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Identification of wild plants to phytoextract chromium from polluted terrestrial environments

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This study is a part of a series of studies that attempt to evaluate the phytoextraction potential of commonly found wild plant species in Sri Lanka. Eight wild plant species; *Lantana camara, Cassia occidentalis, Ipomoea pes-caprae*, *Pteris hillebrandii, Tithonia diversifolia, Cyanthillium cinereum, Achyranthes aspera* and *Synedrella nodiflora*(L.) were investigated in a pot study to assess chromium uptake. The experiments were carried out in two series using soil, containing Cr(VI) in the range of 10 to 200 mg kg^{-1} of dry soil and Cr(III) in the range of 100 to 500 mg kg^{-1} of dry soil. The plant materials and corresponding soil samples were digested and analyzed by Atomic Absorption Spectrophotometry.

The results indicated that both forms of chromium accumulation in plants increased with the increase in soil Cr concentration. The highest Cr extraction in each plant by dry weight was observed in *P. hillebrandii* (Cr(VI) 37.63 mg kg^{-1} and Cr(III) 134.87 mg kg^{-1}), followed by *L. camara* (Cr(VI) 37.34 mg kg^{-1} and Cr(III) 123.12 mg kg^{-1}), *C. occidentalis* (Cr(VI) 34.87 mg kg^{-1} and Cr(III) 125.11 mg kg^{-1}), *I. pes-caprae* (Cr(VI) 32.19 mg kg^{-1} and Cr(III) 65.19 mg kg^{-1}), *T. diversifolia* (Cr(III) 6.26 mg kg^{-1}), *C. cinereum* (Cr(III) 2.13 mg kg^{-1}), *A. aspera* (Cr(III) 3.50 mg kg^{-1}) and *S. nodiflora* (L.) (Cr(III) 0.76 mg kg^{-1}). According to the study *L. camara, P. hillebrandii* and *C. occidentalis* can tolerate up to 200 mg Cr(VI) kg^{-1} of dry soil whereas *I. pes-caprae* can only tolerate up to 100 mg Cr(VI) kg^{-1} of dry soil. Also *P. hillebrandii* and *C. occidentalis* can tolerate Cr(III) up to 500 mg kg^{-1} of dry soil whereas *L. camara* and *I. pes-caprae* can only tolerate up to 400 mg kg^{-1} of dry soil. The concentration, transfer and accumulation of Cr from soil to roots and shoots were evaluated in terms of the Bioconcentration Factor (BCF) and Translocation Factor (TF). For many plants, accumulation of Cr was higher in roots than shoots. According to the results BCF and TF ranged between 0.01 – 0.51 and 0.01 – 2.18 respectively.

The results of this study indicate that, four of the tested plant species can extract relatively significant amounts of chromium from soil, compared to reported values in literature. However, the percent extractions are not high enough to consider these plants as potential candidates for phytoextraction of chromium. Optimization studies and investigation in different soil conditions are required to improve the chromium phytoextraction ability of these plant species.

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