CHELATE-MEDIATED CHANGES IN SOIL METAL SOLUBILITY: IMPLICATIONS IN THE UPTAKE AND TRANSLOCATION OF CADMIUM BY WHEAT (*Triticum aestivum* L.) AT DIFFERENT GROWTH STAGES

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Abstract: Phytoextraction is gaining acceptance as a cost-effective and environmentally sound phytoremediation strategy for reducing toxic metal levels from contaminated soils. We hypothesized that the addition of synthetic chelates can increase the amount of bioavailable metal for root uptake, thereby improving the efficacy of phytoextraction. This study was therefore conducted to determine whether the addition of synthetic chelates can further enhance the root uptake and subsequent translocation of cadmium (Cd) to the shoots. Wheat (*Triticum aestivum* L. cv TAM-109) seeds were planted in plastic tubes containing topsoil and peat (2:1, v: v) spiked with various levels (0, 250, 500 mg Cd/kg dry soil) of cadmium nitrate. At six, eight, and ten weeks after emergence, aqueous solutions (0, 250, 500 mg/kg dry soil, 1:1 ratio with metal concentration) of [ethylenebis(oxyethylenenitrilo)] tetraacetic acid (EGTA) alone or in combination with acetic acid (HAc) were applied to the root zone. Plants were harvested at 5 days after chelate addition to coincide with the duration of maximum Cd availability as determined from a previous chelate-induced metal solubility study. Results showed that for each growth stage, wheat exhibited less growth with increasing soil Cd treatment indicating Cd toxicity. However, within each Cd treatment there were no significant differences in wheat growth in response to chelate treatments. Enhancements in root Cd uptake at ten weeks after emergence were attributed to chelate amendments especially at the highest Cd treatments. Shoot Cd concentrations were maximal at both eight and ten weeks after emergence when EGTA alone was amended to soil treated with 2,000 mg Cd/kg. Overall, this study demonstrated that depending on the nature and type of Cd-contaminated soil being remediated, the efficacy of phytoextraction can depend on the mobility of the metal in the soil especially at the growth stage when the plants have attained maximum biomass.

Keywords: Phytoextraction, cadmium, chelates, *Triticum aestivum*, metal solubility.

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