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Macro and micro-mineral profile of different dry and green fodder samples in Meerut district of Uttar Pradesh

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Abstract
A study was conducted to find out the macro and micro-minerals status in of different dry and green fodder farm condition in Meerut district of Uttar Pradesh. Total five types of crop residues and fodder samples were collected. For estimation of copper (Cu), zinc (Zn) and manganese (Mn), 2.0 g of each samples was digested with the help of tri-acid mixture (nitric acid: sulphuric acid: perchloric acid in ratio of 3:1:1). It was observed that the highest Ca concentration was present in sorghum fodder followed by maize fodder while lowest was found in wheat straw samples. The phosphorus concentration varied from 0.14 to 0.43 % Sorghum fodder was found the richest. Copper concentration varied a lot among sample as the range varied from 3.92 to 19.46 ppm. The richest Cu source was found to be maize fodder. Zinc concentration varied from 14 to 56.30 ppm and manganese varied from 12.70 to 44.09 ppm. Based on observations, it was inferred that calcium content was found sufficient except in wheat straw and sugarcane top. This may be due to presence of oxalate which binds with calcium. Phosphorus content was also low in wheat straw, sugarcane top and bajra fodder. Cu and Zn content was also found in wheat straw, sugarcane top and bajra fodder. Mn was found deficient in almost all the samples. It may be concluded from the above experimentation that most of the greens and crop residue samples at this region are deficient in micro minerals like copper, zinc and manganese. Phosphorus was also found deficient. Thus animals are required to be supplemented with mineral mixture fortified with phosphorus, copper, zinc and manganese to maintain high productivity.

Keywords: Dry fodder, green fodder, Macro-micro minerals

Introduction
In spite of a large cattle population, milk production per animal is low due to poor individual productivity, which is attributed to malnourishment and mineral deficiency (Sharma *et al*., 2003) [7]. Productive animals in rural areas largely depend upon grazing and crop residues and a little extent on supplemented concentrates to fulfill their nutritional requirements. These resources rarely provide all the needed mineral requirements of dairy animals (McDowell, 1985) [4]. Animals obtained minerals through the consumption of natural feeds, fodders and supplementation of inorganic salts in the ration. Mineral deficiencies and imbalances have long been held responsible for low production among cattle and buffaloes fed on crop residues in tropical agro-climatic condition. Meerut district of Uttar Pradesh is considered one of the best milk producing areas in India. A good quality of germ-plasm of both cattle and buffalo are present here. It is believed to produce more milk than present production. One of the reasons may be the deficiency of mineral matter in their feed. Taking into consideration of above constrains, an experiment was conducted with following to estimate the mineral status of locally available crop residue and green fodder samples in Meerut district of Uttar Pradesh.

Materials and Methods
The crop residues and fodder samples were collected from SVPUAT university farms, different organized dairy farms and villages of Meerut district. Total five types of crop residues and fodder samples were collected which are commonly fed to dairy animals in this

district. The sampling was done in triplicate for each crop from each farm plot. Among them thirty different samples of sorghum fodder, thirty three samples of maize fodder, twenty four sugarcane top samples, forty five bajra fodder samples and thirty wheat straw samples were collected.

All the samples were dried overnight at hot air oven and ground into powder before stored in air tight packet. For estimation of copper (Cu), Zinc (Zn) and Manganese (Mn), 2.0 g of each samples was digested with the help of tri-acid mixture (nitric acid: sulphuric acid: perchloric acid in ratio of 3:1:1). After that volume of each sample was made by volumetric flask and stored for further analysis. Standards of Cu, Zn and Mn were prepared by using their salt taking into consideration of purity. Copper, zinc and manganese concentration were estimated with the help of Atomic Absorption Spectrometer by using flame techniques. Calcium (Ca) and Phosphorus (P) concentration of different samples were estimated by traditional method (Talapatra *et al*., 1940) [9]. Standard statistical method was applied to calculate the average value of each mineral concentration (Snedecor and Cochran, 1994) [8].

Result and Discussion

The average concentrations of Ca, P, Cu, Zn and Mn are given below in Table 1. It was observed that the highest Ca concentration was present in sorghum fodder followed by maize fodder. The lowest was found in wheat straw samples. The phosphorus concentration varied from 0.14 to 0.43 %. Sorghum fodder was found the richest. Copper concentration varied a lot among sample as the range varied from 3.92 to 19.46 ppm (Figure 1 & 2). The richest Cu source was found to be maize fodder. Zinc concentration varied from 14 to 56.30 ppm and manganese varied from 12.70 to 44.09 ppm.

