

## Extractable Micronutrient Status of Some Chickpea (*Cicer Arie tinum* L.) Growing Soils (Typic Ustorthent) of Haryana

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Chickpea is the most important food legume of the Haryana state and contributes to 96 and 17.6% of the total pulse production of the state and the country, respectively (Singh 1985). A survey was conducted in chickpea growing soils of Haryana state to assess the available micronutrient status to determine the application need and to examine the effect of some soil properties on their availability.

One hundred and seventy five soil (Typic Ustorthent) samples (0- 20 cm) were collected from chickpea growing area covering Sirsa and Hisar districts of Haryana. Soil samples were analysed for pH, EC<sub>2</sub>, CaCO<sub>3</sub> and organic carbon content following standard procedures. The available Zn, Cu, Mn and Fe in soils were extracted with DTPA (Lindsay & Norvell 1978).

The soils were alkaline in reaction (pH 7.3 to 9.3), low in soluble salts (EC<sub>2</sub> 0.9 to 0.98 dS m<sup>-1</sup>), Organic C (0.05 to 1.3%) and CaCO<sub>3</sub> content (traces to 4.5%). The texture varied from sand to clay loam.

Zinc content which varied between 0.12 to 2.08 ppm with a mean value of 0.29 ppm, is in range of alluvial soils of Haryana (Singh & Gupta 1986 a). Taking the critical limit of 0.48 ppm DTPA-Zn (Singh & Gupta 1986 b), about 78% of the soils fall in the category of low Zn status and would require Zn fertilization for improvement in chickpea production. Multiple regression equation i.e. Soil Zn = 74.06 - 0.08 pH + 0.03 EC + 0.01 CaCO<sub>3</sub> + 0.46 Org. C\*\* showed that 24 % variations were due to the influence of pH, EC, CaCO<sub>3</sub> and organic C content. However, partial regression coefficients showed significant contribution of organic C towards available Zn as also evident by

significant correlation ( $r = 0.47^{**}$ ). Singh et. al (1991) also reported the dominant role of Organic C in the distribution of available Zn.

Extractable Cu which ranged between 0.2 to 3.7 with a mean value of 0.82 ppm seemed to be quite sufficient to meet the crop requirement taking critical level of 0.20 ppm (Lindsay & Norvell 1978). Extractable Cu showed negative relationship with pH ( $r = -0.36^{**}$ ) and positive with organic C content ( $r = 0.64^{**}$ ). The multiple regression equation i.e. Soil Cu = 501.45 - 0.60 pH\* + 0.11 EC + 0.08 CaCO<sub>3</sub> + 2.18 Org. C\*\* showed that 45% variation in extractable Cu was due to the integrated effect of all the soil properties. The partial regression co-efficient however indicate the dominant influence of organic C content and soil pH.

The DTPA-Mn varied between 1.68 and 20.0 ppm with an average of 4.56 ppm does not seem to be problematic taking a critical limit of 2.9 ppm (Bansal & Nayyar 1989). Co-efficient of correlation indicated that the variation in Mn status has resulted by the variations in pH ( $r = 0.30^{**}$ ), organic C ( $r = 0.50^{**}$ ) and CaCO<sub>3</sub> ( $r = 0.53^{*}$ ), in soils. The coefficient of multiple correlation in regression equation i.e. Soil Mn = 8853.7 - 10.4 pH - 2.1 EC + 5.7 CaCO<sub>3</sub> + 21.8 Org.C\*\* indicated that 49% variation in DTPA-Mn was due to the influence of pH, EC, CaCO<sub>3</sub> and organic C content. However, partial regression coefficients suggests that pH, CaCO<sub>3</sub> and organic C control the extractable Mn in these soils.

Extractable Fe varied from 0.87 to 26.95 ppm with an average value of 7.11 ppm. Considering 2.0 ppm DTPA Fe as critical level (Takkur & Randhawa 1978), about 49% samples are deficient

Table 1 Available micronutrients  $\mu\text{g g}^{-1}$  in relation to organic C content and pH

Soil property	No. of samples	Zn	Cu	Mn	Fe
<b>Organic C(%)</b>					
< 0.25	28	0.12-0.72 (0.29)*	0.2-1.0 (0.6)	1.89-6.93 (3.7)	0.87-3.50 (1.4)
0.25-0.50	63	0.12-0.88 (0.32)	0.3-3.7 (0.9)	1.89-9.24 (5.1)	0.87-16.80 (2.5)
> 0.50	84	0.16-2.08 (0.54)	0.4-2.8 (1.3)	1.68-200. (6.0)	1.22-26.95 (3.6)
<b>pH</b>					
< 8.0	19	0.16-0.88 (0.33)	0.6-2.3 (1.1)	3.57-20.00 (8.0)	1.57-11.37 (4.1)
8.0-8.5	132	0.12-2.08 (0.29)	0.3-3.7 (0.9)	1.68-14.70 (4.8)	0.87-26.95 (3.2)
> 8.5	24	0.12-0.64 (0.27)	0.2-2.2 (0.7)	1.89-7.35 (3.8)	1.05-8.75 (3.0)

\* Mean values in parenthesis.

and Fe deficiency may become a serious impediment in crop production. Significant correlation with organic C ( $r=0.56^{**}$ ) pH ( $r=0.29^{**}$ ) and  $\text{CaCO}_3$  ( $r=0.16^*$ ) suggest that these soil properties largely influence the Fe status in these soils. The regression equation i.e. soil Fe =  $4805.1 - 5.7\text{pH}^* - 0.6 \text{ EC} + 0.7 \text{ CaCO}_3 + 18.3 \text{ Organic c}^{**}$  showed that 33% variability was due to the combined effect of pH, EC,  $\text{CaCO}_3$  and organic C content.

Mean values of extractable Zn, Cu, Mn and Fe increased with an increase in soil organic C content (Table 1) and significant relationship between extractable micronutrients and organic C suggest that augmentation of micronutrient availability in majority of chickpea growing soils (low in organic matter) is possible by raising their organic matter content. Therefore, addition of bulky organic manure, green manure and compost is suggested.

Mean values of extractable Zn, Cu, Mn and Fe decreased as soil pH increased from 8.0 to above 8.5 (Table 1). The negative relationship between micronutrients and soil pH supports micronutrient deficiencies in alkaline soils.

#### References

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