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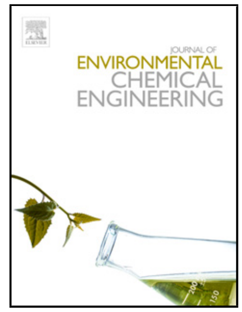

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Compost and biochar assisted phytoremediation potentials of *Moringa oleifera* for remediation of lead contaminated soil

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Abstract

The aim of this study was to investigate the germination, growth, tolerance and Pb accumulation potentials of *Moringa oleifera* in compost and biochar amended Pb-contaminated soils for possible phytoremediation. Lead slag contaminated soil (100%- 32,640mg/kg) was diluted into three Pb contamination levels (75%, 50%, and 25%) by mixing it with uncontaminated control (0%) soil. Sunflower-poultry manure compost (Compost), rice husk biochar (RHB) and groundnut shell biochar (GSB) were applied at 10g/kg separately to the soils in triplicates and incubated for 2 weeks. *Moringa oleifera* seedlings were transplanted at two weeks into the incubated soils and set up in greenhouse experiments. Plant height, stem girth, leaf number and biomass were measured at 4 and 8 weeks. Plant roots and shoots were analysed. *Moringa oleifera* seeds planted in the contaminated and amended contaminated soils failed to germinate. Its seedlings withered off in 100% and 75% but survived in 25% and 50% amended contaminated and control soils. It tolerated Pb contamination up to 8,600mg/kg. The concentrations of Pb in the roots and shoots of the plants at 8 weeks ranged from 930 to 2100mg/kg and 420 to 1120mg/kg respectively for both contamination levels, indicating Pb phytoaccumulation potentials of *M. oleifera.* Compost and RHB enhanced *M. oleifera* roots and shoots production. The combination of compost and *M. oleifera* improved Pb phytoextraction efficiency. The combination of GSB and *M. oleifera* improved Pb phytostabilisation efficiency. Utilisation of compost, rice RHB and GSB with *M. oleifera* may be recommended for phytoremediation of Pb-contaminated soil.

Keywords: Phytoextraction, Phytostabilisation, *Moringa oleifera*, biochar, sunflower-poultry manure compost, lead smelting slag contaminated soil

1. Introduction

Recycling of spent lead acid batteries as raw materials for production of electrodes of new lead-acid batteries and other purposes is gaining increasing popularity globally. One of the drawbacks of the popular method of reducing all lead (Pb) compounds in the waste is the generation of Pb-containing slags. Disposal of the slag into the environment can lead to degradation of soils, contamination of air and water, and impairment of human health. Studies have also confirmed Pb contamination of the environment through other human activities. The primary sources include metallurgical mining, processing and smelting, unregulated artisanal gold mining, e-waste recycling and proximity to military shooting ranges [1-5]. The release of Pb to soil, sediment, water, air, plant, animals and human through these activities has been widely documented [2-8].