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Phytoextraction of Copper and Zinc by Willow Varieties in a Pot Experiment

Authors : Muhammad Mohsin, Mir Md Abdus Salam, Pertti Pulkkinen, Ari Pappinen

Abstract : Soil and water contamination by heavy metals is a major challenging issue for the environment. Phytoextraction is an emerging, environmentally friendly and cost-efficient technology in which plants are used to eliminate pollutants from the soil and water. We aimed to assess the copper (Cu) and zinc (Zn) removal efficiency by two willow varieties such as Klara (S. viminalis x S. schwerinii x S. dasyclados) and Karin ((S.schwerinii x S. viminalis) x (S. viminalis x S.burjatica)) under different soil treatments (control/unpolluted, polluted, lime with polluted, wood ash with polluted). In 180 days of pot experiment, these willow varieties were grown in a highly polluted soil collected from Pyhasalmi mining area in Finland. The lime and wood ash were added to the polluted soil to improve the soil pH and observe their effects on metals accumulation in plant biomass. The Inductively Coupled Plasma Optical Emission Spectrometer (ELAN 6000 ICP-EOS, Perkin-Elmer Corporation) was used in this study to assess the heavy metals concentration in the plant biomass. The result shows that both varieties of willow have the capability to accumulate the considerable amount of Cu and Zn varying from 36.95 to 314.80 mg kg^{-1} and 260.66 to 858.70 mg kg^{-1}, respectively. The application of lime and wood ash substantially affected the stimulation of the plant height, dry biomass and deposition of Cu and Zn into total plant biomass. Besides, the lime application appeared to upsurge Cu and Zn concentrations in the shoots and leaves in both willow varieties when planted in polluted soil. However, wood ash application was found more efficient to mobilize the metals in the roots of both varieties. The study recommends willow plantations to rehabilitate the Cu and Zn polluted soils.

Keywords : heavy metals, lime, phytoextraction, wood ash, willow
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