The Availability of Chelated and Unchelated Zinc in Soils

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INTRODUCTION

Zinc deficiency is very common in many agricultural crops especially on high-pH soils. Application of Zn fertilizers is a common practice to overcome the effects of Zn deficiency. Inorganic Zn salts, such as $ZnSO_4$, and chelated Zn, such as Zn-EDTA, are used. In this study the availability of unchelated Zn will be compared to that of Zn-EDTA in neutral and alkaline soils.

METHODS

Computer modelling (speciation calculations) and soil incubation tests are used to determine the behaviour of chelated and unchelated Zn in neutral and alkaline soils.

RESULTS AND DISCUSSION

Speciation calculations show that EDTA is able to keep a substantial concentration of Zn in solution up to relatively high pH soil values. The situation is shown for 1.5 mg Zn kg^{-1} soil added as $ZnSO_4$ or Zn-EDTA (Fig. 1). It was observed, that Zn from $ZnSO_4$ became immobilized in a high-pH soil, whereas the EDTA was able to keep a significant amount of added Zn soluble in soil solution.

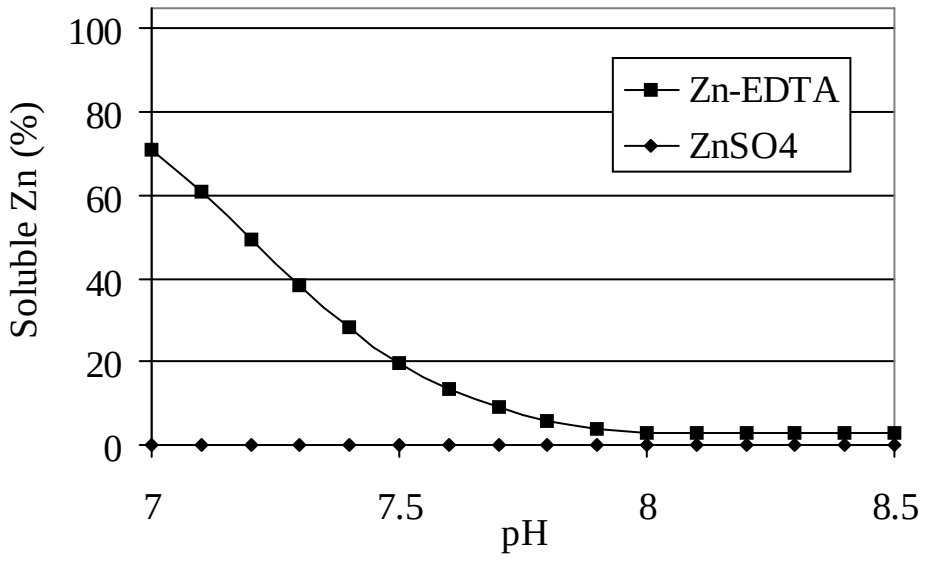

Fig. 1. Calculated relative amount of Zn that remained soluble in soil solution.

This difference in behaviour was confirmed by soil incubation tests. An incubation of a calcareous soil (pH 7.3) with $ZnSO_4$ or Zn-EDTA at 25 mg Zn kg^{-1} soil showed that none of the Zn from $ZnSO_4$ remained soluble, whereas more than 50% of the Zn from Zn-EDTA remained in soil solution.

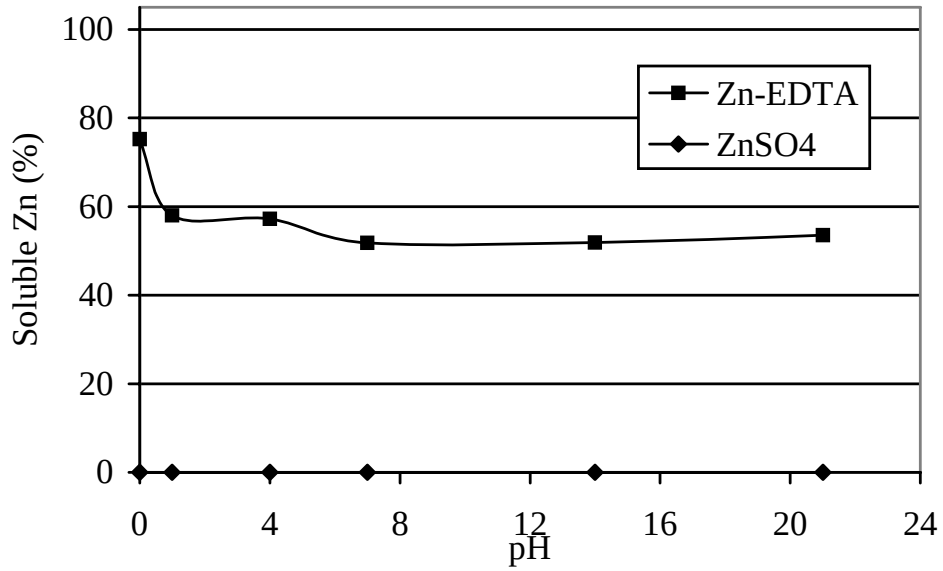

Fig. 2. Measured relative amount of Zn that remained soluble in soil solution.

CONCLUSION

Chelated Zn from Zn-EDTA applied to high-pH soils showed a remarkable higher availability compared to unchelated Zn.