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SOIL RESTORATION UNDER ZINC AND LEAD STRESS VIA WASTEWATER SLUDGE APPLICATION

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Abstract

In this study, the effects of stabilized wastewater sludge application on soil biological functionality in agricultural soils contaminated with Zn and Pb were investigated. In the experimental design, heavy metals were added to the soils at doses of 100 mg Zn/kg and 50 mg Pb/kg and the effects of wastewater sludge application on urease, alkaline phosphatase and dehydrogenase activities were evaluated during a 45-day incubation period. Heavy metal applications led to statistically significant inhibition of urease and alkaline phosphatase activities; however, dehydrogenase activity was not significantly affected by these levels of contamination. The response of enzymes to heavy metals varied, and inhibition rates ranging from 32–42% in urease and 6–20% in phosphatase were calculated. Wastewater sludge application improved all enzyme activities; an increase in dehydrogenase activity of over 87% was observed, especially in control soils enriched with sludge. Sludge applications in soils contaminated with Zn or Pb also had a significant stimulating effect on enzyme activities. However, the presence of heavy metals partially limited the severity of this positive effect. As a result, the findings indicate that wastewater sludge derived from the food industry can support soil biological functioning in soils contaminated with Zn and Pb, as reflected by enzyme activity responses under the experimental conditions applied.

Key words: enzyme activity, heavy metals, microbial activity, soil remediation, wastewater sludge

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