Residual effect of synthetic Zn chelates on the availability of this metal in different soils under waterlogged conditions.

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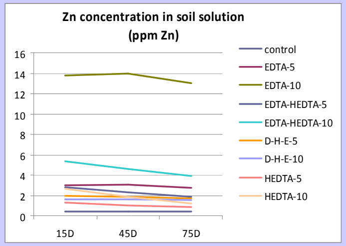
Introduction and Objectives

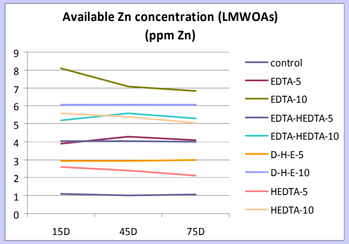
Adding Zn improves crop growth, increases seed yield and also positively affects nutritional quality. After Zn fertilization, there is normally a period of several years in which residual effects provide an adequate supply of Zn to successive crops. Immediately after the application of Zn sources water-soluble Zn slowly but continually decreases. Various factors, including time and moisture conditions, affect the aging process and modify the solubility of the metal in soil and therefore its availability.

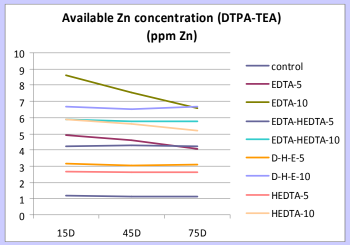
In previous experiments, we studied the residual effect of synthetic chelates, obtained that the amounts of potentially available Zn decreased in the second cropping year due to aging processes. The present study was undertaken to verify variations in the residual effects of applying four different synthetic Zn sources.

Results

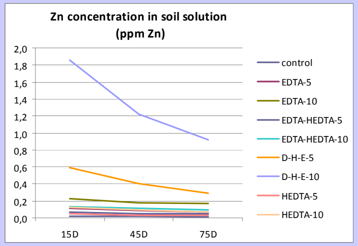
SOIL 1

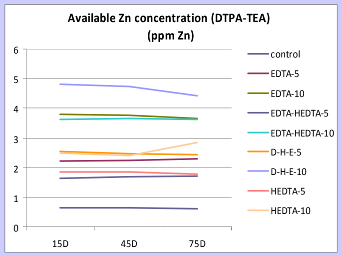


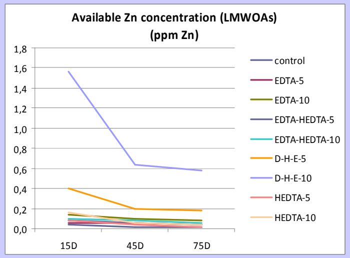




SOIL 2







Materials and Methods

The present study was conduced in two different soils:

- ✓ Soil 1: Typic Haploxeralf
- ✓ Soil 2: Typic Calcixerept

With four synthetic Zn sources:

- ✓ Zn-EDTA (Zn-ethylenediaminetetraacetate)
- ✓ Zn-HEDTA (Zn-N-2-hydroxyethyl-ethylenediaminetriacetate)
- ✓ Zn-EDTA-HEDTA
- ✓ Zn-DTPA-HEDTA-EDTA (Zn-DTPA, Zn-diethylenetriaminepentaacetate)

At different rates of application:

- ✓ 0 mg Zn kg^{-1} soil (control)
- ✓ 5 mg Zn kg^{-1} soil
- ✓ 10 mg Zn kg^{-1} soil

The experiment was conducted to determine:

- ➢ Zn in soil solution
- ➢ available Zn:
  - ✓ DTPA-TEA method
  - ✓ low-molecular-weight organic acids: LMWOAs method
- ➢ their evolution over time
  - → at 15, 45 and 75 d under waterlogged conditions.

Conclusions

In Soil 1, the Zn-EDTA fertilizer produced the highest Zn concentration in the soil solution and greatest quantity of available Zn. However, the Zn concentrations did not show any significant differences for any treatment over time.

In Soil 2, the Zn-DTPA-HEDTA-EDTA produced the highest Zn concentration in the soil solution and the greatest quantity of available Zn. Applying this fertilizer, at both of the rates studied, produced significant differences over experimental time ($P < 0.05$) in the soil solution and also in terms of the amount of available Zn extracted with the LMWOAs method.

For both soils, except in the control treatments, the available Zn concentrations obtained for the different Zn treatments were higher than those reported as critical for most plants. These concentrations were greater in Soil 1 than in Soil 2 and this was particularly evident at the high-rate of application.

References

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