

Microbial community of hydrocarbon impacted sites of Bodo oilfield, Ogoniland rivers state, Nigeria

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Abstract

Hydrocarbon pollution has greatly altered the normal microbial flora of our environments, this has lead to the succession of hydrocarbonclastic microbes in oil impacted sites. This study is a comparative study of the microbial flora of hydrocarbon impacted site of Bodo oilfield and the non impacted site in Ogoniland. A total of 12 samples were collected, 6 from oil impacted site and 6 from non impacted site. Sample were coded A –F. Physicochemical parameter of soil was determine, microbiological examination were conducted to determine the bacterial and fungal communities present at each site. Result shows that higher population of oil degrading microorganisms were found on the hydrocarbon impacted site, prominent among them were Micrococcus, Acinetobacter, Corynebacterium , Bcilus, Pseudomonas, Flavobacterium ,Actinomycetes, fungi isolated from impacted sites includes Candida , Rhizopusmucor and Aspergillus while the non impacted site has ; streptococcus, staphylococcus, E.coli, and Actinomycetes species. There were also fungal isolate of which only Candida was the only isolate. Microbial growths ranges between 1.1×10^3 to 9×10^3 cfu/ml .

Key words: Microbial, Community, Bodo, Hydrocarbon , impacted sites, Ogoniland, Nigeria

Introduction

Many oil-producing communities have been suffering from the after effects of oil spillage. The accidental discharge of petroleum products on soil or water surfaces is termed oil spill. Oil-spill pollution has been hazardous and problematic World-wide (Vincent, 1980) Crude oil is a heterogeneous liquid consisting of hydrocarbons. Most oil spill occur as a result microorganism which causes the deterioration of the product leading to corrosion of pipelines and storage tanks (wiri and Igoma 2020) Crude oil is classified according to its distillation residues as paraffin, naphtha or aromatics and based on the relative proportions of the heavy molecular weight constituents are classified as light, medium or heavy oils. This, however, results in the accidental discharge of petroleum product into the environment, causing severe and lasting damages which often alters the microbial flora of that impacted environment.

Materials and Methods

Soil samples used for this study were collected using opaque polyethen bags. Samples were collected from hydrocarbon impacted sites of Bodo community in Gokana Local government area of Rivers State. A Total of six soil sample were collected each, from the oil impacted and none oil impacted site around Bodo oilfield . The sample were labelled A-F and were immediately transported to the laboratory for analysis. Microbiological examinations were conducted to ascertain the various microbial flora of each site (oil impacted and none oil impacted) In the laboratory, 10 g of each of the soil samples was weighed and transferred into 250 ml flask containing 90 ml of sterile distilled water. The suspensions were shaken intermittently for about 30 mm. Each solution was allowed to stand for about 1 h after which the suspension was decanted into another 250 ml flask. Serial dilution of each suspension was made up dilution 6. The physicochemical parameter of the various soil were also determine. SDA was used in fungi cultivation while nutrient agar was use to cultivate bacteria

Table 1: Total microbial Community of soil samples from Bodo oil Field

Sample	Oil-impacted site		Non oil-impacted site	
	Bacteria (cfu/g)	Fungi (cfu/g)	Bacteria (cfu/g)	Fungi (cfu/g)
A	8.4×10^3	10×10^4	1.8×10^3	2.0×10^4
B	5.8×10^3	7.3×10^4	1.6×10^3	8.0×10^4
C	7.5×10^3	4.4×10^4	1.1×10^3	7×10^4
D	9.4×10^3	3.3×10^4	1.2×10^3	8×10^4
E	7.1×10^3	5.7×10^4	2.2×10^3	5×10^4
F	9×10^3	2×10^4	2×10^3	7×10^4

Table 2. Identified bacteria isolates from the oil impacted site of Bodo

Oil-impacted site	Non-oil impacted site
<i>Pseudomonas species</i>	<i>Pseudomonas species</i>
<i>Bacillus species</i>	<i>Staphylococcus species</i>
<i>Micrococcus species</i>	<i>Bacillus species</i>
<i>Acinetobacter species</i>	<i>Actinomycetesspp</i>
<i>Corynebacterium species</i>	<i>E.coli</i>
<i>Flavobacterium species</i>	<i>Actinomycetes</i>
<i>Actinomycetes species</i>	<i>Streptococcus species</i>

Table 3. Identified Fungi isolates from the oil impacted site of Bodo oil field

Sample	Morphology	Type of organism	Species
oil-impacted site	Ovoid spheres	yeast-like	Candida spp
	Filamentous	Mold	<i>Arthrobacterspp</i>
	Filamentous	Mold	<i>Rhizopus spp</i>
	Filamentous	Mold	<i>Aspergillus spp</i>
Non oil-impacted site	Ovoid Spheres	Yeast-like mold	<i>candida spp</i>

Table 4, Physicochemical parameter of soil

Parameter	Impacted soil	Non impacted soil
PH	7.50	7.20
iron(mg/kg)	18.50	7.50
EC	1437	1012
Cadmium(mg/kg)	<0.001	<0.001
Oil and grease(mg/kg)	32070	400
Lead (mg/kg)	0.002	0.000
Zinc (mg/kg)	0.089	0.016
Arsenic (mg/kg)	<0.001	<0.001
Chromium (mg/kg)	<0.001	<0.001

Results and Discussion

Result shows the microbial counts (Table 1) of oil impacted and non impacted soil in Bodo oil field. Area that are impacted have high microbial counts. Microbial counts from the non impacted sites were low, This result agrees with works of Wiri, Desmond, Mbato, and Nabiradee (2019) which reported that a higher microbial counts is usually associated with oil polluted sites. Table 2 is the results of the various microbial isolates, prominent among isolates from the impacted sites are *Micrococcus*, *Acinetobacter*, *Corynebacterium*, *Bacillus*, *Pseudomonas*, *Flavobacterium*, *Actinomyces* species while isolates from non impacted sites include *Staphylococcus*, *Bacillus*, *Streptococcus* species etc Table 3 shows morphological features and fungi isolates from oil impacted and non oil impacted sites, *Candida* was predominantly fungal species from oil-impacted site, others include *Mucor*, *Rhizopus*, *Arthrobacter* and *Aspergillus* while predominantly *Candida* was the only fungal isolate from non impacted site of Bodo oilfield. Table 4 shows results of the various physical and chemical attributes of the soil sample of both oil impacted and non impacted soil. The slight difference in bacterial population of the two areas

might be due to the effect of slight increase in the acidity of the soil spilled with crude oil. Following every oil spillage, there is always slight increase in soil acidity of the affected environment mostly when the spilled petroleum compounds are of high sulphur content (Hans, 1962). This explains the slight decrease in bacterial population in the oil-spilled area. The fungal population may have increased due to the fact that fungi tolerate acidic environment than bacteria. Also the depletion in the oxygen level of the spilled area contributed to the population differences. There were no growing grasses around the area spilled with crude oil as at the time of the study which differs from non polluted sites where there were much green grasses growing, This result agrees with the results of Okereke, Obiekezie and Obasi (2007)

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