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HYDROCARBON DEGRADATION AND TRANSCRIPTOMIC RESPONSES OF CATALASE, PEROXIDASE, LACCASE ENCODING GENES AND ENZYMES OF OIL SPILL INHABITING RHIZOSPHERIC FUNGAL STRAINS

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Four most abundant strains were isolated from the rhizosphere of grasses growing in aged oil spill sites and identified through morphological and molecular level. Transcriptase responses of genes encoding lignin peroxidase, manganese peroxidase, catalase and laccase enzymes were studied in these strains using RT-PCR. These strains were used with *Megathyrsus maximus* for 90 days hydrocarbons remediation experiment. Cultures of these strains were first mixed with spent mushroom compost (SMC), the mixture was then applied to a sterilized crude oil polluted soil at concentrations of 10%, 20%, 30% and 40%. Soil with plant alone (0% 1) and soil with fungi-SMC alone (0% 2) served as controls. The soil's initial and final pH, nutrient, 16 EPA PAHs and heavy metal contents were determined, degradation rate, half-life and percentage loss of the total polyaromatic hydrocarbon (TPAH) were also calculated. Finally, the remediated soils were further screened for seed germination supporting index. The fungal strains were identified and registered at NCBI as *Aspergillus niger* (KY473958.1), *Talaromyces purpurogenus* (KY488463.1), *Trichoderma harzianum* (KY488466.1) and *Aspergillus flavus* (KY488467.1). We observed for that the synergistic mechanism improved the soil nutrient, reduced the heavy metal concentration and sped up hydrocarbon degradation rate. Using the initial and final concentrations of the TPAH, we recorded highest biodegradation rates (K1) and half-life (t1/2) in 30 and 40% treatments over controls. Transcriptomic response of lig 1-6 genes showed overexpression in *A. niger and T. harzianum* while *lcc* and *mnp* genes were moderately expressed in all the four strains. Almost 145 U.mL-1 of lignin and manganese peroxidase, 87 U.mL-1 of catalase, and 180 U.mL-1 of laccase enzymes were produced by these strains in response to increasing crude oil concentrations. Considering the robust nature and diverse production of these catalytic enzymes, these strains could be used to remediate crude oil polluted soil at large scale.

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