

Zinc transformations in neutral soil and zinc efficiency in maize fertilization.

[Alvarez JM¹](#), [Gonzalez D.](#)

Author information

Abstract

The effect of six Zn sources (Zn-phenolate, Zn-EDDHA, Zn-EDTA, Zn-lignosulfonate, Zn-polyflavonoid, and Zn-glucoheptonate) was studied by applying different Zn levels to a representative Calcic Haploxeralf neutral soil (the predominant clay is montmorillonite) in incubation and greenhouse experiments. Zinc soil behavior was evaluated by sequential DTPA and Mehlich-3 extraction procedures. In the incubation experiment, the highest percentage recovery values of Zn applied to soil occurred in the water-soluble plus exchangeable fraction (29%) in fertilization with 20 mg of Zn kg⁻¹ of Zn-EDTA fertilizer. In the greenhouse experiment with maize (*Zea mays* L.), a comparison of different Zn carriers showed that the application of six fertilizers did not significantly increase the plant dry matter yield among fertilizer treatments. The highest yield occurred when 20 mg of Zn kg⁻¹ was applied as Zn-EDDHA fertilizer (79.4 g per pot). The relative effectiveness of the Zn sources in increasing Zn concentration in plants was in the following order: Zn-EDTA (20 mg kg⁻¹) > Zn-EDDHA (20 mg kg⁻¹) approximately Zn-EDTA (10 mg kg⁻¹) > Zn-EDDHA (10 mg kg⁻¹) approximately Zn-phenolate (both rates) approximately Zn-polyflavonoid (both rates) approximately Zn-lignosulfonate (both rates) approximately Zn-glucoheptonate (both rates) > untreated Zn. The highest amounts of Zn taken up by the plants occurred when Zn was applied as Zn-EDTA fertilizer (20 mg kg⁻¹, 7.44 mg of Zn per pot; 10 mg kg⁻¹ Zn rate, 3.93 mg of Zn per pot) and when Zn was applied as Zn-EDDHA fertilizer (20 mg kg⁻¹ Zn rate, 4.66 mg Zn per pot). After the maize crop was harvested, sufficient quantities of available Zn remained in the soil (DTPA- or Mehlich-3-extractable Zn) for another harvest.

Effects of zinc complexes on the distribution of zinc in calcareous soil and zinc uptake by maize.

[Alvarez JM¹](#), [Rico MI.](#)

Author information

Abstract

The movement and availability of Zn from six organic Zn sources in a Typic Xerorthent (calcareous) soil were compared by incubation, column assay, and in a greenhouse study with maize (*Zea mays* L.). Zinc soil behavior was studied by sequential, diethylenetriaminepentaacetate, and Mehlich-3 extractions. In the incubation experiment, the differences in Zn concentration observed in the water soluble plus exchangeable fraction strongly correlated with Zn uptake by plants in the greenhouse experiment. Zinc applied to the surface of soil columns scarcely moved into deeper layers except for Zn-ethylenediaminetetraacetate (EDTA) that showed the greatest distribution of labile Zn throughout the soil and the highest proportion of leaching of the applied Zn. In the upper part of the column, changes in the chemical forms of all treatments occurred and an increase in organically complexed and amorphous Fe oxide-bound fractions was detected. However, the water soluble plus exchangeable fraction was not detected. The same results were obtained at the end of the greenhouse experiment. Significant increases were found in plant dry matter yield and Zn concentration as compared with the control treatment without Zn addition. Increasing Zn rate in the soil increased dry matter yield in all cases but Zn concentration in the plant increased only with Zn-EDTA and Zn-ethylenediaminedi-o-hydroxyphenyl-acetate (EDDHA) fertilizers. Higher Zn concentration in plants (50.9 mg kg⁻¹) occurred when 20 mg Zn kg⁻¹ was added to the soil as Zn-EDTA. The relative effectiveness of the different Zn carriers in increasing Zn uptake was in the order: Zn-EDTA > Zn-EDDHA > Zn-heptagluconate > Zn-phenolate approximately Zn-polyflavonoid approximately Zn-lignosulfonate.