

The effect of zeolite, bentonite and sepiolite minerals on heavy metal uptake by sunflower

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Abstract

Mining, industrial and agricultural activities can result in considerable soil pollution by heavy metals (HMs). One of the methods to control this pollution is application of adsorbent minerals. The purpose of this study was to compare the effects of adsorbent minerals (bentonite, zeolite and sepiolite) on transfer of some heavy metals (i.e., Pb, Zn and Cd) from soil to tissues of sunflower (*Helianthus annuus* L.). Treatments included: Non-polluted soil, HM-polluted soil, polluted soil + bentonite, polluted soil + zeolite, and polluted soil + sepiolite. Sunflower seeds were planted in different pots containing the above treated soils. After 70 days of growth, plants were harvested and HMs content was measured. Results revealed that the uptake of HMs from non-polluted soil was lower than that of other treatments. In the polluted soil + sepiolite treatment, the added sepiolite increased plant Cd and Zn uptake by 0.37 and 7.17 mg/kg, respectively. However, the differences in HMs uptake were not significant for other treatments. Zeolite addition decreased plant uptake of Zn and Cd by about 12 and 0.21 mg/kg, respectively, while bentonite addition reduced Pb uptake by about 3.05 mg/kg, without any significant difference for the other treatments. Zn uptake was higher by about 12.2 mg/kg in plant shoots as compared to plant roots. On the contrary, the roots took up higher amounts of Cd and Pb, as compared to the shoots. Despite high concentration of the HMs in the polluted soils, considerable tendency of sunflower for uptake, and a high adsorption capacity of the applied minerals, the HMs uptake by sunflower and surface adsorption by the minerals were very low, probably due to HMs precipitation in the soil.

Keywords: Soil pollution, Heavy metals, Adsorption capacity.

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