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Fungal Remediation of PCP and TNT Contaminated Soil in the Field:
Papers from the Fourth International In Situ and On-Site Bioremediation Symposium

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FUNGAL REMEDIATION OF PCP AND TNT CONTAMINATED SOIL IN THE FIELD

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ABSTRACT: A proprietary strain of white rot fungi, F600, was used to remediate pentachlorophenol (PCP) and trinitrotoluene (TNT) contaminated soil at Superfund sites located at the Montana Pole Plant in Butte, MT and at the Naval Weapons Station in Yorktown, VA. In both field demonstrations, F600 and amendments (33%v/v) were mixed with soil and placed into plots approximately 25 cm deep. At the Montana Pole Plant, treatment with F600 decreased PCP concentrations from 1060 to 154 mg/kg (85%) and from 740 to 85 mg/kg (88%) within 18 weeks in two-two cubic meter plots. At the Naval Weapons Station, two 9 cubic meter plots of soil contaminated with TNT, octahydro-1,3,5-trinitro-1,3,5,7-tetrazocine (HMX), and hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) were treated with fungal amendments both with and without fungal inoculation. In the inoculated plot, concentrations of TNT, HMX, and RDX decreased from 194, 61, and 118 mg/kg to 9.3, 28, and 8 mg/kg respectively in 33 days. The addition of fungal amendments was sufficient to stimulate degradation by indigenous microbes since the initial concentrations of explosives were relatively low. In the amended uninoculated plot TNT, HMX, and RDX decreased from 283, 67, and 144 mg/kg to 16, 61, and 24 mg/kg within 32 days.

INTRODUCTION

White rot fungi produce an extracellular free radical generating system consisting of peroxidases, intermediate molecules, and hydrogen peroxide to degrade lignin. Degradation of lignin increases the availability of cellulose which is used as an energy source. This extracellular ligninolitic system is non-specific and can be utilized to degrade a wide variety of organic contaminants (Barr and Aust, 1994). White rot fungi have the potential to degrade a variety of contaminants in soil under favorable environmental conditions.

Prior to field work at both Superfund sites, a variety of white rot and non-white rot fungi were screened for the ability to degrade contaminants and to colonize soil. F600, a proprietary strain of white rot fungi was selected to degrade contaminants in the field at both sites. Laboratory tests also indicated that the most effective remediation of contaminated soils occurred when a solid inocula was used and when fungi were not nutrient limited.

Successful fungal remediation of PCP in the field has already been shown (Lamar and Dietrich, 1990; Holroyd and Caunt, 1995, and Johnston et al., 1996).

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