Effects of Fe-Modified Biochar and Bacteria-Loaded Biochar on Remediation of Heavy Metals-Contaminated Soil

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Abstract

Heavy metals are non-biodegradable metals and are considered as the main pollutants in soil, which can be transferred to the food chain through crops. High level of arsenic (As), chromium (Cr), and lead (Pb) in composite soil samples from contaminated sites around Taiwan indicated the urgency of remediation. Biochar is a carbon-rich material of thermal conversion of biomass under anaerobic or oxygen-limited condition. Previous studies have evaluated and demonstrated the ability of biochar to sorb heavy metals, and to reduce the mobility, bioavailability, and consequently toxicity of heavy metals in the soil. Different temperature and modification of biochar play an important role to the effectivity of remediation. River tamarind (*Leucaena leucocephala*) biochar could remove cadmium from contaminated water and the rapid growth of river tamarind in the forests of Taiwan has completely replaced native tropical forests and shrubs and become the only dominant plant species. Therefore, this study will be using river tamarind biochar processed at 300 and 700 ^{0}C, followed by modification with iron (Fe) and bacteria. Modification of biochar using Fe reduced the mobility of heavy metals in soil as well as reduced the transfer from soil to plants and the application of functional microorganisms to the soil diminished the available heavy metals through biosorption and biomineralization. Hence, this research aims to quantify the effects of biochar, Fe-modified biochar, bacteria-loaded biochar, as well as the combination of Fe-modified and bacteria-loaded biochar on the concentration, bioavailability and mobility of heavy metals in the soil.

Keywords: Biochar, Bacteria-loaded Biochar, Fe-modified Biochar, Heavy Metals, *Leucaena leucocephala*

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