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Estimation of mineral profile in hair of cattle and buffaloes in different districts of raya-pearl millet growing zone of Haryana

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Abstract

A detailed survey was carried out to estimate mineral status of hairs of lactating cattle and buffaloes in raya-pearl millet growing zone of Haryana state during Kharif season. Seven district of raya-pearl millet zone (Charkhi Dadri, Bhiwani, Jhajjar, Gurugram, Mewat, Mahendragarh and Rewari) having 42 blocks, representing all the districts of the zone were selected for the survey. Thus, a total of 504 farming families were selected for the survey. Samples of hairs were collected from cattle and buffalo farmers. The hair samples of the same animals were cut from different body parts i.e., neck and switch by stainless steel scissor and packed in small polythene bags. The samples then analysed for the concentration of Zn, Cu, Mn, and Fe using Perkin Elmer Atomic Absorption Spectrometer (PinAAcle 900T). Calcium in samples was estimated by Arsenazo method (McLeans and Hastings, 1935) and phosphorus was measured by UV phosphomolybdate method (Daly and Ertingshausen, 1972). Results revealed that all the hair samples were deficient in Zn and Cu which is indicative of their general deficiency in animal feeds while none of the hair samples were deficient in Fe.

Keywords: Minerals, hair, raya-pearl millet, deficiency and *Kharif* season

Introduction

Livestock sector plays a very imperative role in Indian economy. Almost 60% of the population is still living in rural areas and most of them are dependent on agriculture for their livelihood and landless population are dependent on livestock to augment their income. Almost 4.11% of Gross Domestic Product and a quarter of total Agricultural Gross Domestic Product are contributed by the livestock sector. Livestock rearing along with crop production maximizes the overall agricultural production. Haryana state has played an important role in the agricultural development of the country resulting in a boom in the economic growth of the country. Haryana produced 117.35 lakh tones of milk during 2019-20, showing an increase of 9.40% over the previous year (ISSR, 2019) [5]. Based on cropping pattern, the Haryana state is divided into three zones namely Raya-pearl millet growing zone, Cotton-Wheat growing zone and Raya-Pearl millet growing zone.

In Haryana state farmers generally do not supplement mineral mixture and common salt in animal ration which leads to many reproductive and health problems due to deficiency of mineral elements. Further, studies conducted on mineral status of buffaloes in Mohindergarh and Rewari districts of the state revealed that over fifty percent of buffaloes had calcium, phosphorus and copper level below the normal values (Mandal *et al.*, 1996) [8]. Minerals can form structural components of body organs and tissues, exemplified by minerals such as calcium, phosphorus and magnesium; silicon in bones and teeth; copper in hairs and phosphorus and sulphur in muscle proteins.

Materials and Methods

A detailed survey was carried out to record mineral status of hairs of lactating cattle and buffaloes in raya-pearl millet growing zone of Haryana during Kharif season. Raya-pearl millet growing zone (Charkhi Dadri, Bhiwani, Jhajjar, Gurugram, Mewat, Mahendragarh and

Rewari) has 0.64 million cattle and 1.35 million buffaloes, i.e. 36.65% and 31.58% of the state cattle and buffalo population. 42 blocks, representing all the districts of the zone were selected for the survey.

The hair samples of the same animals were cut from different body parts i.e., neck and switch by stainless steel scissor and packed in small polythene bags till further analysis. All the samples were labeled and stored for analysis. The hair samples were dusted off for extraneous contamination, cut into 1 cm length and washed with acetone again before digestion following standard procedure. For digestion, 0.2 g of hair sample was taken in 50 mL conical flask and added 10 mL digestion mixture of acids (4 Nitric acid: 1 Perchloric acid). Thereafter, it was left overnight and in the next morning, heated the sample over hot plate until color of fumes changed. Then after cooling 10 mL final volume was made by

adding distilled water into conical flask slowly, mixed properly and stored into 20 ml capped tubes until analysis. The samples then analysed for the concentration of Zn, Cu, Mn, and Fe using Perkin Elmer Atomic Absorption Spectrometer (PinAAcle 900T). Calcium in samples was estimated by Arsenazo method (McLeans and Hastings, 1935)^[9] and phosphorus was measured by UV phosphomolybdate method (Daly and Ertingshausen, 1972)^[3]. The data was statistically analysed as per statistic methods of Snedecor and Cochran (1994)^[11].

Results and Discussion

The mean values of mineral concentration in hair of cattle and buffaloes of different districts of raya-pearl millet growing zone are presented in Table 1 and Table 2, respectively.

Table 1: Mineral composition of hair of cattle in different districts of raya-pearl millet growing zone

| | n | Ca (%) | P (%) | Zn (ppm) | Cu (ppm) | Fe (ppm) | Mn (ppm) |
|----------------|----|-----------|-------------|-------------|-----------|--------------|------------|
| Rewari | 36 | 0.22±0.02 | 0.005±0.01 | 74.36±3.90 | 4.87±1.65 | 186.75±5.43 | 8.80±0.51 |
| Jhajjar | 36 | 0.26±0.04 | 0.006±0.01 | 80.75±3.95 | 6.94±0.94 | 238.72±5.22 | 9.35±0.44 |
| Gurugram | 24 | 0.21±0.03 | 0.005±0.01 | 82.92±3.53 | 5.82±1.14 | 295.76±6.31 | 9.85±1.43 |
| Mewat | 42 | 0.18±0.02 | 0.003±0.02 | 71.73±3.54 | 4.51±1.38 | 274.82±5.61 | 8.68±0.38 |
| Mahendragarh | 48 | 0.25±0.03 | 0.005±0.01 | 79.44±3.63 | 6.82±0.75 | 150.29±5.22 | 9.73±0.37 |
| Bhiwani | 42 | 0.24±0.03 | 0.008±0.01 | 73.52±3.82 | 6.84±1.82 | 146.97±5.51 | 8.87±1.47 |
| Charkhi dadri | 24 | 0.22±0.04 | 0.007±0.02 | 77.61±3.96 | 5.89±1.72 | 158.71±4.49 | 9.81±0.42 |
| Mean | | 0.22±0.02 | 0.006±0.01 | 77.19±1.38 | 5.95±0.68 | 207.43±1.06 | 9.29±0.59 |
| Range | | 0.06-0.29 | 0.001-0.016 | 43.51-98.67 | 1.94-7.64 | 94.23-335.45 | 4.16-13.56 |
| Critical level | | 0.17 | 0.09 | 115 | 8 | 40 | 8 |

