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Kinetic behavior of Fe(o,o-EDDHA)-humic substance mixtures in several soil components and in calcareous soils.

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Source

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Abstract

Ferric ethylenediamine- N, N'-bis-(o-hydroxyphenylacetic)acid chelate (Fe(o, o-EDDHA)) is one of the most effective Fe fertilizers in calcareous soils. However, humic substances are occasionally combined with iron chelates in drip irrigation systems in order to lower costs. The reactivity of iron chelate-humic substance mixtures in several soil components and in calcareous soils was investigated through interaction tests, and their behavior was compared to the application of iron chelates and humic substances separately. Two commercial humic substances and two Fe(o, o-EDDHA) chelates (one synthesized in the laboratory and one commercial) were used to prepare iron chelate-humic substance mixtures at 50% (w/w). Various soil components (calcium carbonate, gibbsite, amorphous iron oxide, hematite, tenorite, zincite, amorphous Mn oxide, and peat) and three calcareous soils were shaken for 15 days with the mixtures and with iron chelate and humic substance solutions. The kinetic behavior of Fe(o, o-EDDHA) and Fe non-(o,o-EDDHA) (Fe bonded to (o,p-EDDHA) and other polycondensated ligands) and of the different nutrients solubilized after the interaction assay was determined. The results showed that the mixtures did not significantly reduce the retention of Fe(o, o-EDDHA) and Fe non-(o,o-EDDHA) in the soil components and the calcareous soils compared to the iron chelate solutions, but they did produce changes in the retention rate. Moreover, the competition between humic substances and synthetic chelating agents for complexing metal cations limited the effectiveness of the mixtures to mobilize nutrients from the substrates. The presence of Fe(o, p-EDDHA) and other byproducts in the commercial iron chelate had an important effect on the evolution of Fe(o, o-EDDHA) and the nutrient solubilization process.