



Phytotoxicity and remediation of heavy metals by fibrous root grass (sorghum)

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ABSTRACT

Objectives: To determine the uptake and effects of heavy metals (Cd, Cu, Ni, Pb and Zn) on seed germination, growth of fibrous roots, root/shoot growth and biomass of grass (sorghum) grown in soil - vermicompost media (3:1).

Methodology and results: Vermicompost developed using vermiculture biotechnology from vegetable market waste was characterized and found to have high concentrations of the nutrient elements Ca, Zn, Cu, Mg, Fe and Mn. The vermicompost was used as a natural fertilizer for phytoremediation studies of heavy metals. The selected heavy metals were dosed at concentrations from 0, 5, 10, 20, 40 and 50 ppm separately in the soil - vermicompost media (3:1) in pot experiments. The phytotoxic effect of heavy metals on the growth of sorghum and physicochemical parameters of soil-vermicompost media were measured. The uptake of heavy metals in plant samples were analyzed by atomic absorption

spectrophotometer. Plant growth was adversely affected by heavy metals at the higher concentration of 40 and 50 ppm, while lower concentrations (5 to 20 ppm) stimulated shoot growth and increased plant biomass. Heavy metals were efficiently taken up mainly by roots of sorghum plant at all the evaluated concentrations of 5, 10, 20, 40 and 50 ppm.

Conclusions and application of findings: Vermicompost from vegetable waste has high nutrient contents and therefore it can be used as a natural fertilizer to increase growth of plants that play a role in phytoremediation. Although heavy metals at 40 and 50 ppm reduced seed germination, plants germinated and grew efficiently when Zn was available. Vermicompost application as a natural fertilizer or soil amendment would enhance sorghum plant growth and enhance phytoremediation of heavy metals from contaminated environments.

Key words: heavy metals, sorghum, phytoremediation, vermicompost.