AVAILABLE MICRONUTRIENT STATUS IN SOILS OF GOGUNDA TEHSIL, UDAIPUR DISTRICT (ZONE IV- a) OF RAJASTHAN.

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Abstract : A study was carried out to assess the micronutrient status of soils of the Gogunda Tehsil, Udaipur district (Zone IV-a) of Rajasthan. The EC of soils ranged from 0.05 to 2.0 dSm^{-1} and OC varied from 0.40 to 21.0 g kg^{-1}. The pH of soils ranged from 6.5 to 9.20. $CaCO_3$ content ranged from 0.2 to 41.0 g kg^{-1}. The available Fe, Zn, Cu, and Mn ranged from 1.25 to 15.25, 0.25 to 12.42, 0.50 to 7.05 and 2.14 to 112.95 mg kg^{-1} respectively.

Keywords : Fertility Status, Micronutrients, Correlation, Critical limit

INTRODUCTION

Micronutrients have an important role in increasing the productivity and quality of crops. Their availability in soil is dependent on parent material, landform, climatic condition, natural vegetation and land use pattern (Deka *et al.* 1996). The study on the availability of micronutrient cations in the soils is helpful in understanding the inherent capacity of soils to supply these nutrients to crops and their movement in the soils. The improper nutrient management has led to emergence of multinutrient deficiencies in the Indian soils (Sharma 2008). The uptake of micronutrients is influenced by the presence of major nutrients. High phosphate content of soil may also reduce the uptake of micronutrients. An inventry of the available micronutrient status of the soils help in demarcating areas for application of a particular nutrient for profitable crop production.

Keeping in view the close relationship between soil properties and available zinc, iron, copper and manganese the present study was undertaken to analysis the influence of soil properties on the availability of zinc and iron for better land use management of soils of Gogunda block, Udaipur district of Rajasthan as information available on these soil is rather scanty and scattered.

MATERIAL AND METHOD

The study area Gogunda Tehsil of Udaipur district is located in southern plain (Zone IV-a) of Rajasthan. 150 composite surface soil samples were collected randomly from 25 villages representing the area. The samples were air dried and passed through 2 mm sieve and analysed for physico-chemical properties. Soil pH was measured in 1:2 soil water suspension using glass electrode pH meter. Electrical conductivity was measured in 1:2 soil water supernatant solution with the help of conductivity bridge (Jackson, 1973). The organic carbon was determined by rapid titration method (Walkley and Black, 1934) and $CaCO_3$ by rapid titration method (Puri 1930). The available Zn and Fe in soil samples were extracted with DTPA (0.005 *M* DTPA + 0.01 *M* $CaCl_2$ + 0.1 M TEA, pH 7.3) as per the method described by Lindsay and Norvell (1978) and the concentration of Cu and Mn in the DTPA-extract was determined using atomic absorption spectrophotometer.

RESULT AND DISCUSSION

Physico-chemical properties

The soils studied varied widely with regard to texture, reaction, soluble salts and $CaCO_3$. Out of the 150 soil samples 4 samples fall in the category of sandy clay loam, 26 in loamy sand, 5 in clay loam, 19 in loam, 94 in sandy loam and 2 in clayey textural classes. The soils were alkaline in reaction (pH 6.5 to 9.20). Electrical conductivity (EC) varied from 0.05 to 2.0 dSm^{-1} with a mean value of 0.35 dSm^{-1}. On the basis of limits given by Muhr *et al.*, (1963) 140 soil samples fall into the category of normal soils and 10 soil samples contained soluble salts critical for seed germination. Organic carbon ranged between 0.40 to 21.0 g kg^{-1} with a mean value of 8.3 g kg^{-1} in soils. It was found to be medium to high in the soils because of the continuous application of FYM and sufficient amount of plant residues left in the fields. The calcium carbonate varied from 0.20 to 41.0 g kg^{-1} with a mean value of 10.3 g kg^{-1} soil. The variation in $CaCO_3$ content is due to the difference in the type of parent material from which these soils have been formed.

