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Batch washing of lead contaminated and spiked soils using extracts of dried *Terminalia mantaly, Panicum maximum* and *Eleusine indica* plants

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Abstract. Application of dried plant water soluble extracts in soil Pb decontamination is rear, but advantageous due to their ecological biodegradability. Single batch laboratory scale suitability of *Terminalia mantaly, Panicum maximum, Eleusine indica* and water as washing solutions for Pb removal from contaminated and spiked soils at different soil pulp densities (3%, 6%, 9%, 12%, 15% and 18%) and washing time (1, 3, 6, 12, 24 and 96 h) was investigated. Washings of *Terminalia mantaly* and *Panicum maximum* proved more efficient comparatively for contaminated soil with Pb removal efficiency of 27.2±0.64% and 27.0±0.52% respectively at 3% soil pulp density and washing time of 96 h. Removal efficiency increased with increasing washing time but decreased with increasing of soil pulp density. Furthermore, water was found effective for removing Pb from spiked soils with maximum removal efficiency of 74.5±3.38% at 3% soil pulp density after 1 h washing. High exchangeable fraction of Pb (81.2%) in spiked soil makes water more suitable against other washing solutions. Statistical *t*-testing showed significant difference in Pb removal efficiency between contaminated and spiked soils for all four washing solutions, reflecting differences in geochemical phases of Pb in both soils. *Terminalia mantaly* and *Panicum maximum* showed promising result in soil washing and have potential for application in Pb removal from contaminated soils. However, chemical modifications are needed to enhance and improve on their efficiencies. Similarly, more information is needed to predict and model removal efficiencies when multiple washing steps are applied.

Keywords: heavy metals; plant extracts; removal efficiency; soils remediation; soil washing.

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