Assessment of Phytoremediation of Pb-Anthracene Co-Contaminated Soils Using Vetiveira zizanioides, Heianthus annuus L., Zea mays and Glycine max

Authors : O. U. Nwosu, C. O. Osuagwu, N. Nnawugwu, C. T. Amanze

Abstract : Phytoremediation is a green and sustainable approach to decontaminate and restore contaminated sites while maintaining the biological activity and physical structure of soils. A pot experiment was conducted for a period of 70 days to evaluate the remediation potentials of Vetiveira zizanioides, Heianthus annuus L., Zea mays, and Glycine max in concurrent removal of anthracene and Pb in co-contaminated soil. Sandy loam soils were polluted with Pb chloride salt and anthracene at three different levels (50mg/kg of Pb, 100mg/kg of Pb, and 100mg/kg of Pb+100mg/kg of anthracene) and laid out in a completely randomized design with three replicates. Shoot dry matter weight was significantly reduced ($p \le 0.05$) in comparison to control treatments by 33%, 32%, 40%, and 6.7% when exposed to 100mg kg⁻¹ of Pb, respectively in G.max, H.annuus, Z.mays, and vetiver. There was 42%, 41%, 48%, and 7.1% growth inhibition of shoot dry matter weight of G.max, H.annuus, Z.mays, and vetiver relative to control treatments when 100 mg Pb kg⁻¹ was mixed with 100 mgkg⁻¹ anthracene. Root and shoot metal concentration in G.max, H.annuus, Z.mays, and vetiver increased with increasing concentration of Pb. Translocation factor (TF < 1) obtained for G.max, Z.mays, and vetiver suggests that these plant species predominantly retain Pb in the root portion, while the TF value (TF \geq 1) obtained for H.annuus suggests that it predominantly retains Pb in the shoot portion. The extractable anthracene decreased significantly ($p \le 0.05$) in soil planted with G.max, H.annuus, Z.mays, and vetiver, as well as in pots without plants. This accounted for 53% to 71% of anthracene dissipation in planted soil and 40% dissipation in unplanted soil. This result suggested that the plant species used are a promising candidate for phytoremediation. Keywords : phytoremediation, heavy metals, polyaromatic hydrocarbon, co-contaminated soil

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