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## EVALUATION OF PHYSICO CHEMICAL PROPERTIES AND MICRONUTRIENT ANALYSIS IN PETROLEUM HYDROCARBON DEGRADATION IN CONTAMINATED SOIL SAMPLE OF JAIPUR, RAJASTHAN

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**Abstract:** Environmental pollution with petroleum and petrochemical products is regarded as one the most critical problem in present scenario. The main contribution in environment pollution belongs to hydrocarbon groups. The main factors add from industrial waste in the form of emissions, spillage from tankers, pipelines and other sources. The soil contamination may cause extensive damage to the system. The accumulation of pollutants in animals and plants may cause mutations or death. Environmental conditions in garage have made workers exposed with oily sludge and contaminated soil which are potent immunotoxicants and carcinogenic. In the present study conducted, it was observed that the pH, EC and WHC values decreased as compared to the normal soil. Decrease in pH significantly affects the growth and stability which is due to the hydrocarbon contamination. The organic Carbon, organic matter, available chloride, available nitrogen and the C/N ratio showed comparatively higher values as compared to the normal soil. An increase in the available micronutrients (Pb, Mg, K, Zn, Cu, Mn, Fe) was observed as compared to the normal soil. Heavy metals such as Pb, Mg, Cu present in the contaminated soil pose a serious threat to both man and animals present in the environment.

**Keywords:** Jaipur, physico chemical, hydrocarbon degradation, contaminated soil.

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**Introduction:** Jaipur known as “pink city” of India with geographical area of 11061.44 sq. km constitutes the east central part of Rajasthan. Jaipur is a famous tourist spot known for its gem and jewelry, and its famous sanganeri and bagru prints. Its features of beautiful architecture, planned growth and cosmopolitan character have endowed it with uniqueness in India's urban setting. With all these remarkable features this pink city is bestowed with pollution in its soil also. Soil has four physical components which includes 45% inorganic solids, 5% organic matter, 25% air and 25% water. Soil has high demands for agriculture and non farm use (Gawel *et al.*,2006). Soil quality has deteriorated due to poor agricultural practices. Environmental pollution with petroleum and petrochemical products is regarded as one the most critical problem in present scenario (Jain *et al.*,2011). The main contribution in environment pollution belongs to hydrocarbon groups. The main factors add from industrial waste in the form of emissions, spillage from tankers, pipelines and other sources. The accidental release is avoidable by taking proper safety majors the long term hazardous to the ecological and environmental system are toxics and persistence in terrestrial and aquatic ecosystem. Hydrocarbon compounds such as petroleum are essential elements of life. Spills and leaks of the petroleum hydrocarbons from storage facilities and distribution system results in contamination of environment with petroleum hydrocarbons, which is also a cause of serious concern for many countries. The soil contamination may cause extensive damage to the system. The

accumulation of pollutants in animals and plants may cause mutations or death. The public has now realized that oil business generates not only financial benefits but also causes pollution (Ebere *et al.*,2011). Threat to flora and fauna is mainly caused by the accidental leakages from petroleum carrying ships which lead to oily layers over the water surface. Environmental conditions in garage have made workers exposed with oily sludge and contaminated soil which are potent immunotoxicants and carcinogenic (Jain *et al.*,2011). The techniques mostly used for disposal of these pollutants are expensive and often involve risk of spreading pollution. A better way would be to biodegradation. The biodegradation of hydrocarbon is often relatively slow under normal conditions due to complex interaction that involves the hydrocarbons, environment and the composition of the microbial community.

### **Materials And Methods:**

**Study Area and Sample collection:** Contaminated soil samples were collected from motor garage areas of Transport nagar region of Jaipur, Rajasthan. Samples were collected from 5-9 cms of upper surface of contaminated sites. Samples were air dry and pass through 2mm sieve. The processed samples were store in sterile poly beg at room temperature for future testing. The samples were labeled as T1 T2 and T3. And the normal soil (NS) used as control has been collected from the premises of the Rajasthan University, Jaipur.

**Physico chemical characterization of soil sample:** The soil environment influences the microbial community, it will be analyzed for the following

parameters by standard methods includes, Soil pH (Pandey and Sharma, 2003), Soil dry mass (Moisture content) (Pandey and Sharma, 2003), Organic matter present (Walkley and Black, 1934), Amount of Total hydrocarbon present, Amount of Nitrogen present (Subbiash and Asija, 1956), Amount of Phosphorus present, Amount of Chlorides present (Pandey and Sharma, 2003), Amount of Carbonates and Bicarbonates (Pandey and Sharma, 2003), Determination of water holding capacity, Estimation of calcium carbonate, Estimation of organic matter and organic carbon in soil by Walkley and black's rapid titration method, Determination of available nitrogen and C/N ration, soil micronutrient content (Lb, Mg, K, Zn, Cu, Mn, Fe).

