

Utilization of drinking-water treatment residue to immobilize copper and zinc in sewage-sludge-amended soils

ABSTRACT

In situ immobilization of copper and zinc using alum-treated drinking-water treatment residue (WTR) was selected for the remediation of sewage-sludge-amended soils. The WTR has a pH of 7.07 and, although its acid-neutralizing capacity (ANC) is low, utilization at high rates (>2.5%) can help to increase the pH of the soil system. The minerals present in WTR, such as kaolinite, gibbsite and Fe-oxides, provide surfaces for the adsorption of heavy metals. From the soil-solution study, results showed that application of WTR had reduced Zn concentrations in the soil solutions, as compared to the control treatment. Removal of Zn occurred via precipitation, adsorption and possibly organic-matter complexation or chelation. From the glasshouse study, results showed that by using WTR, Zn uptake by maize can be reduced. Although the decrease in Cu concentrations in the soil-solution study was not apparent, due to the very low concentrations of Cu present, the glasshouse study did indicate a reduction in Cu uptake by the maize plants; suitable rates of WTR application for maize growth should be less than or equal to 10%. In fact, there is an additional benefit of WTR application, whereby the rate of 2.5% can increase the dry weight of the maize plants. Thus, WTR can be recommended as a potential soil amendment to immobilize Zn in contaminated soil.

Keyword: Acid soil; Alum-treated water treatment residue; Maize growth performance; Soil-solution study