Available micronutrients

Available zinc content ranged from 0.25 to 12.42 mg kg^{-1} with a mean value of 1.39 mg kg^{-1} soils (Table 1). Considering 0.6 mg kg^{-1} as the critical limit given by Singh *et al.* (2003), 24 per cent samples were found to be deficient (<0.6 mg kg^{-1}), 42.67 per cent samples were marginal (0.6 to 1.2 mg kg^{-1}) and 33.33 per cent samples fall in the category of sufficient (>1.2 mg kg^{-1}). These results indicate that most of the samples appeared marginal to sufficient in available zinc. Available copper ranged between 0.50 to 7.05 mg kg^{-1} with a mean value of 2.64 mg kg^{-1}. Considering 0.4 mg kg^{-1} as the critical limit given by Singh *et al.* (2003), all the samples were found sufficient to adequate in available copper.

Available iron in soils ranged from 1.25 to 15.25 mg kg^{-1}.with a mean value of 4.97 mg kg^{-1} (Table 1). The critical limit as suggested by Lindsay and Norvell (1978) is 4.5 mg kg^{-1} for iron. Based on this limit 44 per cent samples were grouped as below the critical limit. Deficiency of iron in these soils may be due to use of high amount of chemical fertilizer and intensive agricultural practices. Available manganese ranged from 2.14 to 112.95 mg kg^{-1} with a mean value of 14.26 mg kg^{-1}. Singh *et al*, (2003) suggested 4.0 mg kg^{-1} as critical limit and accordingly only 4.66 per cent samples were found below the critical limit. Sufficient amount of Mn in soils was due to the presence of Mn containing minerals.

Correlation studies

Data presented in table 2 showed that there was positively correlation between available Zn and OC (r = 0.271**). Addition of organic matter improves the soil structure and acts as chelating agent which increases the availability of Zn (Sharma *et al.* 2003). There was a negative correlation (r = - 0.109*) between soil pH and available zinc. As the pH of soil increases it reduces the availability of zinc. There was a negative correlation between $CaCO_3$ (r = - 0.060) and available zinc. Silt was positively correlated (r = 0.060) with available zinc. Available Cu was positively correlated with OC (r = 0.069), whereas negatively correlated with $CaCO_3$ (r = - 0.030) and it was positively correlated (r = 0.040) with clay. Available Fe increased with increase in OC (r = 0.097), where as it decreased with increase in $CaCO_3$ (r = - 0.090) and silt (r = - 0.052). Available Mn was positively correlated with OC (r = 0.083) and negatively correlated with $CaCO_3$ (r = - 0.057)

Table 1: Physico-chemical properties and nutrient status of soils.

Soil Characteristics	Range	Mean
pH	6.5 - 9.20	8.34
EC (dSm^{-1})	0.05 - 2.0	0.35
$CaCO_3$ (g kg^{-1})	0.20 - 41.0	10.3
OC (g kg^{-1})	0.40 - 21.0	8.3
Fe (mg kg^{-1})	1.25-15.25	4.97
Zn (mg kg^{-1})	0.25-12.42	1.39
Mn (mg kg^{-1})	2.14-112.95	14.26
Cu (mg kg^{-1})	0.50 – 7.05	2.64

Table 2 : Correlation matrix between soil properties and available nutrients in soils.

Soil Characteristics	Fe	Mn	Zn	Cu
pH	-0.050	-0.119	-0.109	-0.002
OC	0.097	0.083	0.271**	0.069
CaCO3	-0.090	-0.057	-0.060	-0.030
Silt	-0.052	0.034	0.060	0.082
Clay	0.074	0.002	0.050	0.040

**Significant at 5%, *Significant at 1%

CONCLUSION

A large variation in the content of available cationic micronutrients in the soils of study area suggests that specific recommendation regarding nutrients need of crops even from soils of the same village can be given after soil testing. Indiscriminate use of phosphatic fertilizers may result into reduced availability of Zn and Fe as a majority of soils are low to marginal with respect to these cationic micronutrients.

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