Table 1: Average values of macro- micro mineral status of different fodders and crop residue

Ingredients	Ca%	P%	Cu (ppm)	Zn (ppm)	Mn (ppm)
Wheat Straw	0.27 ± 0.01	0.14 ± 0.02	3.92 ± 0.34	14.00 ± 1.34	15.00 ± 1.09
Maize fodder	0.46 ± 0.01	0.36 ± 0.01	19.46 ± 0.67	44.56 ± 1.96	12.70 ± 1.90
Bajra fodder	0.39 ± 0.02	0.18 ± 0.01	6.39 ± 0.69	17.23 ± 1.33	34.09 ± 2.29
Sugarcane top	0.29 ± 0.04	0.14 ± 0.01	5.30 ± 0.47	28.60 ± 1.86	38.56 ± 2.45
Sorghum fodder	0.48 ± 0.01	0.43 ± 0.02	8.39 ± 0.55	56.30 ± 1.98	22.80 ± 1.76
Critical levels*	0.30	0.25	8.00	30.00	40.00

*Concentrations below which are considered deficient (McDowall, 1985; Blood *et al.*, 1983; Underwood, 1977) [4, 1, 10].

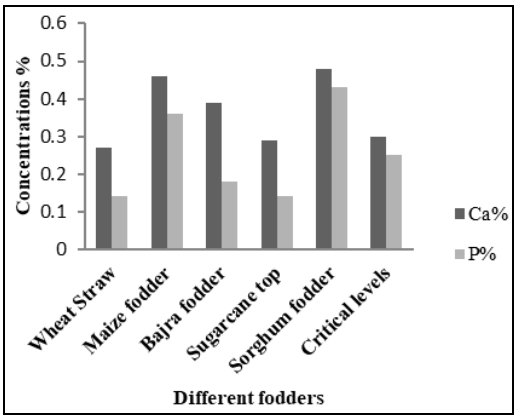

Fig 1: Calcium and phosphorus concentration (%) along with their critical value

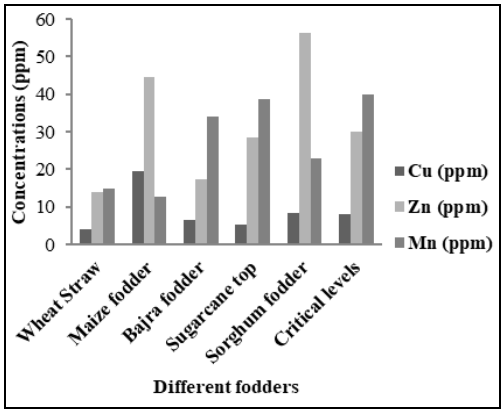

Fig 2: Copper, zinc and manganese concentration (ppm) along with their critical value

Based on above observations, it was inferred that calcium content was found sufficient except wheat straw and sugarcane top. This may be due to presence of oxalate which binds with calcium. Phosphorus content was also low in wheat straw, sugarcane top and bajra fodder. P deficiency in straw might be due to its low absorption as its availability to plants is controlled mainly by soil pH, soluble Al, Fe and Ca and organic matter content (Sefidkoohi and Sepanlou, 2013) [5]. Cu and Zn content was also found in wheat straw, sugarcane top and bajra fodder. Similar to our findings, Cu content in most of the feeds and fodders was found below critical level of 8 ppm (Cuesta *et al*., 1993) [2] hence its supplementation inthe ration of animals is essential. Cu deficiency in feeds and fodder was reported in West Bengal (Das *et al.*, 2003) [3] and in hilly region of Garhwal division of Uttarakhand (Sharma and Joshi, 2004) [6]. Mn was found deficient in almost all the samples.

Conclusions

It may be concluded from the above experimentation that most of the greens and crop residue samples at this region are deficient in micro minerals like copper, zinc and manganese. These minerals are required in animal body for most of the metabolic activities as part of co-enzymes. They also play crucial role in reproductive and productive traits. Phosphorus was also found deficient. Thus animals are required to be supplemented with mineral mixture fortified with phosphorus, copper, zinc and manganese to maintain high productivity.

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