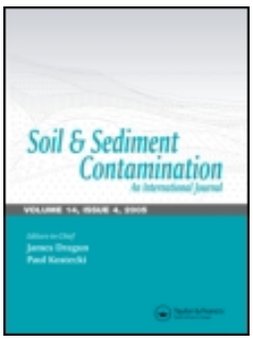

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Enhanced Degradation of Petroleum Hydrocarbons in Corn-Steep-Liquor-Treated Soil Microcosm

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The efficiency of corn steep liquor (CSL) as a potential stimulant for remediation of hydrocarbon-contaminated soil was evaluated in soil microcosms. Chronically polluted soil samples treated with CSL, water, and un untreated control were compared over a period of 42 days. There were remarkable changes in the physicochemical status of the soil in the CSL-treated set-up with noticeable utilization of essential nutrients such as nitrogen, phosphorus, and potassium. Percentage hydrocarbon utilizers showed a concomitant increase with hydrocarbon utilization in CSL-treated (0.05–0.16%) and water-treated (0.02–0.12%) set-ups, while no significant changes occurred in the untreated control. Gas chromatographic fingerprints showed complete disappearance of the lower-fraction alkanes C_7, C_8, C_9, and C_{11} within 21 days, as well as some higher fractions, significantly C_{16} and C_{29}, in the CSL-treated set-up. In the CSL-treated set-up, 77.9% of hydrocarbon was degraded, while the corresponding values for the water-treated and untreated control were 40.55 and 30.6%, respectively. The percentage aliphatic components degraded differed significantly in the CSL-treated, water-treated, and untreated set-ups. The n-C_{17}/pristane and n-C_{18}/phytane ratios in the CSL-treated set-up were 1.298 and 1.153, respectively, on day 0, but at the end of the treatability period, the values had dropped drastically to 0.182 and 0.585, respectively. The results of this study show that corn steep liquor is a potential material for bioremediation of hydrocarbon-polluted sites.

Keywords Biodegradation, bioremediation, petroleum, corn steep liquor

Introduction

Petroleum exploration, production, distribution, and use are inexorably bound up with problems of pollution both in aquatic and terrestrial environments. Today, there is increasing attention to bioremediation as a means of reclaiming such polluted environments because it is more environmentally friendly, cheaper, and technologically less demanding than physical and chemical methods (Vidali, 2001). Whereas large-scale pollution events such as the *Exxon Valdez* and the recent Gulf of Mexico spill have received considerable attention and attracted corresponding high-level bioremediation technologies, including biostimulation (Pritchard *et al*., 1992; Fox, 2011), small-scale releases often go unnoticed and corresponding simple technologies that could be used for reclaiming affected sites are not properly applied.

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