

Effect of zinc and organic materials on transformation of zinc and chemical properties in sodic soil

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ABSTRACT

A field experiment was conducted to study the effect of application of zinc and organic materials on transformation of zinc and chemical properties in sodic soil. Surface soil samples (0-15 cm) were collected after harvest of wheat crop in each year. The recovery of Zn in water soluble plus exchangeable (Wsex-Zn) and occluded zinc (Occ-Zn) was non significant and organically bound zinc (Oc-Zn), adsorbed zinc (Ads-Zn) and residual zinc (Res-Zn) significantly increased with all organic materials and increasing levels of zinc sulphate over control. The magnitude of increase in different zinc fractions was more prominent under poultry manure and vermicompost and 40 Kg ZnSO₄ ha⁻¹. 10t *Tephrosia* and FYM ha⁻¹ were found equally effective in the transformation of soil zinc during both the years. In general, all the organic materials decreased the pH and ESP and increased ECE of soil. Similarly, all organics increased the status of organic carbon in soil. Soil properties were not substantially changed due to increasing doses of zinc sulphate.

Key words : Organic material, Zinc Transformation and
Chemical properties, Sodic soil.

Zinc is known to occur in soils in a number of discrete chemical forms differing in their solubility and strength (or reversibility). A substantial amount of research has been conducted to study the factors affecting transformation of zinc under upland conditions. However, only a few attempts have been made on the redistribution of zinc in soil under different organic materials and zinc application in sodic soil in arid region. Therefore, the present research was undertaken to study the changes that may occur in distribution and transformation of zinc into various forms and their correlation with chemical properties of under different organic materials and zinc levels in sodic soil.

MATERIALS AND METHODS

A field experiment was conducted during 2001-02 and 2002-03 with five different organics and zinc sulphate levels in sodic soil in split plot design. The organic manures were taken in main plots and zinc in sub plots. The soil was loamy sand in texture having pH (1:2) 9.5, EC (1:2) 1.42 dSm⁻¹, ESP 30.85, organic carbon 1.55g kg⁻¹, CEC 6.8 cmol (p+) kg⁻¹, clay 8%, DTPA-extractable zinc 0.42 mg Kg⁻¹. Soil samples were collected from each plot, dried and sieved, and analysed. The soil samples were analysed for various zinc fractions according to the sequential procedure of Iyenger and Deb (1977) as modified by Chandi and Takkar (1982). Different chemical

forms of soil zinc studied were Wsex-Zn (watersoluble plus exchangeable zinc), Occ-Zn (occluded -Zinc), Ads-Zn (adsorbed Zinc), Oc-Zn (organically bound Zinc) and Res-Zn (residual Zinc). Zinc in the extracts was determined by using atomic absorption spectrophotometer. Chemical properties of soil were determined by adopting standard methods.

RESULTS AND DISCUSSION

Transformation of zinc:

The data on concentration of different forms of zinc as affected by various organic materials and levels of zinc are given in the Table 1. The recovery of added zinc in Wsex-Zn form which represents the most readily available pool was non significant as compared to other forms. The maximum values of all the zinc fractions were recorded under 5t ha⁻¹ poultry manure which was significantly higher over no organic material added in the soil. FYM and *Tephrosia* @ 10t ha⁻¹ were equally effective over no organic material for all the zinc fractions.

Relatively lower values of zinc fractions in untreated plot were perhaps related to low organic matter content and high soil pH. The correlation coefficient values confirmed that these zinc fractions were correlated negatively with soil pH and positively with organic carbon content of soil. The formation of metallo-organic complexes with ligands, mineralization and solubilization from the organic source could also be a reason for increased concentration in zinc fractions as in Ads-Zn, OC-Zn and Res-Zn. Similar explanation, were advanced