Table 2: Mineral composition of hair of buffaloes in different districts of raya-pearl millet growing zone

| | n | Ca (%) | P (%) | Zn (ppm) | Cu (ppm) | Fe (ppm) | Mn (ppm) |
|----------------|----|-----------|-------------|--------------|-----------|---------------|------------|
| Rewari | 36 | 0.21±0.03 | 0.008±0.01 | 84.63±2.63 | 4.54±0.14 | 184.68±9.04 | 9.18±0.61 |
| Jhajjar | 36 | 0.22±0.02 | 0.009±0.02 | 89.64±3.54 | 5.61±0.09 | 186.42±8.12 | 9.53±0.41 |
| Gurugram | 24 | 0.22±0.02 | 0.010±0.01 | 91.76±2.65 | 4.72±0.08 | 184.36±8.47 | 8.32±0.50 |
| Mewat | 42 | 0.19±0.03 | 0.007±0.02 | 73.42±3.51 | 4.48±0.39 | 192.31±8.54 | 8.32±0.53 |
| Mahendragarh | 48 | 0.20±0.02 | 0.008±0.01 | 85.36±2.46 | 5.54±0.08 | 187.5±8.31 | 8.59±0.41 |
| Bhiwani | 42 | 0.21±0.04 | 0.007±0.01 | 84.14±3.51 | 5.52±0.43 | 176.97±9.72 | 10.13±0.50 |
| Charkhi dadri | 24 | 0.23±0.03 | 0.006±0.02 | 85.64±3.66 | 5.63±0.07 | 184.19±8.83 | 9.73±0.52 |
| Mean | | 0.21±0.01 | 0.007±0.01 | 84.64±2.05 | 5.14±0.13 | 185.94±3.22 | 9.15±0.19 |
| Range | | 0.07±0.31 | 0.002±0.014 | 45.42-132.32 | 2.88-9.58 | 167.43-241.21 | 3.74-14.47 |
| Critical level | | 0.17 | 0.09 | 115 | 8 | 40 | 8 |

The average values of Ca in cattle and buffalo hair were 0.22 and 0.21%, respectively. Similarly, the concentration of P was 0.006 and 0.007%, respectively. Scanty information is present using hair as an index of Ca and P status of animal that's why hair cannot be used to assess calcium and phosphorus status of ruminants. The average values of Zn content in cattle and buffalo hair were 77.19 and 84.64 ppm, respectively. The normal level of Zn in hair was 115-135 ppm (O, Mary *et al.*, 1969)^[10]. All samples obtained under the present study were below 115 ppm which indicates Zn deficiency in both the species. The present study indicated that Zn content of hair is indicative of general deficiency of Zn in animal feeds. The average values of Cu content in cattle and buffalo hair were 5.95 and 5.14 ppm, respectively. Copper concentration in hair was found below its lower critical level i.e., 8 ppm in cattle and buffaloes in the zone (Underwood, 1977). Similarly, Yadav found that copper and zinc were deficient in hair samples having an average value 38.12 ppm and 4.04 ppm respectively in Jind district of Haryana state. Maan (2000)^[7] surveyed Rohtak reported that 95.8% and 75% hair samples of buffaloes were found deficient in Zn and Cu respectively while Fe and Mn was adequate in most of samples. Kumar

(2019)^[6] found that hair sample of buffaloes in Jhajjar district was deficient in Zn and Cu having an average value of 78.34 and 5.93 mg/kg, relatable to this present study. Baloda (2016)^[2] reported that in Gurugram district, mean value of Zn in hairs was 116.82±1.60 mg/kg. Nearly 90% of animals had Cu concentration 8 ppm in hair below.

In cattle and buffaloes, the mean iron contents of hair were 207.43 ppm and 185.94 ppm. On comparing with lower critical value of Fe in hair i.e., 40 ppm none of the hair samples were deficient in Fe. Kumar (2019)^[6] reported that the Fe contents of hair ranged from 82.55-101.34 mg/kg and the mean value was 91.52 mg/kg.

The concentration of Mn ranged from 4.16 to 13.56 ppm with mean value of 9.29 ppm in cattle while the concentration of Mn ranged from 3.74 to 14.47 ppm with mean value of 9.15 ppm (Underwood, 1977) in case of buffaloes. The hair concentration is correlated with the level of Mn in diet (Georgeveskii *et al.*, 1982)^[4]. Similarly, Underwood stated that hair apparently reflects the dietary status of animals and 8 ppm was the lower critical level in adult cattle (Underwood, 1977). The values obtained from all the districts in both the

species under present investigation were in the normal physiological range.

Conclusion

All samples collected under the present study were below 115 ppm in Zn concentration which indicates Zn deficiency in cattle and buffaloes. Copper concentration in cattle and buffalo hair was also found below its lower critical level i.e., 8 ppm. The lower critical value of Fe in hair is 40 ppm and none of the hair samples was deficient in Fe.

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