

Phytoremediation Potentials of Sunflowers (*Tithonia diversifolia* and *Helianthus annuus*) for Metals in Soils Contaminated with Zinc and Lead Nitrates

Johnson Kayode Adesodun, Mutiau O. Atayese, T. A. Agbaje, Bose A. Osadiaye, O. F. Mafe and Adeniyi A. Soretire

Abstract

Two species of sunflower, i.e., *Tithonia diversifolia* and *Helianthus annuus*, were investigated for their potential to remove heavy metals from contaminated soils. Dried and mature *T. diversifolia* (Mexican flower) seeds were collected along roadsides, while *H. annuus* (sunflower) seeds were sourced from the Department of PBST, University of Agriculture Abeokuta, Nigeria. The contaminants were added as lead nitrate ($\text{Pb}(\text{NO}_3)_2$) and zinc nitrate ($\text{Zn}(\text{NO}_3)_2$) at 400 mg/kg which represents upper critical soil concentration for both Pb and Zn. The results indicated that *T. diversifolia* mopped up substantial concentrations of Pb in the above-ground biomass compared to concentrations in the roots. The concentrations in the leaf compartment were 87.3, 71.3, and 71.5 mg/kg at 4, 6, and 8 weeks after planting (AP), respectively. In roots, it was 99.4 mg/kg, 97.4 mg/g, and 77.7 mg/kg while 79.3, 77.8, and 60.7 mg/kg were observed in the stems at 4, 6, and 8 weeks AP, respectively. Observations with *H. annuus* followed the pattern found with *T. diversifolia*, showing significant ($p < 0.05$) accumulation of Pb in the above-ground biomass. Results obtained from Zn contaminated soils showed significant ($p < 0.05$) accumulation in the above-ground compartments of *T. diversifolia* and *H. annuus* compared with root. However, the highest accumulation of Zn was observed in the leaf. The translocation factor and enrichment coefficient of Pb and Zn with these plant species are greater than 1, indicating that these metals moved more easily in these plants. However, this result also showed that the translocation of Zn from root to the shoot of the two plants was higher than Pb. In conclusion, this experiment showed that these plants accumulated substantial Pb and Zn in their shoots (leaf and stem) at 4 weeks AP which diminished with time. This implies that the efficiency of these plants in cleaning the contaminated soils was at the early stage of their growth.

Keywords Phytoremediation - Heavy metals - Sunflowers - Translocation factor - Enrichment coefficient