



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(12): 6245-6248  
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[www.thepharmajournal.com](http://www.thepharmajournal.com)  
Received: 01-10-2022  
Accepted: 05-11-2022

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## Mineral composition of various dry roughages used in raya-pearl millet growing zone of Haryana

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### Abstract

A detailed survey was carried out to record mineral composition of various dry roughages 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 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 roughage ingredients (wheat straw, rice straw and bajra kadbi) offered to animals were collected from each block and analysed for minerals. The results revealed that all the dry roughages i.e. wheat straw, rice straw and bajra kadbi were deficient in all the minerals except Fe.

**Keywords:** Minerals, roughage, straw, bajra kadbi, rice and kharif season

### Introduction

Feed resources which accounts for approximately 70-80% of the inputs cost are the major constraints in exploiting the full genetic potential of the livestock. For efficient production, reproduction and maintenance of normal health in dairy animals, it is essential to provide nutrients according to their needs (Sherasia *et al.*, 2016) <sup>[15]</sup>. Where possible locally available feeds should be used so that the costs can be managed (Baloda *et al.*, 2016) <sup>[3]</sup>. A survey work conducted in Charkhi Dadri district (Ramsawroop *et al.*, 2019) <sup>[14]</sup> revealed that majority of buffaloes were fed adequately in terms of TDN but underfed in terms of dry matter and crude protein.

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 cannot be synthesized in the body and need to be supplemented daily. They are constituent of biomolecules and also help in the activation of many enzymes. As soluble salts in blood and other body fluids they are responsible for maintenance of osmotic and acid-base equilibrium. Mineral status of dairy animals also affects the symbiotic microflora of GIT besides influencing milk production and reproduction efficiency (Maan, 2000) <sup>[10]</sup>. 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) <sup>[11]</sup>.

Raya-pearl 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, respectively (BAHS, 2019) <sup>[2]</sup>. Climate of the zone is suitable for growing pearl millet, rapeseed, mustard and other rain fed crops. The deficiency or toxicity of minerals is an area specific problem because soil mineral status keeps on changing due to pressure on land for maximizing crop production, fertilizer application, rain and natural calamities. This directly alters the mineral content of feeds and fodders and, hence, their supply to the animals.

It is likely that deficiency of certain minerals may not affect crop yield but their availability from such forages may be inadequate for meeting the requirements of livestock. It is, therefore, necessary to generate zone wise information on the mineral status so as to identify deficiencies or toxicities, if any.

## Materials and Methods

A detailed survey was carried out to record mineral composition of various dry roughage feeds 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 dry roughage 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 dry roughage i.e. wheat straw, rice straw and bajra kadbi 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) <sup>[1]</sup>. The data was statistically analysed as per statistic methods of Snedecor and Cochran (1994) <sup>[17]</sup>.

## Results and Discussion

Wheat straw was being fed by farmers at all the sites surveyed and was preferred choice of all the farmers in the zone. Mineral composition of wheat straw in different districts of the zone is given in Table 1 shows that the concentration of Ca in wheat straw ranged from 0.18 to 0.24% with an average of 0.21%. The average Ca content ranged from 0.20% (Mewat) to 0.22% (Jhajjar). All the samples were below critical limit (0.30%). The concentration of P in wheat straw ranged from 0.03 to 0.12% and had an average value of 0.06%. The P concentration was below critical limit (0.25%) in all the samples. The average Zn concentration was 19.23 ppm and had ranged from 17.89 to 21.43 ppm which was below critical limit (30 ppm). The average value of Cu concentration in wheat straw of the zone was 4.45 ppm. Concentrations of Cu, varied from 3.82 to 5.03 ppm. The average value of Cu content was highest (4.95 ppm) in Jhajjar district and the lowest (4.03 ppm) in Mewat district. Considering 8 ppm as critical limit, all the samples were Cu deficient in the districts. The average Fe content of the zone was 151.18 ppm which ranged from 139.72 to 159.81 ppm. Considering 50 ppm as critical limit, none of the samples were deficient. The concentration of Mn (ppm) in wheat straw ranged from 25.64 to 34.53 ppm average value of 29.69 in the zone. The average Mn concentration ranged from 27.39 (Mewat) to 32.95 ppm (Jhajjar). All the samples contained Mn below critical value (40 ppm).

