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Mineral composition of different green fodder used in raya-pearl millet growing zone of Haryana

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Abstract
A survey was conducted to found mineral composition of different green fodders used in raya-pearl millet growing zone of Haryana during Kharif season. 42 blocks, representing all the districts of the zone were selected for the survey. Samples of green fodder were collected from cattle and buffalo farmers. Thus, a total of 504 farming families were selected for the survey. A questionnaire was prepared and individual farmer was interrogated regarding the type of green fodder and their amount fed to their animals. The samples of fodder ingredients (bajra fodder, sorghum fodder and grasses fodder) offered to animals were collected from each block and analysed for minerals. The results showed that Bajra fodder was used as green fodders by majority of farmers. Sorghum and grasses was also used as green fodders by few farmers. Green fodders were deficient in P, Zn, Cu and Mn.

Keywords: Minerals, green, fodder, bajra fodder, sorghum and grasses

Introduction
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) [6]. 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.

Minerals in adequate quantity and proportion need to be supplemented in addition to those available from different feeds. Rahman *et al.* (1998) [9] reported that conditions of tropical areas significantly affect the quality and quantity of forages. The deficiency of minerals in soil leads to lower mineral content in feeds and fodders and thereby mineral deficiency in animals causing health problems in animals (Mandal *et al.*, 1996) [8]. Regional mapping of elements in feed and fodders is relatively a rapid, reliable and line data on the level of macro and microelements (Agett *et al.*,1988) [1].

Raya-Pearl Millet growing zone (Charkhi Dadri, Bhiwani, Jhajjar, Gurugram, Mewat, Mahendragarh, Rewari) has 0.64 million cattle and 1.35 million buffaloes, i.e., 36.65% of the state cattle and 31.58%of the buffalo population (BAHS, 2019). Climate of the zone is suitable for growing pearl millet, rapeseed, mustard and other rain fed crops. But due to pressure on land for maximizing crop production, fertilizer application, rainfall and natural activities, the soil mineral status keeps changing. Hence, deficiency or toxicity of minerals is an area specific problem.

Materials and Methods
A detailed survey was carried out to record mineral composition of various green fodders fed 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. Samples of green fodder feedstuffs, were collected from cattle and buffalo farmers. Thus, a total of 504 farming families were selected for the survey. A questionnaire was prepared and individual farmer was interrogated regarding the type of feedstuffs and their amount fed to their animals. The samples of green fodders i.e. bajra fodder, sorghum fodder and grass fodder offered to animals were collected from each block and analysed for minerals.

The collected samples were dried and ground then analysed for the concentration of Zn, Cu, Mn, and Fe using Perkin Elmer Atomic Absorption Spectrometer (PinAAcle 900T). Calcium and Phosphorus content in feeds and fodders were estimated as per AOAC (2007) [2]. The data was statistically analysed as per statistic methods of Snedecor and Cochran (1994) [11].

Results and Discussion

Home grown bajra fodder was the major green roughage being fed by farmers in almost all the districts of the zone under investigation. Mineral composition of bajra fodder in different districts of the zone has been given in Table 1. The Ca content in bajra fodder ranged from 0.24 to 0.42% and had an average value of 0.31%. Among districts, the mean Ca concentration ranged from 0.29% in Gurugram and Mahendargarh district to 0.34% in Jhajjar district. The concentration of P in bajra fodder ranged from 0.08% to 0.21%. Among districts, the mean P content ranged from 0.10% in Mewat to 0.19% in Jhajjar. The Ca concentrations is more than their critical level in all the districts i.e., 0.30% however P concentrations were more than their critical level in all the districts except Mahendragarh and Gurugram i.e., 0.29% and 0.29% respectively.

