

Abstract

Ho, Chi-hua. Ph.D., Purdue University, August 2005. Microbial Community Analysis of Contaminated Soil During Phytoremediation. Major Professor: M. Katherine Banks.

Phytoremediation is the clean-up of contaminated sites using green plants. This innovative remediation approach has been used on many impacted sites to remove contaminants while simultaneously restoring ecological resources at relatively low cost. Polycyclic aromatic hydrocarbons (PAH) are ubiquitous in nature. Because of the vast amounts of land contaminated with these compounds and their carcinogenic characteristics, they are of concern currently.

Phytoremediation of PAH contaminated soil was assessed by monitoring PAH concentration, as well as changes in the bacterial community structure, over a time period of 10 months with tall fescue (*Festuca arundinacea*). Enhanced degradation of PAH was observed, with a maximum reduction of pyrene at a rate 36% higher than that noted for the unvegetated control. The dissipation of < 4 ring PAH, 4 ring PAH, and > 4 ring PAH in unvegetated soil were obtained at 70%, 54%, and 49% respectively, while a higher dissipation was shown in tall fescue treated soil at 78%, 68%, and 61% at the end of 10 months. A higher degradation rate of 4 ring and > 4 ring PAH in the tall fescue treatment suggested that plants can promote the rhizosphere degradation of more recalcitrant PAH in the soil. Microbial enumeration showed greater total bacterial numbers and PAH degrading bacteria in rhizosphere soil. The results obtained from terminal restriction fragment length polymorphism (T-RFLP) analysis of polymerase chain reaction (PCR) amplified 16S rRNA genes indicated that induced bacteria dominated the soil bacterial community during phyto-treatment.