status of milch animals for developing area specific mineral mixture for Bharatpur district of Rajasthan. Anim Nutr Feed Tech. 2008; 8:53-64.
11. Georgievskii VI, Annenkov BN, Samokhin VT. Mineral nutrition of animals: studies in the agricultural and food sciences. Elsevier; 1982, 22.
12. Gupta BN, Chaudhari AB. Trace element status of the naturally available fodder and cattle poll hair in the Hilly Tracts of Darjeeling. Proceeding of the symposium on recent advances in mineral nutrition held in CCS HAU, Hisar, 1984, pp. 179-183.
13. Henry PR, Miller ER. Bioavailability of nutrients for animals: amino acids, minerals and vitamins. Bioaviability of nutrients for animals: amino acids, minerals, vitamins, 1995.
14. Kadyan RS. Studies on Trace Minerals Inter-relationship Between Soil-plant and Animals (Doctoral dissertation, Animal Nutrition, CCSHAU, Hisar).
15. Lall D, Dixit VB, Chauhan TR, Khanna S. Feeding practices vis a vis mineral supply to lactating buffaloes in Hisar district. Indian Journal of Animal Nutrition. 1996; 13(2):95-100.
16. Lall D, Gupta R, Gupta VK. Blood serum levels of certain mineral elements in lactating buffaloes in relation to forages and soil content. Indian Journal of Animal Nutrition. 1994; 11(4):233-6.
17. Maan NS, Mandal AB, Sihag S, Khatta VK. Feeding Plane and Mineral Status of Murrah Buffaloes in Bhiwani District of Haryana State. Indian Journal of Animal Nutrition. 2014; 31(1):53-9.
18. Malik, Yaqoob Muhamma. Mineral imbalance in the livestock of Pakistan. First Int. Anim. Nutr. Workers Conference for Asia and Pacific, 1991, pp. 162-169.
19. Mandal AB, Yadav PS, Sunaria KR, Kapoor V, Maan NS. Mineral status of buffaloes in Mohindergarh district of Haryana. Indian journal of animal sciences. 1996; 66(8):849-51.
20. Maynard LA, Loosli JK, Hintz HF, Warner RG. Animal Nutrition. Tata McGraw-Hill Pub. Co. Ltd. New Delhi, India, 1979.
21. Mc Dowell LR. Nutrtion of Grazing Ruminants in Warm Climate. Academic Press New York, 1985.
22. Nasser MH. Diagnosis of copper deficiency in cattle. In proceeding of the Third Scientific Congress Egyptian Society for Cattle diseases. 1995; 1:78-81.
23. O'mary CC, Butts WT, Reynolds RA, Bell MC. Effects of Irradiation, Age, Season and Color on Mineral Composition of Hereford Cattle Hair 1, 2. Journal of animal science. 1969; 28(2):268-71.
24. Rajora VS, Pachauri SP. Micronutrient status of dairy cattle as influenced by soil-plant relationship in Tarai region. The Indian Journal of Animal Sciences (India), 1993.
25. Sawhney PC, Bedi SP, Khan SA. note on trace element contents in the fodders of Jammu and Kashmir State. Indian journal of animal sciences, 1977.
26. Sharma PR, Singh MP, Gupta PC. Effect of enhanced feeding and anti-parasitic measures on body measurement and physiological parameters of buffalo heifer calves. Indian J. Ani. Prod. Manag. 1991; 7(1):30-31.
27. Sharma SK, Prasad T. Blood copper, iron, magnesium and zinc levels in growing and lactating buffaloes. Indian journal of dairy science, 1982.
28. Singh Jasvir. A study on feeding practices of buffaloes. Int. Book Distributing Co. Lucknow, 1997.
29. Underwood EJ. Trace elements in human and animal nutrition. 4th Ed. Academic press, New York, U.S.A, 1977.
30. Underwood EJ. The mineral nutrition of livestock Commonwealth Agric. Bureau, London, 1981.
31. Wakelin RL. Copper supplementation for ruminants. Publication Veterinary Continuing Education, Massey University. 1992; 145:43-51.
32. Yadav PS, Mandal AB, Kapoor V, Sunaria KR, Mann NS. Mineral status of cows and buffaloes in Rewari district of Haryana. Indian journal of animal sciences. 1998; 68(10):1059-61.
33. Yadav PS, Sunaria KR, Kapoor V, Mann NS, Mandal AB. A survey on mineral status of buffaloes in Rewari district of Haryana state. Paper presented in National Symposium on Environmental Related Animal Feeding Strategies organized by Deptt. of Animal Nutrition, CCS HAU, Hisar, 1994; 36:12-13.