Study conducted by Garg *et al.* (2008) <sup>[8]</sup> reported that the mean Ca content in straws was 0.34% and P level was 0.10% in Bharatpur district of Rajasthan. Gami *et al.* (2013) <sup>[6]</sup> also conducted survey in Dantiwada taluka in North Gujarat region and reported that dry roughages were poor source of phosphorus. According to Maan (2000) <sup>[10]</sup>, the mean Ca and P content of wheat straw was 0.23% and 0.09, respectively in Bhiwani district.

Farmers of the zone were also using rice straw and bajra kadbi as dry roughage. Mineral composition of rice straw and bajra kadbi has been depicted in Table 2 and Table 3. The Ca

content in rice straw ranged from 0.10 to 0.15 while in case of bajra kadbi it is 0.19 to 0.34%. Rice straw and bajra kadbi average Ca was 0.13 and 0.23% respectively. Most of the samples of rice straw and bajra kadbi were deficit (%) heavy values critical level below of 0.30%.

The concentration of P in rice straw ranged from 0.11 to 0.23% with an value of 0.13 while in case of bajra kadbi ranged from 0.05 to 0.15 with average 0.10. Rice straw and bajra kadbi provided less of P than critical level of 0.25. The average value of Zn concentration in rice straw and bajra kadbi were 11.14 ppm and 21.25 ppm respectively. Thus, rice straw and bajra kadbi were poor in Zn content and all samples were deficient in Zn from its critical level of 30ppm. The average value of Cu concentration in rice straw was 1.24 ppm and in bajra kadbi it was 4.53 ppm. Considering 8 ppm as critical limit, all the samples of rice straw and bajra kadbi were deficient in Cu in the zone. The average value of Fe concentration in rice straw and bajra kadbi were 185.79 ppm and 133.45 ppm respectively. Considering 50 ppm as critical limit, none of the samples were deficient in the zone. The average value of Mn concentration in rice straw and bajra kadbi were 33.87 ppm and 28.10 ppm respectively. Most of the samples of rice straw and bajra kadbi were deficit in Mn content from critical limit of 40 ppm.

Above results were in alignment with Mandal *et al.* (1996) <sup>[11]</sup> who reported that the mean Cu content in wheat straw was 3.56 mg/kg which might be due to deficiency of Cu in soil. Dry roughages are mostly deficient in Cu because in most circumstances Cu concentration declines as plant mature (McDowell, 1985) <sup>[18]</sup>. He also reported that the mean Zn content in wheat straw was 18.25 mg/kg and the mean Fe content in wheat straw was 377.8 mg/kg while the mean Mn content was 59.50 mg/kg in Mahendragarh district of Haryana state. Similarly Garg *et al.* (2011) <sup>[7]</sup> in their survey conducted in Amritsar, Ludhiana and Patiala districts of Punjab reported that the mean copper (Cu) content was low in straws (4.46 ppm). Further, Zn mean values of our study was in same pattern of Singh (1977) <sup>[16]</sup> who observed that the Zn content in wheat straw varied from 16.34 to 24.75 mg/kg.

According to Rajora and Pachauri (1993) <sup>[13]</sup> the Zn content in Tarai region in fodder ranged from 15.84 to 30.22 mg/kg at three livestock farms and revealed that there were Zn deficiency in 33% fodder samples of Prag livestock farm and 50% samples of Livestock Research Centre. Lall *et al.* (1996) <sup>[9]</sup> found that the mean Zn content in wheat straw was 23.05mg/kg in Hisar district. Above results are also supported by Dhore *et al.* (2007) <sup>[5]</sup> who reported that the mean value of Zn in feed and fodders was less than 25.06 ppm in Western Agro Climatic Zone of Vidarbha. Bhanderi *et al.* (2013) <sup>[4]</sup> also reported that dry roughages were good source of Mn (47.88 ppm). According to Maan (2000) <sup>[10]</sup>, the mean Cu content of wheat straw ranged from 0.00 to 3.13 ppm. The mean Zn content of wheat straw was 23.92 ppm which ranged from 10.66 to 34.69 ppm. He also revealed that the Fe content of wheat straw ranged from 88.01 to 277.37 ppm while mean Mn content of wheat straw was 38.25 ppm which ranged from 10.10 to 57.22 ppm. Baloda (2016) <sup>[3]</sup> in his study found that in wheat straw, Cu content ranged from 5.88-9.48 ppm, Zn content ranged from 12.56-27.72 ppm, Fe content ranged from 207.33-247.18 ppm and Mn content ranged from 36.89-54.04 ppm in Gurugram district.

