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IMPACT ON THE FUNGAL COMMUNITY LIVING ON OUR LAND DUE TO PETROLEUM SOIL POLLUTION

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ABSTRACT:
Soil is generally a natural habitat of micro-organisms and tree plants in which most micro-organisms live in communities such as bacterial viruses and fungi etc. At present, many human activities have resulted in many complex problems, of which soil pollution is a serious problem, so many reasons are responsible for soil pollution such as industrialization, urbanization, natural disasters, etc. Besides these, petroleum units are also an important cause of soil pollution. The waste materials and petroleum products that increase hydrocarbon pollution in the soil thus harm the fungal community present in the polluted soil, so petroleum polluted soil has seen a tremendous increase in some fungi species such as Aspergillus Penicillium and Fusarium, these species of fungi can digest the hydrocarbons present in the soil. Therefore, in the future these fungi species can be used to reduce the rate of hydrocarbon pollution from petroleum polluted soil, that is, the rate of soil pollution can be reduced.

Keywords: Habitat, Petroleum Hydrocarbon, Penicillium, Aspergillus Fusarium.

INTRODUCTION:

At present we are all living in the era of industrialization, so due to increasing industrialization urbanization, we have also given rise to many serious problems such as environmental pollution, water, air, and soil pollution, etc. Soil pollution arises due to many reasons but one reason which at present, it is becoming more deadly for the soil and that is due to petroleum soil pollution. It is petroleum refineries, petrol filling station, and other petroleum product units which pollute the surrounding soil and microorganisms located in this polluted soil like bacteria, viruses, and fungi. Species of fungi are also affected. Many species of fungi are found in the soil which normally grows, so the growth of microorganisms in the soil is considered a good indication of soil pollution. Crude oil changes the physical and chemical nature of the soil (Minai-Tehrani D., Herfatmanesh A., 2007.) i.e., the Ph of the soil, the fertility of the soil, the amount of nitrogen phosphorus, and potash in the soil changes. Petroleum soil pollution is a serious problem in many countries as it affects the soil as well as the groundwater, so the trees, live animals, and micro-organisms located in such polluted soil are also affected (Pinedo J, Ibáñez R, Irabien Á.2014.). At present, petroleum polluted soil is treated by biological treatment method. In this process, the method of micro radiation is used, in which some fungal species secretes certain types of enzymes such as lignin peroxidase, manganese peroxidase, etc., which can improve the chain of petroleum hydrocarbons. Breaks (Djelal H, Amrane A.2013

& Harms H, Schlosser D, Wick LY.2011). Some microbes can digest petroleum hydrocarbons which can reduce soil pollution (Adekunle AA, Adebambo OA (2007). Some fungal species degrade petroleum hydrocarbons better than bacteria (Cerniglia CE, Perry JJ (1973). currently, through the research, scientists are trying to find out which species of fungi can digest hydrocarbons too. In recent times, many researchers have studied the specific role of fungi in the biodegradation of petroleum and its products, such as Aspergillus, Penicillium, Rhizopus, Fusarium, and Mucor. These fungal species digest hydrocarbon-rich substances in the soil. Some species of fungi that are found high amount in Petro polluted soil such as Aspergillus, Penicillium, Rhizopus, and Fusarium, etc. These species reduce the number of hydrocarbons in the soil (Llanos C, Kjøller A (1976). Bacteria, yeasts and filamentous fungi are efficient agents to degrade of a large number of organic substances, commonly found in effluents generated by oil refineries (Atagana et al., 2006; Santos et al., 2008), presenting as a powerful alternative to conventional treatment methods (Ururahy, 1998). According to Chaillan et al. (2004), Aspergillus and Penicillium are the most commonly found fungi in tropical soil, which are able to degrade hydrocarbons. Conceição et al. (2005).

Research Area

I have selected Mangalia Petroleum Depot as my research area as it is a major hub of petroleum oil transport, it transports millions of liters of oil daily, so the number of hydrocarbons in the soil of this area has seen an increase which has a direct effect Falling on the diversity of mycoflora located here. Mangalia Depot is located on National Highway-3, 15 km from Indore city, there are several petroleum units like Bharat Petroleum Corporation Limited (BPCL), Indian Oil Corporation Limited (IOCL), and Hindustan Petroleum Corporation Limited (HPCL). These units transport motor spirit, high-speed diesel, superior kerosene oil, hexane, furnace oil, and ethanol in many cities of the state. This research study is based on changes in the diversity of mycoflora in the soil around Mangalia depot.

MATERIAL & METHODS:

1. Soil analysis

Soil samples for soil testing are selected from the polluted area and its surrounding area. A soil sample is taken in the V figure i.e., the surface is 0-5 cm, depth of 10 cm, and depth of 15 cm. The study of these soil samples has been done in Soil Testing Laboratory, College of Agriculture, Indore.

