

## Dynamics of copper fractions in the LTFE's soils

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### ABSTRACT

The dynamics of Cu fractions in the selective treatments were studied by collecting the surface soil samples (0-15 cm) from the LTFE's conducted on groundnut-wheat-fodder sorghum at Instructional Farm, Junagadh Agril. University, Junagadh during the year 1979-80 (1st year), 1989-90 (10th year) and 1999-2000 (20th year) after completion of crop cycle. The selected treatments were T<sub>1</sub>- Control, T<sub>2</sub>-FYM @ 25 t/ha at an interval of 3 years, T<sub>3</sub>- 1/2 RD of NP, T<sub>4</sub>-1/2 RD of NP+K, T<sub>5</sub>- RD of NP and T<sub>6</sub>-RD of NP+K to respective crops. The water soluble-Cu varied significantly in pooled results and the highest values were recorded in T<sub>5</sub> (0.119 ppm) followed by T<sub>4</sub> (0.115 ppm). Exchangeable form of Cu did not differ significantly during individual years and in pooled results. The RD of fertilizers + potassium (T<sub>6</sub>) recorded the highest value of DTPA-Cu at initial and 10th year and triggering utilization in long run rendering lower value at 20th year. Reducible-Cu was not affected significantly in pooled results, but untreated control (T<sub>1</sub>) recorded the highest value (0.269 ppm) at 20th year. Total and residual form of Cu content remain unaffected by different treatments during individual years and in pooled results, however, there was distinct numerical reduction in total and residual form of Cu over the year. Application of fertilizers enhanced utilization of available total-Cu, while conversion of total to available form and under utilization in T<sub>1</sub> (1.907 ppm) and T<sub>2</sub> (1.947 ppm) resulted in higher values after 20th year. The per cent availability of Cu content increased from initial to 20th year crop cycles in untreated control (T<sub>1</sub>) and FYM (T<sub>2</sub>) treatments.

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**Key words :** LTFE's soil, Cu fraction, Water soluble-Cu, Exchangeable-Cu, DTPA available-Cu, Total-Cu, Per cent available-Cu

Copper is tightly held on the soil exchangeable complex. The major factors which are important in transformation of Cu are soil pH, CaCO<sub>3</sub>, organic matter and clay content. Even the nature of clay minerals and presence of oxides of Fe and Al are important in regulating the behavior of Cu in soil. The Cu is held in soil by other than the usual cationic forces. Even extremely insoluble compounds show some availability of Cu. The water soluble and exchangeable forms are of course, assumed to be readily available, but other forms of micronutrients when sufficient in their activity becomes important in the nutrition of crop plants (Tandon, 1991). Therefore, there is a need to study the dynamics of different forms of Cu in intensive agriculture on long run basis present investigation was carried out.

### MATERIALS AND METHODS

Surface soil samples (0-15 cm) were collected from the selective treatments of the LTFE's conducted on groundnut-wheat-fodder sorghum in RBD at Instructional Farm, Junagadh Agricultural University, Junagadh during the year 1979-80 (1st year), 1989-90 (10th year) and 1999-2000 (20th year) after completion of crop cycle. The treatment selected were T<sub>1</sub>-Control, T<sub>2</sub>-FYM @ 25 t/ha at an interval of 3 years. T<sub>3</sub>- 1/2 RD of NP, T<sub>4</sub>- 1/2 RD of NP + K, T<sub>5</sub>- RD of NP and T<sub>6</sub>- RD of NP + K. These

soil samples were sequentially extracted for different Cu fractions as per the procedure described by Jackson (1973) and Viets (1962) as water soluble, exchangeable, DTPA available, and reducible form. Total Cu status was determined by digesting the soil using HF: HClO<sub>4</sub> (5: 1). These extracts were analyzed for their Cu content on Atomic Absorption Spectrophotometer. Residual form of Cu was calculated by deducting water soluble + exchangeable + DTPA available + reducible (*i.e.* available total) from the total Cu status of the soil. The per cent available Cu status was calculated as available total of the total Cu status of the soil.

### RESULTS AND DISCUSSION

#### *Cu-water soluble:*

The data presented in Table 1 showed that water soluble Cu varied significantly among different treatments when pooled over years. The highest value was recorded in T<sub>5</sub> (0.119 ppm) followed by T<sub>4</sub> (0.115 ppm) and T<sub>2</sub> (0.113 ppm).

#### *Cu -exchangeable:*

Exchangeable form of Cu did not show any significant difference due to treatments either in individual years or in the pooled one. Hence, the particular form remained stable over a long term of 10 and 20 years (Table 1).