**Table 1:** Mineral composition of wheat straw in different districts of raya-pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	68	0.21±0.01	0.05±0.02	18.98±0.45	4.27±0.41	153.40±3.14	28.36±0.59
Jhajjar	70	0.22±0.01	0.06±0.02	19.84±0.36	4.95±0.17	145.29±2.19	32.95±0.65
Gurugram	36	0.21±0.03	0.06±0.02	19.52±0.40	4.63±0.19	152.48±3.75	30.31±0.84
Mewat	75	0.20±0.02	0.05±0.01	18.54±0.40	4.03±0.28	154.24±2.62	27.39±0.62
Mahendragarh	88	0.20±0.01	0.05±0.01	18.77±0.33	4.10±0.27	153.19±2.20	27.97±0.66
Bhiwani	77	0.21±0.01	0.06±0.02	19.24±0.42	4.48±0.19	152.15±3.34	29.62±0.81
Charkhi dadri	40	0.22±0.01	0.06±0.01	19.76±0.28	4.69±0.30	147.55±3.61	31.29±0.77
Mean		0.21±0.01	0.06±0.02	19.23±0.34	4.45±0.13	151.18±1.68	29.69±0.39
Range		0.18-0.24	0.03-0.12	17.89-21.43	3.82-5.03	139.72-159.81	25.64-34.53
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

\*McDowell (1993)<sup>[12]</sup>**Table 2:** Mineral composition of rice straw in different districts of raya-pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	6	0.13±0.01	0.13±0.01	11.12±0.38	1.24±0.07	185.37±13.62	33.71±1.09
Gurugram	14	0.14±0.01	0.14±0.02	11.96±0.45	1.26±0.05	184.14±13.52	35.31±0.88
Mewat	13	0.12±0.02	0.12±0.01	09.28±0.30	1.19±0.04	197.56±12.11	31.59±2.03
Mahendragarh	10	0.13±0.01	0.12±0.01	10.36±0.40	1.21±0.08	191.56±24.11	32.46±2.42
Bhiwani	8	0.13±0.02	0.13±0.02	11.25±0.57	1.26±0.04	185.24±12.89	34.95±1.29
Charkhi dadri	9	0.14±0.01	0.14±0.02	12.85±0.48	1.28±0.09	170.86±13.53	35.18±0.99
Mean		0.13±0.01	0.13±0.01	11.14±0.27	1.24±0.03	185.79±04.92	33.87±0.41
Range		0.10-0.15	0.11-0.23	08.93-13.54	1.17-1.31	168.36-232.54	29.46-37.83
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

\*McDowell (1993)<sup>[12]</sup>**Table 3:** Mineral composition of bajra kadbi in different districts of raya-pearl millet growing zone

	n	Ca (%)	P (%)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
Rewari	4	0.29±0.01	0.11±0.01	22.36±0.30	4.52±0.48	131.36±23.57	29.63±0.82
Jhajjar	3	0.26±0.02	0.10±0.02	22.19±0.26	5.43±0.45	133.63±36.38	29.24±0.72
Gurugram	3	0.28±0.02	0.11±0.02	21.71±0.26	4.71±0.46	133.24±35.43	25.24±0.88
Mewat	2	0.25±0.02	0.09±0.01	19.16±0.25	3.69±0.50	135.67±27.38	22.37±0.83
Mahendragarh	1	0.26±0.01	0.10±0.01	20.62±0.27	4.46±0.39	134.67±31.48	31.94±0.74
Bhiwani	1	0.30±0.01	0.10±0.02	21.47±0.47	4.38±0.57	132.12±30.59	30.21±0.82
Mean		0.23±0.01	0.10±0.02	21.25±0.14	4.53±0.21	133.45±18.53	28.10±0.31
Range		0.19-0.34	0.05-0.15	16.06-28.03	2.85-6.53	127.08-138.94	20.01-32.96
Critical level*		<0.30	<0.25	<30.0	<8.0	<50.0	<40.0

\*McDowell (1993)<sup>[12]</sup>

## Conclusion

Among dry roughages, wheat straw was most preferred feed as dry roughage followed by rice straw and bajra kadbi and mineral estimation of dry roughages revealed that all three dry roughages i.e. wheat straw, paddy straw and bajra kadbi were deficient in all the minerals except Fe.

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