



**“Gheorghe Asachi” Technical University of Iasi, Romania**



---

## **PHYTOACCUMULATION, COMPETITIVE ADSORPTION AND EVALUATION OF CHELATORS-METAL INTERACTION IN LETTUCE PLANT**

**Audil Rashid, Tariq Mahmood, Faisal Mehmood, Azeem Khalid,  
Beenish Saba<sup>1,2\*</sup>, Aniq Batool, Ammara Riaz**

<sup>1</sup>PMAS Arid Agriculture University Rawalpindi, Department of Environmental Sciences, Pakistan

<sup>2</sup>Department of Food Agricultural and Biological Engineering, The Ohio State University, Columbus, Ohio USA

---

### **Abstract**

Present study was envisaged to study chelators-metal interaction in phytoaccumulation of metals as a bioremediation technology to decontaminate metal pollution and adsorption of metals on soil. *Lactuca sativa* was used as model plant for phytoaccumulation to identify uptake of Cadmium (Cd) and Lead (Pb) and their subsequent accumulation in edible tissue of plant. Cadmium and lead were two selected metals for phytoaccumulation and copper was also studied for adsorption experiment. Green house experiments on Lettuce plant were conducted for 3 months and a significant difference of growth with metal chelator addition was observed. The whole study was divided into two experiments first enhanced phytoaccumulation with chelator addition in plants was conducted in green house and in second experiment batch studies were conducted to evaluate competitive adsorption of selected metals on agricultural soils in laboratory conditions. Three main trends were identified in the experiment. First, transfer of metals from root to shoot was increased after DTPA application as it helped to increase metal bioavailability. Second a negative trend was observed with increasing metal-chelator concentration and > 50 % reduction in plant dry biomass. Thirdly, water solubility of metals in soil was significant after 3 months of DTPA which shows low degradation and higher bioavailability. Bioconcentration factor and metal transportation index were calculated to find relation with metal uptake and plant growth. Phytoaccumulation and adsorption of Cd is higher than Pb and copper.

*Key words:* cadmium, competitive adsorption, DTPA, lead, lettuce

*Received: February, 2012; Revised final: June, 2012; Accepted: July, 2012*

---

\* Author to whom all correspondence should be addressed: e-mail: [beenishraja@gmail.com](mailto:beenishraja@gmail.com), [beenishsaba@uaar.edu.pk](mailto:beenishsaba@uaar.edu.pk); Phone: +16146205550