

The effects of different chelants on the solubility of heavy metals in contaminated soil

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Heavy metals contamination of soil is a widespread global problem. Chelant assisted phytoextraction has been proposed to improve the efficiency of phytoextraction. To study the effects of different chelants on the solubility of heavy metals, a batch of soil incubation experiment was conducted. EDTA, EDDS, AES, IDSA of 5 mmol.kg⁻¹ were singly added to the contaminated soil (2000 mg.kg⁻¹Pb, 350 mg.kg⁻¹Cu, 10 mg.kg⁻¹Cd, 1500 mg.kg⁻¹Zn) with no chelant addition as control, five treatments together. After 7 days of incubation, the concentrations of water soluble Pb, Zn, Cu and Cd increased significantly compared to the control. Pb was increased by 158.6, 3.9, 42.2 and 5.3 times respectively, Cu was increased by 45.0, 162.0, 40.0 and 53.6 times respectively, Zn was increased by 6.2, 5.6, 9.4 and 1.5 times respectively, and Cd was increased by 33.5, 3.3, 126.5 and 38.0 times respectively. The results showed that EDDS was more effective for Cu desorption, EDTA was more effective for Pb desorption, which was inconsistent with other many reports. And AES was more effective for Zn and Cd desorption, IDSA was more effective for Cd desorption, which was our interesting findings. With the time increasing, the soluble metals with EDTA treatment were increased, while the soluble metals with EDDS, AES and IDSA treatments were decreased significantly. This phenomenon may be due to the different chemical characteristics of the chelants. EDTA is a persistent chelant which can't be degraded in the environment, while EDDS, AES and IDSA are biodegradable chelants. With the time increasing, EDDS, AES and IDSA were degraded and the metals were absorbed to the bulk soil again resulting in water soluble metals reduced, which provides evidence of the biodegradable property of EDDS, AES and IDSA.

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