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Effects of Amino Bisphosphonic Acid on the Growth and Phytoextraction Efficiency of Salix schwerinii Grown in Ni-Contaminated Soil

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Abstract : Soil polluted with elevated level of nickel (Ni) concentration may cause severe hazards to humans and forest ecosystems, for example, by polluting underground water reserves, affecting food quality and by reducing agricultural productivity. The present study investigated the phytoextraction ability of Salix schwerinii, enhanced with an application of the N100 (11-amino-1-hydroxyundecylidene) chelate. N100 has proved to be a non-toxic, low risk of leaching, environmentally friendly and easily biodegradable chelate that has a potential for metal chelation. The Salix were grown in garden soil that was also amended with nickel (Ni; 150 mg kg^{-1}). Multiple doses of N100 were applied to the treatments as follows: Ni + N100 1.2 g and Ni+ N100 2.4 g. Furthermore, N100 doses were also repeated with the control soil. The effect of N100 on height growth, biomass, and the accumulation of Ni in Salix in polluted soils was studied. In this study, N100 application was found to be effective in enhancing height and biomass growth under polluted treatments. Total reflection X-ray fluorescence (TXRF) spectrometry was used to determine the concentration of Ni in the Salix tissues. The total Ni concentrations in the soils amended with N100 increased substantially by up to 324% as compared to the control. The Ni translocation factor (TF) and bioconcentration factor (BF) values for S. schwerinii increased with the application of N100 as varied from 0.45–1.25 and 0.80–1.50, respectively. This study revealed that S. schwerinii is suitable for the phytoextraction of Ni-contaminated soils.

Keywords : bisphosphonic acid, nickel, phytoextraction, Salix
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