The mean value of Zn concentration in bajra fodder of the zone was 24.99 ppm. Concentration of Zn, ranged from 22.71 to 29.54 ppm. The mean Zn concentration was the lowest in Mewat (23.24 ppm) while it was the highest in Jhajjar district (27.16 ppm). Zn was deficient in the samples of all district of the zone as its level was below critical level (30 ppm). Overall the concentration of Cu, ranged from 1.98 to 3.51 ppm. Mean Cu content was lowest in Mahendragarh , Mewat and Rewari districts while highest in Jhajjar district although all the district had mean Cu level below critical Cu level (8 ppm). The average Fe content of the zone was 121.19 ppm and ranged from 109.62-136.32 ppm. None of the samples were deficient in the zone (critical level with 50 ppm). The concentration of Mn in bajra fodder ranged from 33.67 to 39.41 ppm and had an average value of 36.06 ppm. Among the districts, the mean Mn concentration ranged from 34.23 in Mewat to 38.38 ppm in Jhajjar district. All the districts have Mn concentration below critical value (40 ppm).

Farmers of this zone were also using sorghum and grasses as source of green roughages. Mineral composition of sorghum and grasses has been depicted in Table 2 and Table 3, respectively. The Ca content in sorghum fodder ranged from 0.37 to 0.62% while in grass it varied from 0.64 to 0.73%. Sorghum had an average Ca value of 0.48% and it was 0.69% in case of grass fodder. Thus, sorghum fodder and grasses had adequate Ca which was above critical level of 0.30%. The concentration of P (%) in sorghum fodder ranged from 0.35 to 0.52% and had an average value of 0.44% while in case of grass fodder it ranged from 0.15 to 0.24 and had an average value of 0.20%. Sorghum fodder was providing adequate P whereas grass fodder was providing less P than required critical level i.e. 0.25%. The average values of Zn concentration in sorghum and grass fodder were 22.83 and 18.81 ppm, essentially which showed that both the sources were providing lower content of Zn than critical level of 30 ppm. The average values of Cu concentration in sorghum and grass fodder were 34.19 and 5.84 ppm, respectively. All the samples of grass fodder were deficient in Cu in the zone (Considering 8 ppm as critical limit). The average values of Fe concentration in sorghum fodder and grass fodder were 159.51 and 153.94 ppm, respectively, and none of the samples were deficient in the zone (Considering 50 ppm as critical limit). Lall *et al*. (1994) [7] reported that Cu content was quite high in sorghum (10-16 mg/kg) compared to the requirement of this element in diet i.e. 10 mg/kg. Bhanderi *et al*., (2013) [3] while surveying the Sabarkantha District of Gujarat reported that green roughages were good source of Cu (12.31 ppm). Garg *et al*., (2008) [5] reported that the average value of Cu in green fodders was 9.68 ppm in Bharatpur district of Rajasthan. Dhore *et al*., (2007) [4] reported that the average value of Zn in feed and fodders was less than 25.06 ppm in Western Agro Climatic Zone of Vidarbha.

The average values of Mn concentration in sorghum and grass fodder were 50.21 and 32.28 ppm, respectively. Sorghum fodder was a good source of Mn and none of samples of the sorghum fodder were below critical level of Mn but in case of grass fodder majority of samples were deficit in terms of Mn (Considering 40 ppm as critical limit).

Table 1: Mineral composition of bajra fodder in different districts of raya- pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	54	0.33±0.02	0.15±0.06	24.34±1.02	2.66±0.40	124.86±3.17	35.20±0.54
Jhajjar	58	0.34±0.01	0.19±0.04	27.16±0.68	3.20±0.22	113.02±3.21	38.38±0.77
Gurugram	34	0.29±0.02	0.17±0.08	25.44±1.02	2.66±0.42	115.76±5.13	36.30±0.74
Mewat	58	0.30±0.01	0.10±0.07	23.24±1.05	2.26±0.46	130.26±4.26	34.23±0.54
Mahendargarh	72	0.29±0.02	0.12±0.06	24.44±1.02	2.26±0.41	128.76±5.66	34.37±0.54
Bhiwani	62	0.31±0.02	0.15±0.08	24.44±1.02	2.66±0.43	120.56±5.46	36.35±0.74
Charkhi dadri	35	0.33±0.01	0.18±0.02	25.92±1.63	3.05±0.43	115.14±7.17	37.59±0.62
Mean		0.31±0.01	0.15±0.02	24.99±0.74	2.68±0.21	121.19±3.02	36.06±0.43
Range		0.24-0.42	0.08-0.21	22.71-29.54	1.98-3.51	109.62-136.32	33.67-39.41
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

