Evaluation of *Dittrichia viscosa* (L) Greuter for chelate-assisted phytoextraction of Pb and Zn spiked soil

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Soil is composed of mineral particles, organic matter, water, air and living organisms and regulating the supply of water and nutrients for the flora and microfauna. However soil is being contaminated with various contaminants including heavy metals (Cd, Pb, Cu, As, Zn etc.) through mining, industrial and agricultural activities creating potential hazards to ecosystems and human health (Lantzy and Mackenzie, 1979). Remediation of such soils requires high cleanup efforts in terms of technical, financial and social resources and most of the current remediation technologies are often high-priced, energy consuming, resulting CO_2 emissions (Mitsch and Jorgensen, 2003). The intensive research work has resulted in plant-based remediation technologies called phytoremediation. Phytoextraction is a promising technique to clean-up contaminated soils and waters by using metal-tolerant plants to remove metals and metalloids (Salt *et al.,* 1998). Amendments such as synthetic chelants have been used to enhance the solubility of metals in soils and their subsequent uptake and translocation into plant shoots (Blaylock *et al*., 1997; Huang *et al*., 1997). However phytoextraction is still not fully applied because of long time period requirement for soil remediation.

Efficiency of phytoextraction can be increased by using more biomass producing plant species and with the application of suitable amendment. The present research work will evaluate *Dittrichia viscosa*, considering its high fresh biomass production (Curadi *et al*., 2005), for phytoextraction of contaminated soil. *D. viscosa* has a wide distribution and grows well in heavy metals contaminated soils (Melendo *et al*., 2002). Ethylenediamine disuccinate (EDDS) has received much attention in the past few years in the remediation process (Grcman *et al*., 2003; Kos and Lestan, 2003) with good degree of biodegradability in the soil (Schowanek *et al*., 1997). The metal chelating ability with short timespan in the soil due to rapid biodegradation, make EDDS more suitable amendment for enhanced phytoextraction (Meers *et al*., 2005). EDDS will be investigated for its effects on bioavailability of heavy metals and their uptake by plants.

Soil sample from agricultural field will be analyzed for various important physico-chemical characteristics and then will be spiked with Pb and Zn reference to the Italian soil standards for commercial and industrial use (Gazzetta Ufficiale, 2006) making 2, 4 and 10 times level of contamination separately. After one month soil incubation (Turan and Esringu, 2007), 1 kg soil from each contaminated soil will be taken in plastic (polypropylene) pot separately and 15 seeds of *D. viscosa* will be sown in each pot. Each treatment will be quadruplicated and NH_4NO_3 and

KH_2PO_4 at the rates of 0.43 and 0.33 g/kg soil respectively as basal fertilizer solution (Wu *et al*., 2004) will be applied to one set of treatment before sowing and other will be without fertilizer. Plants will be thinned and 5 plants will be kept in each pot which will be allowed to grow for approximately 2 months. Using the same levels of soil contamination, another set of experiment will be arranged and EDDS will be added to soil in various doses for enhancing bioavailability of Pb and Zn for plant uptake. At the end of plant growth period, plant shoots and roots will be dried and will be analyzed for Pb and Zn content. Similarly soil sample from each pot will be analyzed for total and exchangeable (NH_4OAc-EDTA and $CaCl_2$) Pb and Zn content.

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