

Dynamics of manganese fractions in the LTFE's soils

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ABSTRACT

Surfaces soil samples (0-15 cm) were collected to study the dynamics of Mn 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 (1st year), 1989-90 (10th year) and 1999-2000 (20th year) after completion of crop cycle. The selected treatments were T_1 -Control, T_2 -FYM @ 25t/ha at an interval of 3 years, T_3 -1/2 RD of NP, T_4 -1/2 RD of NP + K, T_5 -RD of NP and T_6 -RD of NP+K to respective crops. The water soluble Mn was found very trace. Exchangeable form of Mn differs significantly only at 1st year and after 20th year only. Remarkable decreased in exchangeable form of Mn was noticed in treatments without application of chemical fertilizers after 20th year. The control and FYM application recorded the highest values of DTPA-Mn at 1st and 20th year, and it was recorded highest (7.241 ppm) at 10th year in treatment T_6 . Overall increase in reducible form of Mn was found, but it was non significant when pooled over year. Overall mean registered an increase in total Mn content on the long run basis. After 20th year residual Mn decline in T_1 whereas in other treatments. it was declined at 10th and increased at 20th year. Per cent available of Mn increased up to 10th year and then it was decreased. There was overall increase in total available form of Mn after a long run.

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Key words : Mn fraction, water soluble-Mn, Exchangeable-Mn, DTPA-Mn, Total available-Mn, LTFE'S soil

Manganese play an important role in the photosynthesis and detoxification of superoxide free radicals. It is an integral component of water splitting enzyme associated with photosynthesis-II. Medium black soils of Saurashtra region derived from trap basalt, sand stone and lime stone under semi-arid climate have unique properties of calcareousness which affect the physico-chemical properties, nutrient availability and plant growth. Very little or no work was done on Mn nutrition, status and different forms in soils of Saurashtra region so far. Hence, there is a need for depth study of dynamics of different forms of Mn under intensive agriculture, 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_1 -Control, T_2 -FYM @ 25 t/ha at an interval of 3 years. T_3 - 1/2 RD of NP, T_4 - 1/2 RD of NP + K, T_5 - RD of NP and T_6 - RD of NP + K. These soil samples were sequentially extracted for different Mn fractions as per the procedure described by Jackson (1973) and Viets (1962) as water soluble, exchangeable, DTPA available, and in reducible form. Total Mn status was determined by digesting the soil using HF: HClO_4 (5:

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

RESULTS AND DISCUSSION

Mn-water soluble:

The water soluble Mn was found in very trace quantity and did not show any significant variation due to treatments over time (Table 1). Similarly, Mehra and Baser (1982) and Sharma *et al.* (1997) also reported stress amount of water soluble Mn.

Mn-exchangeable:

Exchangeable Mn content were not affected by different treatments when pooled over year, but Y x T interaction was significant and the highest value were recorded in T_1 (3.586 ppm) of 1st year followed by T_3 (2.401 ppm) in the 10th years, while the lowest values were in T_1 (0.279 ppm) after 20th year. Overall there was a decline in content of exchangeable Mn after span of 20 years.

Mn-DTPA available:

The DTPA available-Mn did not showed any significant difference when pooled over years, but Y x T