*McDowell (1993)

Table 2: Mineral composition of sorghum fodder in different districts of raya- pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	22	0.53±0.02	0.44±0.01	24.38±0.30	33.60±0.48	159.36±1.57	50.63±0.82
Jhajjar	28	0.53±0.01	0.47±0.02	24.23±0.26	36.42±0.45	159.63±1.38	50.24±0.72
Gurugram	15	0.50±0.01	0.42±0.02	20.71±0.26	35.84±0.46	159.24±1.43	49.24±0.88
Mewat	33	0.44±0.02	0.41±0.01	24.16±0.25	35.32±0.50	160.67±1.38	50.37±0.83
Mahendargarh	34	0.43±0.01	0.42±0.01	19.62±0.27	31.35±0.39	158.67±1.48	49.94±0.74
Bhiwani	36	0.45±0.02	0.44±0.02	22.58±0.47	31.20±0.57	159.12±1.59	51.21±0.82
Charkhi dadri	20	0.46±0.01	0.45±0.02	24.16±0.25	35.64±0.48	159.89±1.64	49.89±0.77
Mean		0.48±0.01	0.44±0.02	22.83±0.14	34.19±0.21	159.51±0.53	50.21±0.31
Range		0.37-0.62	0.35-0.52	16.06-28.03	25.10-42.53	140.08-178.94	40.01-60.96
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

*McDowell (1993)

Table 3: Mineral composition of grasses fodder in different districts of raya-pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	27	0.68±0.01	0.20±0.02	18.31±0.26	5.81±0.43	169.04±8.01	29.70±0.02
Jhajjar	34	0.72±0.01	0.23±0.01	22.74±0.57	6.66±0.87	114.49±6.50	37.61±1.61
Gurugram	15	0.69±0.02	0.19±0.01	20.71±0.64	5.98±0.35	133.51±8.40	34.44±1.48
Mewat	27	0.65±0.01	0.19±0.01	14.89.±0.53	5.08±0.64	192.65±4.02	24.99±0.01
Mahendargarh	32	0.68±0.02	0.19±0.02	15.06±0.90	5.39±0.79	189.87±5.10	29.47±1.28
Bhiwani	29	0.69±0.01	0.20±0.02	18.87±0.64	5.93±0.40	155.41±9.24	33.21±1.58
Charkhi dadri	15	0.70±0.02	0.21±0.01	21.09±0.44	6.03±0.83	122.60±6.10	36.56±1.38
Mean		0.69±0.01	0.20±0.01	18.81±0.31	5.84±0.15	153.94±3.65	32.28±0.61
Range		0.64-0.73	0.15-0.24	13.56-23.83	4.91-7.62	104.58-196.46	23.86-38.46
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

*McDowell (1993)

Conclusion

Among green fodders, Bajra fodder was used as green fodders by majority of farmers, which had adequate Ca (0.31%), and Fe content (121.19 ppm) but was deficient in P (0.15%), Zn (24.99 ppm), Cu (2.68 ppm), Mn (36.06 ppm). Sorghum and grasses was also used as green fodders by few farmers. Sorghum had adequate Ca (0.48%), P (0.44%), Cu (34.19ppm), Mn (50.21 ppm) and Fe content (159.51 ppm) but was deficient in Zn. Grasses were had adequate Ca and deficient in P, Zn Cu and Mn.

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