

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

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### ABSTRACT

Surfaces soil samples (0-15 cm) were collected to study the dynamics of Zn fractions in the selective treatments of the LTFE's conducted on groundnut-wheat-fodder sorghum at Instructional Farm, Junagadh Agricultural University, Junagadh during the year 1979-80 (15th 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>1</sub>-FYM @ 25t/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 Zn was present in negligible quantity. Exchangeable forms of Zn differed significantly only at 20th year and also in pooled over years. Potassium enhanced the utilization of exchangeable form of Zn. The RD of fertilizers recorded the highest value of DTPA-Zn at initial and 10th year and triggering utilization in long run thereby rendering differences non significant at 20th year. Total Zn content did not differ significantly, while residual form of Zn was found significantly highest in T<sub>3</sub> (38.171 ppm). The total available-Zn and Zn-per cent availability were not influenced significantly by different treatments in pooled results, but Y x T interactions were found significant and the highest values were recorded in T<sub>1</sub>- (3.648 ppm) and T<sub>2</sub> (3.559 ppm), respectively after 20th year crop cycle.

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**Z**inc in soils exists in several 10rms (Katyai and Deb, 1982) such as water soluble. exchangeable, complexed, organically bound and acid soluble. Out of these forms. Water soluble, exchangeable and complexed forms are readily available to plants, whereas Zn associated with oxides and other primary/secondary minerals is relatively unavailable (Mandal and Mandal, 1986). The significant and positive correlations among different pools of soil 7,11 pointed to the existence of a dynamic equilibrium among the various forms of soil Zn (Randhawa and Singh, 1995). In order to study the dynamics of various forms of Zn 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 Zn fractions as per the procedure described by Jackson (1973) and Viets (1962) as water soluble, exchangeable, DTPA available, and reducible form. Total Zn status was determined by digesting the soil using HF: HClO<sub>4</sub> (5: 1).

These extracts were analyzed for their Zn content on Atomic Absorption Spectrophotometer. Residual form of Zn was calculated by deducting water soluble + exchangeable + DTPA available + reducible (*i.e.* available total) from the total Zn status of the soil. The per cent available Zn status was calculated as available total of the total Zn status of the soil.

### RESULTS AND DISCUSSION

#### **Zn-water soluble:**

The water soluble Zn was represented in negligible quantity and did not record an significant change among treatments (Table 1).

#### **Zn -exchangeable:**

Exchangeable form of Zn differed significantly only at 20th year and also when pooled over years (Table 1). Potassium application appeared to enhance the utilization of exchangeable form of Zn as evident from the respective lower values in the treatment T<sub>4</sub> (0.197 ppm) and T<sub>6</sub> (0.271 ppm) as compared to T<sub>5</sub> (0.333 ppm) and T<sub>3</sub> (0.257 ppm).

#### **Zn-DTPA available:**

The DTPA available form of Zn did not show any significant differences after a long term of 20 year and also in pooled data (Table 1) The Y x T interaction was found significant and the highest values were recorded in T<sub>6</sub> (2.413 ppm) after 10 years followed by T<sub>2</sub> (2.036 ppm)