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Transport of Lead and Cadmium in Soil as Affected by Vermicompost

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Abstract

Heavy metals are important environmental pollutants, particularly in areas with high anthropogenic sources. This study was conducted to evaluate changes of chemical properties of Pb and Cd enriched municipal wastewater after passing through soil columns with different levels of vermicompost. Polyethylene columns filled with a clay loam soil. Enriched municipal wastewater with Pb (40 mgl^{-1}) and Cd (20 mgl^{-1}) was added to soil columns during 8 periods of 10 days followed by the measurement of chemical properties of drainage water in each stage. Experimental treatments consisted of 3 levels of vermicompost comprising control (V1), 2 % (V2) and 4 % wt (V3) and time in 8 levels with 3 replications. The results indicated that vermicompost and time have significant effects on chemical properties of drainage water. Treatment V3 showed a significant effect on pH, EC, cations and anions concentrations, P, N, total organic carbon and the amount of Pb and Cd in drainage water. All measured properties except for pH showed decreasing trends with time. Nitrate and chlorine concentrations exhibited a great increase in drainage water of the two last stages. A decreasing trend was observed in drainage pH until the sixth stage followed by an increase. Cd concentration in drainage water was larger in the first two stages of experiment compared to Pb. The results of the soil analyses showed that soil depth has significant effect on soil chemical properties. The effect of vermicompost on the amounts of Na, K, Ca, Mg, Cl, and $HCO3^-$, pH (Pb column), P, organic carbon and Cd was significant. Significant increase of Na and K, Cl, nitrate and phosphate, organic matter, Cd and Pb was observed at surface depth of 0–20 cm compared to lower depth of 40–60 cm. Larger contents of pH, Cl and HCO3 was measured in depth of 40–60 cm.

Keywords: Cadmium, calcareous soil, drainage water, lead, vermicompost, waste water

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