



831/E2

Effect of EDTA on chromium uptake and translocation of selected, potential phytoextractant wild plants, under contaminated conditions

A M D Tharanga¹ and R C L De Silva*

Department of Chemistry, Faculty of Science, University of Kelaniya, Kelaniya

Phytoremediation is a novel strategy that uses plants to remove heavy metal contaminants from contaminated soil and water. The aim of this study is to improve the removal of trivalent chromium from terrestrial environment using selected wild plants in Sri Lanka. In this study, *Tithonia diversifolia*, *Achyranthes aspera* and *Cassia occidentalis* plant species were introduced to pots contaminated with 250.00 and 350.00 mg kg⁻¹ of Cr³⁺ by dry weight of soil. The pH of the tested soil sample was 6.59. Different concentrations of EDTA (1.00 mmol kg⁻¹ -10.00 mmol kg⁻¹) were applied to the soil, to check whether there was an enhancement of Cr³⁺ extraction upon applying the chelating agent. The separated plant materials (shoot and root) were digested and analyzed by atomic absorption spectroscopy after 60 days of planting. The amount of Cr³⁺ extracted by plants increased with increment of Cr³⁺ concentrations of soil. *Achyranthes aspera* and *Cassia occidentalis* indicated good tolerability to both trivalent Cr concentrations while *Tithonia diversifolia* showed poor tolerability to both Cr³⁺ concentrations. Addition of EDTA increased the extracted Cr³⁺ by plants. Among these three plant species, the highest Cr³⁺ extraction (285.84 mg kg⁻¹ by dry weight of plant) was obtained by *Achyranthes aspera*, in the presence of 350.00 mg kg⁻¹ Cr³⁺ and 10.00 mmol kg⁻¹ EDTA concentrations. At these Cr³⁺ and EDTA concentrations, 285.84 mg kg⁻¹ of chromium was accumulated by *Cassia occidentalis* whereas *Tithonia diversifolia* couldn't tolerate these conditions and died. In every combination of trivalent Cr and EDTA concentrations, Cr³⁺ accumulation was higher in roots than shoots of the three plant species. The root to shoot ratio (R/S) ranged from 0.82-0.04 for *Tithonia diversifolia*, 0.23-0.13 for *Achyranthes aspera*. The R/S for *Cassia occidentalis* ranged from 0.17-0.07 for 250.00 mg kg⁻¹ Cr³⁺ and 0.10-0.03 for 350.00 mg kg⁻¹ Cr³⁺. *Achyranthes aspera* species showed the highest dry biomass production [2.09 (± 0.27) g]. It is possible to conclude that application of the chelating agent EDTA to the soil can increase the Cr accumulation in plants. Although EDTA enhances the Cr accumulation, it also resulted in low biomass production. Therefore, further studies are required to investigate optimum EDTA concentration.

Keywords: Chelating agents, phytoremediation, terrestrial, chromium contamination