2. Isolation and identification of soil fungi

The separation of soil fungi is done by the serial dilution method. This method is considered to be the most suitable method for the isolation of fungal species. PDA medium is used for the growth of fungal species because fungal species grow easily on this medium. They have been identified based on their conidia size and their arrangement, arrangement of mycelium, fungal colony color, and fungal colony size and with the help of standard literature and Google Scholar. Lactophenol cotton blue is used for microscopic slide staining.

RESULTS AND DISCUSSION:

In this comparative research study, samples of petroleum polluted soil and controlled soil were

investigated which resulted in a higher concentration of carbon in the soil of the polluted area as compared to lower in controlled soil. Apart from this, some common changes in the soil of both samples like pH, nitrogen, phosphorus, potash, and other components are also seen. Therefore, if the concentration of carbon in petroleum polluted soil is higher than normal, it also affects the diversity of mycoflora present there, i.e., some common fungal species like Penicillium, Aspergillus, Rhizopus, and Fusarium, etc. These fungal species can digest the number of hydrocarbons present in the soil and also increase the fertility of the soil. (Oboh OB, Ilory OM et al. 2006). Trees growing in such polluted soil also have an adverse effect. In some research studies, it has been found that despite the high number of hydrocarbons in petroleum polluted soil, some fungal species are found in the highest quantity, which can digest hydrocarbons there such as Aspergillus, Penicillium, Fusarium, Trichoderma, Alternaria, Curvularia, Mucor, Rhizopus, Morssonina, Helminthosporium, (Cerniglia CE.,1997and Chaillan F, et al 2004).

CONCLUSION:

Through this research study, it is concluded that Oil leakage is a serious problem of the present time, this leakage can be seen around petroleum depots, refineries, and petrol filling stations, due to which the surrounding soil and the mycoflora located in it are also affected. But some fungal species can digest petroleum hydrocarbons such as Aspergillus, Penicillium, and Fusarium. These fungal species work to improve the soil ecosystem by reducing the number of hydrocarbons from petroleum polluted soils. Therefore, in the future, these fungal species can be used to increase the fertility of the soil. (Oboh OB, Ilory OM et al. 2006)

REFERENCES:

Adekunle AA, Adebambo OA (2007) Petroleum hydrocarbon utilization by fungi isolated from Detarium senegalense (J. F Gmelin) seeds. Journal of American Science 3: 69-76.

Adenipekun CO, Fasidi IO. Bioremediation of oil-polluted soil by Lentinus subnudus, a Nigerian white-rot fungus. Afr J Biotechnol. 2008;4(8):796–8.

Al-Nasrawi HA (2012) Biodegradation of crude oil by fungi isolated from Gulf of Mexico. J Bioremed Biodegrad 3: 147-152.

Anastasi A, Varese GC, Bosco F, Chimirri F, Marchisio VF. Bioremediation potential of basidiomycetes isolated from compost. Bioresource Technol. 2008;99(14):6626–30.

Ashraf R, Ali TA (2006) Effect of oil (crude petroleum) on the survival and growth of soil fungi. Pakistan Int. J. Biotechnol 3: 127-133.

Atagana HI, Haynes RJ, Wallis FM. 2006. Fungal Bioremediation of creosote contaminated soil: a laboratory scale bioremediation study using indigenous soil fungi. Water, Air, and Soil Pollution 172:201-219.

Atlas RM (1981) Microbial degradation of petroleum hydrocarbons: an environmental perspective. Microbiol Rev 45: 180-209.

Cerniglia CE, Perry JJ (1973) Crude oil degradation by microorganisms isolated

from the marine environment. Z Allg Mikrobiol 13: 299-306.

Chaillan F, Fleche AL, Bury E, Phantavong Y, Crimount P, Saliot A, Oudot J. 2004. Identification and biodegradation potential of tropical aerobic hydrocarbon-degradading microorganisms. Res Microbiol, 155:587-595.

Chaillan F, Le Flèche A, Bury E, Phantavong YH, Grimont P, et al. (2004) Identification and biodegradation potential of tropical aerobic hydrocarbon degrading microorganisms. Res Microbiol 155: 587-595.

Djelal H, Amrane A. Biodegradation by bioaugmentation of dairy wastewater by fungal consortium on a bioreactor lab-scale and on a pilotscale. J Environ Sci. 2013;25(9):1906–12.

Elshafie A, AlKindi AY, Al-Busaidi S, Bakheit C, Albahry SN (2007) Biodegradation of crude oil and n-alkanes by fungi isolated from Oman. Mar Pollut Bull 54: 1692-1696.