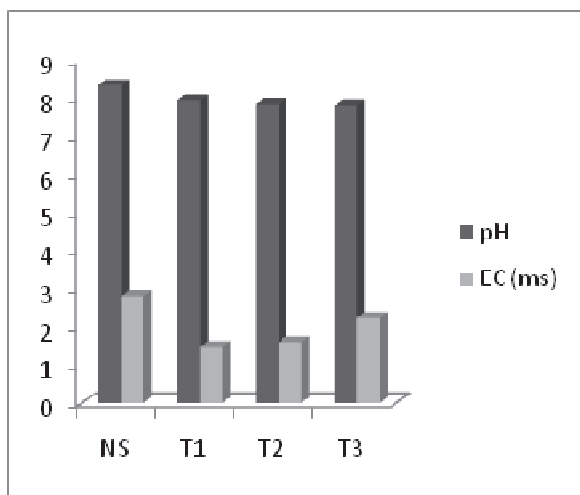
**Result And Discussion:** In order to determine and compare the physico chemical properties of the soil sample collected from transport nagar region with the normal soil sample, it was observed that the pH, EC and WHC values decreased as compared to the normal soil as shown in Table 1. The pH among the samples T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> varied from 7.82 to 7.95, EC from 1.48 to 2.24 and WHC from 14.24 to 18.98 which is relatively lower than the normal soil values of pH (8.36), EC (2.80) and WHC (0.13). Soil is highly buffered ecosystem. The pH of the soil affects the absorption and availability of nutrients. Decrease in pH significantly affects the growth and stability which is due to the hydrocarbon contamination. It

was also observed that the available carbonate presence was not detected. The organic Carbon, organic matter, available chloride, available nitrogen and the C/N ratio showed comparatively higher values as compared to the normal soil. The C/N ratio varied from 16:1 to 21:1 among the samples which was much higher as observed in the normal soil (4:1). Organic matter is responsible for the stability and formation of soil aggregates. The accumulation of petroleum products to the soil widens the C/N ratio which limits the available N for degradation processes (Frick *et al.*, 1999). And also the microbes are able to metabolize the hydrocarbons which quickly immobilize the mineral N that is available, leaving critical conditions for other microorganisms and also affects the growth (Newman *et al.*, 2004). An increase in the available micronutrients (Pb, Mg, K, Zn, Cu, Mn, Fe) was observed as compared to the normal soil as shown in Table 2. Heavy metals such as Pb, Mg, Cu present in the contaminated soil pose a serious threat to both man and animals present in the environment. Initially, heavy metals were naturally present in soils as natural components but with time to changing conditions the presence of heavy metals in the environment has accelerated due to human activities. Initially, heavy metals are naturally present in soils as natural components but as of now, the presence of heavy metals in the environment has accelerated due to human activities.

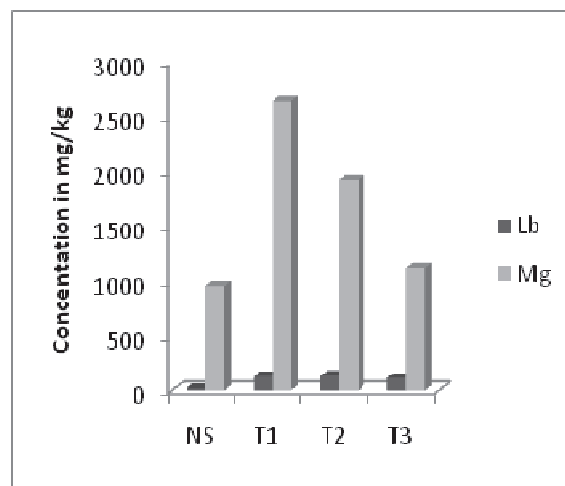
Table 1: Physico chemical properties of the hydrocarbon contaminated soil of Jaipur

Parameters	Unit	Normal soil (NS)	Sample 1 (T <sub>1</sub> )	Sample 2 (T <sub>2</sub> )	Sample 3 (T <sub>3</sub> )
pH	-	8.36	7.95	7.85	7.82
Electrical Conductivity (EC)	ms	2.80	1.48	1.60	2.24
Available Carbonate	mg/100gm	-	-	-	-
Bicarbonate	mg/100gm	610	152.5	122	122
Calcium Carbonate	mg/100gm	1	1.5	1	0.5
Soil Organic Matter	%	0.103	0.413	0.310	0.413
Soil Organic Carbon	%	0.06	0.24	0.18	0.24
Total Dissolved Solids (TDS)	ppt	0.251	0.888	0.954	1.330
Chloride	mg/100gm	4.2	53.9	71	146.26
Water Holding Capacity (WHC)	%	24.66	18.98	14.24	16.98
Moisture Content	%	0.13	0.431	0.502	0.644
C/N Ration		4:1	21:1	17:1	16:1

Micronutrients	Unit	Normal soil (NS)	Sample 1 (T1)	Sample 2 (T2)	Sample 3 (T3)
Lead	mg/kg	17	130	136	117
Potassium	mg/kg	60	210	167	259
Magnesium	mg/kg	960	2640	1920	1120
Manganese	ppm	3.46	8.08	5.76	5.48
Zinc	ppm	4.60	16.24	12.46	15.36
Copper	ppm	1.54	107.0	61.6	54.0
Iron	ppm	1.50	7.74	9.70	9.24
Available Nitrogen	mg/kg	54	445	253	394



**Graph 1: Comparative analysis of pH and EC respectively among the normal soil and the hydrocarbon contaminated soil samples**



**Graph 2: Comparative analysis of Lb and Mg respectively among the normal soil and the hydrocarbon contaminated soil samples**

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