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# Dynamics of iron fractions in calcareous soils of Saurashtra region of Gujarat

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## ABSTRACT

From the tagged cultivated farmer's field, 169 surface soil samples (0-15 cm) were collected during the year 1990 and 2000 to study the dynamics of different iron fractions in soils. There were overall depletion of WSF, EF, AF, RF, Total, residual, per cent available and available total iron from 2.188, 3.766, 3.797, 1.024, 36391.99, 36380, 0.0327 and 10.275 ppm to 1.516, 1.424, 3.092, 0.999, 26077.035, 2620.114, 0.0317 and 7.031 ppm, respectively over a period of 10 years in different soil groups of Saurashtra region of Gujarat.

**Key words :** Dynamics of Fe, Fe fraction, DTPA available-Fe, Fe status, Available total Fe.

Soil fertility and soil productivity is declining with advent of modern agro-technologies including use of high analysis fertilizers, high yielding varieties and less use of organic manures which results into continuous mining of soil nutrients since decade and centuries, and hence create imbalance in secondary and micronutrients status of soil. This is particularly so in case of different forms of Fe present in soil because they are present in minute quantity and indispensable for crop growth. Thus, there is a need to study the dynamics of different forms of iron in different soil groups 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 Fe fractions as per the procedure described by Jackson (1973) and Viets (1962) as water soluble, exchangeable, DTPA available and reducible form. Total Fe status was determined by digesting the soil using HF: $HClO_4$ (5:1). These extracts were analyzed for their Fe content on Atomic Absorption Spectrophotometer. Residual form of Fe was calculated by deducting water soluble + exchangeable + DTPA available + reducible (*i.e.* available) from the total Fe status of the soil. The per cent available Fe status was calculated from available and total Fe.

## RESULTS AND DISCUSSION

### *Water soluble-Fe (WSF):*

The data (Table 1) reveal that there was overall marginal depletion of water soluble form of Fe from 2.188 ppm to 1.516 ppm after a period of 10 years span, but varied with individual soil groups. The considerable depletion in WSF of Fe was recorded in DBTB, MBLS and MBTB soil groups, while it was maintained some what in CS, stony, RAD, SBSS, SBTB and CD soil groups and in SBLS soil group, it increased. Similarly, Singh *et al.* (1990) also reported 1.8 ppm WS-Fe in arid soils of Haryana.

### *Exchangeable-Fe (EF):*

The overall exchangeable Fe depleted from 3.766 ppm during 1990 to 1.424 ppm in the year 2000 (Table 1). Similar trend was observed in most soil groups, except SBSS, CD, RAD and Stony where its status increased during the year 2000. Present finding supports the earlier work of Joshi *et al*. (1988) who reported 8-10 ppm exchangeable Fe in the soils of Rajasthan.

### *DTPA available-Fe:*

The soil group SBSS, DBTB, RAD, Stony and CS showed an increase in DTPA available Fe, while it declined in MBLS, MBTB, SBTB, SBLS and CD soil group over a period of 10 years. The highest depletion was recorded in MBLS (5.472 ppm), while the lowest in CD (0.673 ppm) soil group. The present finding supports the earlier work of Singh *et al*. (1988), Bhardwaj and Omanwar (1994) and Dangarwala and