

Remediation of Copper Contaminated Soil by Char Derived from Used Disposable Baby Diapers

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Plastic is an emerging soil pollutant. The increased use of single-use plastic products is the main reason for plastic wastes. Disposable baby diapers (UDD) are one of those. Fifty percent of its content is plastic. The degradation time of UDD can be > 100 yr. Pyrolysis is a possible way to recycle plastic wastes. The aim of this study was to produce plastic char from used UDD and to assess its effectiveness in using it as a soil amendment to immobilize copper (Cu) in soil. Uncontaminated soil was spiked with copper (II) sulfate. Based on the thermo gravimetric analysis of UDD, 550°C was selected as the pyrolysis temperature. Produced plastic char was characterized before applying them to soil. The contaminated soil was incubated after applying plastic char at (the rates of 0%-control, 1 and 2.5%). Immobilization of Cu was measured after one month of incubation period by using single extraction using 1M ammonium acetate and consecutive extraction using 0.01M CaCl₂ methods. The soil pH, Electrical conductivity (EC), available Na, available Mg, available K, available P, available Ca and available N were analyzed. Based on the consecutive extraction analysis, plastic char added treatments showed significant ($p < 0.05$) reduction of extractable Cu concentration. The reduction was similar in soil with the two application rates of plastic char. Properties of plastic char i.e., high pH (11.27), high ash content (36.38%) and high EC (0.03 dS/m) could increase the soil pH thereby facilitate Cu immobilization. The C-H, C=O, C-C and phenols-like functional groups on the surface and high fixed C content (48.14%) of plastic char also might have supported the immobilization of Cu. These findings indicate that derived plastic char from UDD could be applied to immobilize Cu in contaminated soil. Pyrolyzed UDD could be an efficient waste management practice which minimize the environmental pollution.

Keywords: Copper contaminated soil, Disposable diapers, Immobilization, Plastic char

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