Harms H, Schlosser D, Wick LY. Untapped potential: exploiting fungi in bioremediation of hazardous chemicals. Nat Rev Micro. 2011;9(3):177–92.

Llanos C, Kjøller A (1976) Changes in the flora of soil fungi following oil waste application. Oikos 27: 377-382.

Mazaheri Assadi M, Ardeshiri M, Sheykhzadeh H, Jahangiri M. The bioremediation of crude oil contaminated soil. Pet Sci Technol. 2014;32(12): 1497–504.

Minai-Tehrani D., Herfatmanesh A., 2007. Biodegradation of aliphatic and aromatic fraction of heavy crude oil contaminated soil, A pilot study. Bioremediat J. 11(20), 71-76.

Oboh OB, Ilory OM, Akinyemi OJ & Adebusoye AS. (2006). Hydrocarbon degrading Potentials of bacteria isolated from a Nigerian Bitumen (Tarsland) deposit *nature and Science*, 4(3), 51-57.

Pinedo J, Ibáñez R, Irabien Á. A comparison of models for assessing human risks of petroleum hydrocarbons in polluted soils. Environ Model Software. 2014; 55:61–9.

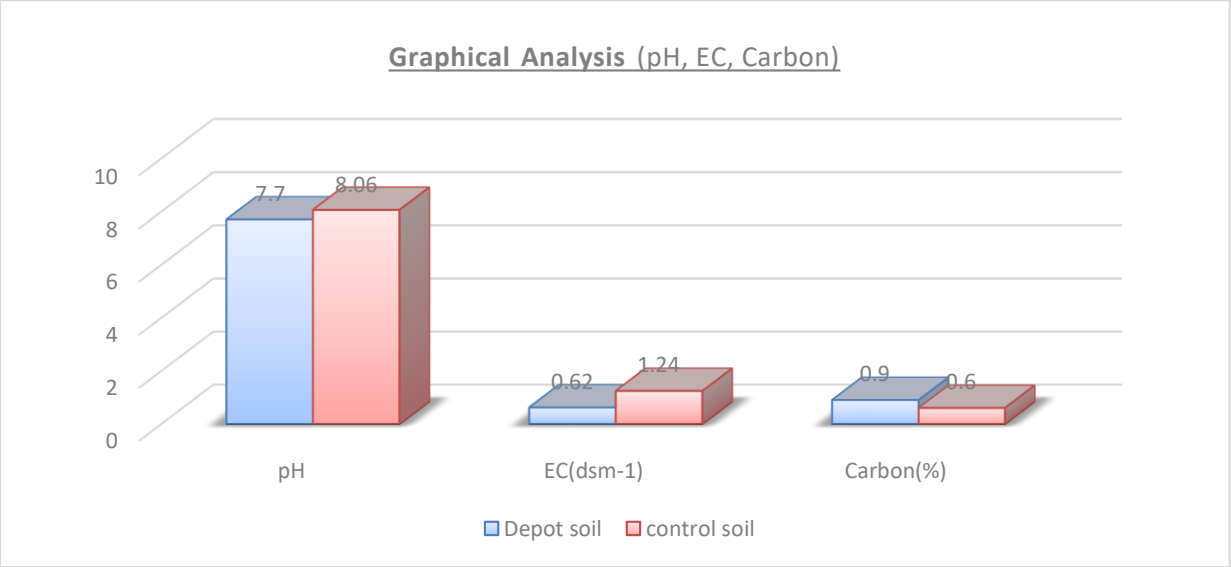
Reyes-César A, Absalón ÁE, Fernández FJ, González JM, Cortés-Espinosa DV (2014) Biodegradation of a mixture of PAHs by non-ligninolytic fungal strains isolated from crude oil-contaminated soil. World J Microbiol Biotechnol 30: 999-1009.

Ururahy AFP, Pereira Jr N, Marins MDM. 1998. Desempenho de um Biorreator do Tipo CSTR no Processo de Degradação de Borra Oleosa. Boletim Técnico PETROBRÁS, 41(¾):125-132.

Table no. 4.
RESULTS OF SOIL ANALYSIS

Sr. No.	Samples	(pH) (1:2)	(EC) (1:2)	Carbon Concentration	Available Nitrogen	Available Phosphorus	Available Potash
			DSM-1	%	Kg/ha	Kg/ha	Kg/ha
01	Control site (Nearby depot soil)	8.06	1.24	0.60	315	16.8	640
02	Petro Polluted site (Depot Soil)	7.7	0.62	0.90	284	13.6	560

4.2 Graphical Analysis (pH, EC, Carbon)



4.3 Graphical Analysis (Nitrogen, Phosphorus, Potash)