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EVALUATION OF THE ABILITY OF NERIUM OLEANDER TO REMEDIATE Pb-CONTAMINED SOILS

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Mine tailings are a frequent source of metal pollution due to the spread of metals from bare surfaces via wind or runoff water. Phytostabilization is an interesting low-cost option to reduce environmental risks in these mining sites. In the present work, a study on the accumulation of lead was carried out in Nerium oleander plants grown in a semiarid area with acidic soils of Southwest Spain (Riotinto, Huelva). Lead is one of the most abundant and ubiquitous toxic element associated with mining and ore-processing operations in the area, and is among the most persistent contaminants in soils (Kumar et al. 1995). Soil samples were taken to characterize Pb contamination, and plant samples were collected in different sites in order to determine Pb content in leaves, stems and roots. Additionally, a hydroponic experiment was carried out to determine critical Pb concentrations for plant growth and investigate the Pb tolerance strategy of Nerium oleander. Plants were exposed to different Pb concentrations (0, 20, 40, 80, and 100 μM) in hydroponic culture and maintained in growth chamber during 30 days. Growth rates, water content (%), photosynthetic pigments (chlorophyll a, b, and carotenoids), and biochemical parameters (MAD, CAT, POD) were measured. The mean total Pb concentration in soils where Nerium oleander grows was around 290 mg Pb/kg but the plant accumulated just 2 mg kg^{-1} Pb in leaves and 13 mg kg^{-1} Pb in roots. Lead soil concentration was positively correlated with Pb concentration in leaves (r=0.899) but no association was found with Pb root. Bioaccumulation (leaf/soil concentration) and translocation factors (leaf/root concentration) were lower than 1, indicating that the species did not translocate Pb to the aerial parts and that might be useful to phytostabilize Pb.

The hydroponic experiment showed that plant growth was inhibited by Pb exposition and toxicity symptoms occurred at high concentrations of Pb. Biomass reduction was particularly evident at high Pb concentration (100 μM Pb) reaching only 13% the biomass accumulated in control plants. Photosynthetic pigment concentration was also reduced with Pb exposure whereas MDA in leaves increased in plants exposed to 100 μM of Pb. Antioxidant enzyme activities (CAT and POD) were not affected by Pb treatments. Plants accumulated Pb mainly in the roots confirming that the species performs as a metal-excluder. This trait together with the ornamental value of the species suggests that Nerium oleander might be used to revegetate mining soils and it might contribute to Pb phytostabilization.

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