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Study of DNA Fingerprinting and Hydrocarbon Bioremediation of Soil for Using Burgan Oil Field Sources

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Abstract

To evaluate the biodegradation of polluted soil from the Burgan oil field in Kuwait, a novel combination of GC-MS & Pyrolysis-GC-MS fingerprinting approaches and metagenomic profiling of microbial populations was utilised. To assess the viability of this material for bioremediation, compost was applied to the soil in microcosms. The most successful study demonstrated a drop in TPH, showing high potential for wide-scale deployment utilising a technology that is both affordable and in keeping with the circular economy's guiding principles. The microbiological investigation revealed that adding compost improved the soil's organic matter and nutritional content. Compost additions act as a biostimulation rather than a bioaugmentation strategy since the microorganisms in the compost did not appear to play a significant role in bioremediation. The Chemical analysis of the various oil fractions revealed chemicals that decomposed quickly and others that were considerably more resistant to degradation.

Keywords: Oil Spill; Compost; Bioremediation; Oil Fingerprint, Microbial degradation

Introduction

It is noteworthy that, despite the fact that heavy components are typically thought to be resistant to biodegradation, we were able to use double-shot thermodesorption and pyrolysis to detect the beginnings of asphaltene breakdown. The treated soil also included some of the substances identified in the compost, such as coprostanol, cholesterol, and plant sterols, according to chemical fingerprinting results [1]. This finding would be in favour of using these substances as proxy to track the effects of compost and modify doses during large-scale bioremediation procedures. Petroleum hydrocarbons may pollute the environment in a number of ways, including spills and the usage of petroleum-based goods [2]. In this background, Kuwait likely saw the largest oil leak in recorded history during the Gulf War in 1991 [3]. In addition to the creation of several oil lakes and the partial volatilization of light chemicals, this spill seriously harmed the ecosystem. Large black smoke plumes were also produced by the oil field fires, and these finally settled as soot, tar mats, and tarcrete deposits [4]. Al-Dahanii the Greater Burgan field, the biggest clastic oil field in the world with an area of 838 km2, is situated in southeast Kuwait and was one of the key locations impacted by this environmental catastrophe. Choosing a remediation technique to address hydrocarbon-induced soil contamination depends on several elements, including the kind and quantity of oil fractions and the constituents involved, the soil's characteristics, the amount of time available for remediation measures, and the cost [5].

Discussion

Given its low energy consumption, minimal danger of pollutant migration and secondary environmental effects, and cost-effectiveness, bioremediation may be the best course of action in this case [6]. In fact, a wide variety of microbes have learned to utilise aliphatic and aromatic hydrocarbons as a source of carbon and energy [7]. Therefore, boosting natural microbial populations or introducing foreign ones can promote biodegradation. Aerobic biostimulation procedures have frequently been used in successful bioremediation treatments [8]. In recent decades, the biosphere's levels of several environmental pollutants have increased [9]. Chemical pollutants' concentrations, length of stay in various environmental matrices, mobility, and environmental destiny all affect how dangerous they are to human health [10]. The need for safer green chemicals is highlighted by the fact that chemical pollutants at excessive quantities can leave a lasting "chemical footprint." The diverse environmental matrices were further disturbed by the uncontrolled environmental discharge of a number of new contaminants, including medicines, personal care goods, chemical additives including PFAAS, endocrine disrupting chemicals, MPs/NPs, mycotoxins, micro pollutants, and NPs. EDCs and PPCPs, which are dangerous to human health even at extremely low concentrations, are examples of developing micro pollutants in this regard. They are environmental contaminants that do not have established regulatory limits.

Conclusion

EDCs in a water environment can either come from estrogenic hormones or are generated as a result of human activity. According to the Stockholm Convention's POPs criterion, EDCs that have been absorbed into extremely unfavourable environmental circumstances may have increased mobility and permanence in the environment. EDCs have a variety of dangerous effects, such as preventing reproduction and lowering birth rates. Alterations in gene expression brought on by EDC exposure have a negative impact on thyroid function, metabolism, and hormonal balance. In accordance with all of the foregoing, we used microcosm experiments to investigate the efficacy of compost as the primary ingredient for the rehabilitation of soil damaged by an oil spill in Kuwait's Burgan field. In addition to looking at how the concentration of total hydrocarbons changed, we also employed a thorough GC-MS fingerprinting to pinpoint the fractions that suffered the most biodegradation and could therefore be described as really resistant. The variations in the heavy fractions were also investigated using gravimetric

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measurements and Py-GC-MS analysis. Additionally, we conducted a microbiological investigation using ARISA that was centred on the DNA fingerprinting of microbial populations, allowing us to deduce the functions of bacterial populations in compost biostimulation. By combining these two quick molecular fingerprinting.

Acknowledgement

None

Conflict of Interest

None

References

1. Axelsson M, Gentili F (2014) A single-step method for rapid extraction of total lipids from green microalgae. PLoS One 9: e89643.
2. Bligh EG, Dyer WJ (1959) A rapid method of total lipid extraction and purification. Can J Biochem 37: 911-917.
3. Breil C, Meullemiestre A, Vian M, Chemat F (2016) Bio-based solvents for green extraction of lipids from oleaginous yeast biomass for sustainable aviation biofuel. Molecules 21: 196.
4. Breil C, Abert Vian M, Zemb T, Kunz W, Chemat F, et al. (2017) Bligh and Dyer" and Folch methods for solid–liquid–liquid extraction of lipids from microorganisms. Comprehension of solvatation mechanisms and towards substitution with alternative solvents. Int J Mol Sci 18: 708.
5. Brennan RB, Healy MG, Grant J, Ibrahim TG, Fenton O, et al. (2012) Incidental phosphorus and nitrogen loss from grassland plots receiving chemically amended dairy cattle slurry. Sci. Total Environ 44: 132-140.
6. Bull ID, Lockheart MJ, Elhmmali MM, Roberts DJ, Evershed RP, et al. (2002) The origin of faeces by means of biomarker detection. Environ Int 27: 647-654.
7. Caprioli G, Giusti F, Ballini R, Sagratini G, Vila Donat P, et al. (2016) Lipid nutritional value of legumes: evaluation of different extraction methods and determination of fatty acid composition. Food Chem 192: 965-971.
8. Cescut J, Severac E, Molina Jouve C, Uribelarrea JL (2011) Optimizing pressurized liquid extraction of microbial lipids using the response surface method. J Chromatogr A 1218: 373-379.
9. Chitescu CL, Oosterink E, de Jong J, Stolker AAM (2012) Ultrasonic or accelerated solvent extraction followed by U-HPLC-high mass accuracy MS for screening of pharmaceuticals and fungicides in soil and plant samples. Talanta 88: 653-662.
10. Fahy E, Subramaniam S, Murphy RC, Nishijima M, Raetz CR, et al. (2009) Update of the LIPID MAPS comprehensive classification system for lipids. J Lipid Res 50: S9-S14.