The effects of manganese on the remediation of the heavy metal contaminated soil by using the dock (*Rumex patientia* L.) plant

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ABSTRACT

The heavy metal contamination has emerged as a critical pollution problem in agricultural soils in recent years. The studies on heavy metal contamination in soil have been conducted mainly on the sources and behaviors of the contaminants, their effects on public health, decontamination and analysis, improvement management and techniques, and the risk analysis. In recent studies, plants like *Vaccinium myrtillus Aesculus hippocastanum* L., *Silene vulgaris, Rumex patientia* L, *Thlaspi caerulescens, Althaea rosea, Solanum nigrum* L, *Hypericum amblysepalum*, and *Plantago lanceolata* have been identified to accumulate toxic heavy metals in their structure and to possess the ability of phytoremedation. The relationship between Cr, Cd, Pb and Mn in Dock (*Rumex patientia* L.) plant was investigated by using the phytoremediation method in heavy metal pollution soils. In a DTPA soil test, the Dock (*Rumex patientia* L.) plant by using some heavy metals was investigated with regard to the effects of manganese interactions with Ethylenediamine tetraacetic acid (EDTA) chelate. Some 100 mg / kg Cr, Cd, Pb were applied as heavy metals $Cr(NO_3)_3$, $Cd(NO_3)_3$ and $Pb(NO_3)_2$ were given in this formula to each pot. Four increasing EDTA doses (0, 5, 10, and 15 mmol/kg) were applied to the pots at the beginning of flowering of the Dock plant. The plants were harvested after a two-month development period. Variance analyses were done on heavy metals and Mn concentration in plant parts (root and shoot).

Keywords: Dock plant; Phytoremediation; Manganese; Heavy metal; Soil pollution