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Evolution of residual-Zn available concentrations of Zn-EDTA chelate in two different soils.

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Zinc chelates, such as Zn-EDTA have been widely used to correct deficiencies in this micronutrient in different crops. Several authors have suggested applying complexed forms of Zn to soils in order to offer an effective source of Zn to plants. When inorganic Zn sources are added to soils, the availability of Zn to plants tends to decrease with time. This is due to the aging of the metal or the transformation of the Zn that is normally available to plants into various less available forms. Soil properties are believed to influence the fixation and/or precipitation of added Zn. The objective of this study was to determine the changes over time in the concentrations of available residual-Zn in two different soils to which the Zn-EDTA chelate was applied.

An experiment was conducted under controlled laboratory conditions in two different soils: an acidic soil [Typic Haploxeralf; field capacity, 6.65 g H_2O/100 g soil; pHw (1/2.5, w/v), 6.2; texture USDA, sandy loam, with illite as the predominant clay; oxidizable organic carbon 0.29%; extractable P, 19.9 mg/kg] and a calcareous soil [Typic Calcixerept; field capacity, 20.5 g H_2O/100 g soil; pHw (1/2.5, w/v), 8.2; texture USDA, loamy sand, with smectite as the predominant clay; oxidizable organic carbon 0.75%; extractable P, 12.6 mg/kg]. These soils were treated with a synthetic chelate, Zn-ethylenediaminetetraacetate (Zn-EDTA), at different rates of application [0 (nil-Zn), 5 and 10 mg Zn kg-1 soil]. The potential available Zn concentrations were estimated at four experimental times (0, 15, 45 and 75 d) by the Mehlich-3 and DTPA-AB extraction methods.

The results obtained showed the evolution of available Zn over experimental time, for each treatment. The Zn concentrations in both soils showed significant differences over experimental time. Zn-EDTA applied at both Zn rates (5 and 10 mg Zn kg-1) was associated with high variations in available Zn concentrations. However, in both soils, the decreases in available Zn concentrations over time were greater for the Nil-Zn treatment than for the Zn-EDTA treatments, in percentage terms with respect to the available Zn concentrations observed after 0-days. In all cases the greatest decreases were observed between 0 and 45 days of incubation. In the acidic soil, the decrease in available Zn ranged from 6.4 to 18.7% of the initial concentration of available Zn. In the calcareous soil, the corresponding decrease in available Zn ranged from 13.5 to 27.7%. This study showed that the aging effect was greater in the calcareous than in the acidic soil; it therefore seems that soil properties such as an alkaline pH and high clay and $CaCO_3$ contents increase the aging effect.