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SLOW PYROLYSIS OF PALM KERNEL SHELL FOR BIOCHAR PRODUCTION AND ITS APPLICATION IN AGRICULTURAL SOIL BIOREMEDIATION

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Abstract

The potential of African palm (*Elaeis guineensis*) kernel shell (PKS) as feedstock for biochar production and agricultural soil remediation was evaluated through slow pyrolysis at 500 °C and 600 °C with a residence time of one hour. The resulting biochars were applied to soil at 5% and 10% (v/v), and the physicochemical and thermal properties of PKS, untreated soil, biochar, and treated soils were analyzed. Biochar produced at 600 °C showed superior characteristics, including higher total carbon, smaller particle size, greater adsorption capacity, and improved moisture retention. Its application enhanced soil quality by promoting carbon stabilization (reflected in higher C/N ratios), adjusting pH toward neutrality, and increasing carbon and sulfur enrichment. The 600 °C biochar applied at 5% yielded the most favorable effects on soil properties, achieving balanced C/N values and safe mercury concentrations well below regulatory thresholds. These findings demonstrate that PKS is a suitable feedstock for biochar production and that slow pyrolysis at 600 °C with a 5% soil application rate is an effective approach for improving soil fertility and supporting mercury immobilization. Overall, the study highlights the potential of PKS-derived biochar as a sustainable strategy for agricultural soil remediation.

Key words: biochar, palm kernel shell, pyrolysis, soil remediation

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