

RESEARCH ARTICLE

THE INVESTIGATION OF BACTERIAL DEGRADATION OF CRUDE OIL BY GRAVIMETRIC ANALYSIS

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ABSTRACT

Crude oil contamination leads to unmanageable extent of loss of biological life that has several negative impacts on global economy. Intensified physical and chemical clean-up and prevention technologies have found temporary solutions. But present study had revealed that almost complete removal can be possible by bioremediation using microorganisms, in particular; Fungi and Bacteria species. In this present study, Bacteria were isolated from soil obtained from oil contaminated Mechanic site in Enugu. Out of the 206 forming colonies, 16 colonies were selected based on observable morphological differences and screened for crude oil degraders. Out of the 16 isolates, 11 isolates were assumed to be degraders because they formed maximum clear zones on mineral salt media. At the end of 14 days incubation on testing the isolates for biodegradation, 14 out of the 16 isolates degraded the crude oil ranging from 5% to 60%. Isolate 1, 5 and 14 had the highest percentage degradation of 60%, followed by isolate 13 that had 50% degradation. While isolate 3 was the least degrader with 5% degradation. Isolate 2 and 16 were not able to degrade the crude oil. An attempt to identify the isolates was done by sequencing the 16s rRNA gene of the isolates using DNA sequencing technique. Isolate 2, 3, 4, 5, 6, and 7 were identified as *Escherichia coli*, *Streptococcus anginosus* strain SK52, *Lactobacillus* spp. G12, *Bacillus cereus* strain Alb17, *Paracoccus* spp. KF89, *Lactobacillus* spp. G22 respectively. While isolate 1, 8, 9, 10, 11, 12, 13, 14, 15 and 16 did not produce any result. This study shows that microorganisms isolated from a non native crude oil contaminated site can be utilized for bioremediation.

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INTRODUCTION

As industrialization expands, petroleum hydrocarbons have become a greater potential source of contaminants in the water and soil environments (Margesin and Schinner, 2001). Petroleum-based products are the major source of energy for industry and daily life, at the same time, petroleum is a major pollutant of the environment (Mehdi and Giri, 2008). Due to its complicated composition, petroleum has the potential to elicit multiple types of toxic effects. It can cause acute lethal toxicity, sub-lethal chronic toxicity, or both depending on the exposure, dosage, and the organism exposed. Some components of petroleum have the potential to bioaccumulate within susceptible aquatic organisms and can be passed by trophic transfer to other levels of the food chain (Gardner et al., 1991; Orisakwe et al., 2004). Crude oil is a naturally occurring complex mixture of hydrocarbon and non-hydrocarbon compounds which at appropriate concentration, possesses a measurable toxicity towards living systems.

The toxicity of crude oil or petroleum products varies widely, depending on their composition, concentration, environmental factors and on the biological state of the organisms at the time of the contamination (Obire and Anyanwu, 2009). Leaks and accidental spills occur regularly during the exploration, production, refining, transport, and storage of petroleum and petroleum products, the release of hydrocarbons into the environment whether accidentally or due to human activities is a main cause of water and soil pollution.

Interest in the microbial biodegradation of pollutants has intensified in recent years as humanity strives to find sustainable ways to clean up contaminated environments (Koukkou, 2011 and Diaz, 2008). These bioremediation and biotransformation methods endeavour to harness the astonishing, naturally occurring ability of microbial xenobiotic metabolism to degrade, transform or accumulate a huge range of compounds including hydrocarbons (e.g. oil), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), heterocyclic compounds (such as pyridine or quinoline), pharmaceutical substances, radiocyclides and metals. Major methodological breakthroughs in recent years have enabled detailed genomic, metagenomic, proteomic, bioinformatic and other high-throughput analyses of environmentally relevant microorganisms providing unprecedented insights into key biodegradative pathways and

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