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# Biodiversity - 2015: Study on the effect of interaction of plants and indigenous micro-organisms in degradation of n-alkanes in crude oil contaminated agricultural soil

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## Abstract

The simplest kind of bioremediation is natural bioattenuation, during which the indigenous microbial populations degrade recalcitrants or xenobiotics supported their natural, nonengineered metabolic processes. According to the Environmental Protection Agency in the United States NA or intrinsic bioremediation processes include a variety of physical, chemical, and biological processes that act to reduce the mass, toxicity, mobility, volume, or concentration of contaminants. These processes include aerobic and anaerobic biodegradation, dispersion, dilution, sorption, volatilization, decay , and chemical or biological stabilization, transformation, or destruction of contaminants.

Natural attenuation as a tool at this moment is now renewed to develop criteria and methods to follow the process of intrinsic bioremediation and to make this process more predictable and therefore more suitable as a bioremediation tool. In the situation of this study, plants in interaction with microorganisms are now employed. Plant roots release an honest kind of materials to their surrounding soil; these include various alcohols, ethylene, sugars, anion and organic acids, vitamins, nucleotides, polysaccharides and enzymes. Microorganisms within the rhizosphere react to the various metabolites released by plant roots. They (rhizosphere microbes) and their products also interact with plant roots during a sort of positive, negative and neutral ways. Such interactions can influence plant growth and development, change nutrient dynamics, and alter the plant susceptibility to disease and abiotic stress. On the opposite hand, they function liable sources of nutrients for other organisms, thus creating a soil microbial loop additionally to playing critical roles in organic matter synthesis and degradation. A wide range of bacteria within the rhizosphere can however, promote plant growth. The living beings speak with the plant utilizing complex substance signals. These concoction signal mixes incorporate auxins, gibberellins, glycolipids and cytokinins.

Furthermore, plants do accumulate non-essential and/or toxic mineral elements like lead, sodium, within the ir ionic form once they're present within the soil solution. Their growth, on the opposite hand, may therefore be limited by the supply of essential elements, also as by the presence of those toxic elements. However, the interactions between plant roots and organisms within their rhizosphere help them to accumulate essential mineral nutrients and stop the buildup of toxic elements. Since all the minerals that a plant requires must come from the ground/soil, and because the activity of microbes within the soil are central to the efficient solubilization of these mineral elements, it's not surprising that a series of generalized and specific plant-microbe

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associations exist to perform this function [8,9]. This study therefore was designed to elucidate the effect of interaction between plant and indigenous micro- organisms on the degradation of n-alkanes in petroleum contaminated agricultural soil.

Agricultural soil samples from mapped out areas for the study were aseptically collected with sterile plastic sample containers and microbiologically analyzed to isolate autochthonous microbial flora. After pollution though, soil samples were also collected to understand the persisting isolate the polluted soil. These were administered using spread plate method of Cheesbrough on agar (Oxoid), MacConkey agar (Oxoid), Mineral salt agar (Lab-M) and Saboraud dextrose agar (Oxoid. The microorganisms isolated were characterized morphologically and biochemically using standard microbiological methods; whereas identification was as described in Berger's Manual of Determinative Bacteriology. Seeds of 4 annual crops including cowpea var unguiculata, Mucuna pruriens, corn and T. occidentalis used were planted on the test soil and polluted with Bonny light petroleum twenty eight (28) days after plant growth. Thirty days after pollution, soil samples were collected within the rhizosphere of the test plants and examined microbiologically to isolate persisting microorganisms within the polluted soil. The variation in degradation of n-alkanes was ascertained using Gas chromatographic analysis on test soil samples and compared with the control. The pre microbial lab analysis of the soil under study revealed culturally, the presence of Penicillum sp., Aspergillus fumigatus , Aspergillus niger, Candida sp., Pseudomonas fluorescence, Acinetobacter baumanni, Bacillus mycoides, Klebsiella sp., Staphylococcus aureus and Escherichia coli whereas the absence of the last two isolates was observed during post microbial analyses. The results of the GC analysis on comparison to the control sample depict that plants kept within the green house were ready to degrade alkanes within the range of $C_7$ to $C_{12}$ and $C_{32}$ to $C_{40}$ while samples in the field degraded alkanes within the range $C_7$ to $C_{15}$ and $C_{36}$ to $C_{40}$. M. pruriens degraded $C_{13}$ in addition. This study might be a promising tool in conversion of petroleum in contaminated agricultural soil to less toxic substances for enhanced remediation.



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