

Dynamics of zinc fractions in calcareous soils of Saurashtra region of Gujarat

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ABSTRACT

Soils of Saurashtra region are comprised of 10 soil groups and majority of soils are medium black calcareous in nature. One hundred sixty nine surface soil samples were collected (0-15 cm) at an interval of 10 years and different fractions of Zn were determined. The WS, EF and AF of Zn showed an increasing trend after a span of 10 years, while RF decreased. During 1990, predominant components were DTPA available and RF, while after decade during 2000, the EF was found predominant followed by DTPA available form. The total Zn content in soils of Saurashtra region increased, while residual forms of Zn decreased marginally. The per cent available and total available Zn also increased after 10 years.

Key words : Dynamics, Zn, Fraction, DTPA, Available Zn.

and total Zn.

Zinc is an essential element for plant growth and metabolism which exists in the soil in different forms and remains in the state of dynamic equilibrium with each other. The overall deficiency of Zn in Indian soils was found 47 per cent (Sakal and Singh, 2001), while it was 24 per cent in soils of Gujarat. The present investigation was aimed to study the status and dynamics of different forms of Zn in soils at an interval of 10 years in the different agro-ecological sub region of Saurashtra region of Gujarat.

MATERIALS AND METHODS

Surface soil samples (0-15 cm) were collected from 169 tagged fields during 1990 and 2000 representing 10 soil groups of Saurashtra region of Gujarat *i.e.* 1. Shallow black-trap basalt (SBTB), 2. Shallow black-lime stone (SBLS), 3. Shallow-black-sand stone (SBSS), 4. Medium black-trap basalt (MBTB), 5. Medium black-lime stone (MBLS), 6. Deep black-trap basalt (DBTB), 7. Coastal alluvial shallow (CS), 8. Coastal alluvial deep (CD), 9. River alluvial deep (RAD) and 10. Stony. 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: HClO₄ (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) from the total Zn status of the soil. The per cent available Zn status was calculated from available

RESULTS AND DISCUSSION

Water soluble-Zn (WS):

The data presented in the Table 1 showed that water soluble form of Zn, on an average, increased after a decade from 0.187 to 1.2 ppm. This increase was invariably in all the soil group of Saurashtra. The highest value of water soluble Zn was recorded in soil group SBBT (1.484 ppm) and MBTB (3.025 ppm), while the lowest values were recorded in SBLS (0.0 ppm) and (0.062ppm) both in 1990 and 2000, respectively. The increase in water soluble Zn content can be attributed to the possibility of addition of Zn by the farmers, and the inter conversion of different forms of Zn (Randhawa and Singh, 1995).

Exchangeable-Zn (EF):

The results revealed overall increase in exchangeable form of Zn in the soil group SBSS, MBTB, RAD, MBLS and DBTB, while in rest of the soil groups it marginally increased and there by exhibiting a constant status (Table 1). The highest mean values were found in stony (2.28 ppm) and SBSS (12.37 ppm), while lowest in RAD (0.15 ppm) and CD (0.17 ppm) soil group during the years 1990 and 2000, respectively. The increase in exchangeable form of Zn over time can be attributed to the inter-conversion from the reducible form of zinc.

DTPA available-Zn:

Most of the soil groups showed in a span of 10 years, DTPA available Zn status in soil increased (Table 1). The highest increase was recorded in soil group MBLS (0.519) followed by SBTB, CS, SBSS and DBTB. The soil group