A systematic review on the implementation of advanced and evolutionary biotechnological tools for efficient bioremediation of organophosphorus pesticides

Marchla Trindade*

Department of Biotechnology, University of Western Cape, South Africa

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Introduction

Bioremediation technology courses are prescribed physical activities or strategies used in microbial therapy. The overall process begins by identifying the status of the contaminated site and characterizing the microorganisms present [1]. Scientists observe how these microbes already interact with contaminants and perform laboratory tests to determine colonization requirements. Catabolic activity is studied in the laboratory, from which field plans are developed [2]. Once this is implemented, the bioremediation process will be monitored and adjustments made as necessary. Three classes of techniques can be used for ex-situ processing [3]. One of these is land management, which involves spreading and biologically decontaminating the soil. The other is composting, which is an older process. The 3rd class includes piles. Bio pile is a hybrid process in which material is piled up in silos and composted as a biological treatment [4]. A bioremediation strategy is a plan that outlines how the fieldwork will be conducted. Different engineering applications depend on the saturation level of the site and the types of contaminants that need to be removed. Techniques also depend on site conditions such as soil composition, compaction, water table, and runoff characteristics [5]. The best technique for a given situation also depends on whether the contaminated material requires on-site work or off-site removal. With today's advanced technology, most soiled properties can be treated on-site.

Description

There are 3 main bioremediation strategies, each using individually designed instruments [5]. Bioventing is the most popular bioremediation approach. In this process, a small diameter well is drilled into the ground. This allows air infiltration and passive aeration, during which soil gases produced by microbial action are released [3]. This approach can be used for groundwater and soil problems because it modulates the aeration rate, which controls the rate of nutrients and oxygen. Biosparging involves injecting high-pressure air into the ground or water table [1]. This process increases oxygen concentration and improves biological air distribution. It is much more effective and affordable than digging or tilling contaminated soil or circulating contaminated water through pumps and filter tanks. Industries often use bio augmentation to add exogenous species or native microorganisms to industrial sites [4]. Augmentation works in conjunction with venting and bio sparging applications but has limitations. Non-native microbes are usually incompatible with native bacteria, so many of the additives to bio augmentation are additional microbes to those already working [2]. Other bioremediation strategies for contaminated soil and groundwater sites can also be implemented. Oil and petroleum waste pollute many areas. Methane is another important pollutant produced by biological processes. Most regulatory agencies are strict about adding other contaminants to the environment, a side issue of the bioremediation process.

Conclusion

Oil is lighter than water and floats on surfaces, creating a spill and cross-contamination hazard. Methane gas gives off a foul odor when released in large amounts. This often occurs when contaminated soil is agitated, but it occurs passively through venting and sparging. Special bioremediation devices are available. Most bioremediation devices are easy to use, but some require professional operation by trained individuals. Specialized bioremediation equipment is typically less expensive than the heavy trucks and machinery required for soil excavation. Soil and groundwater remediation systems offer fully integrated, pre-wired, pre-plumbed turnkey operation, factory tested, and field-ready. They are available in air sparging, bio sparging, and bottom steam extraction systems. These systems also air-strip and complete oil-water systems are installed on exposed or enclosed trailers. A fully integrated custom environmental remediation system goes 1 step further. They set standards across the industry. These complete custom systems include standard air injection and bottom air extraction. There is a 2 phase extraction system with thermal catalytic oxidizer and liquid-phase and gas-phase carbon adsorption. A 2 stage recovery system fills the gap. Do 2 things in 1 with a vacuum blower and moisture separator. Gauges, NEMA IV panels and lever controls can be custom designed to your exact specifications. Options include filter vessels, oxidizers and manifolds with flow indicators.

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Conflict of Interest

The author declares there is no conflict of interest in publishing this article.

*Correspondence to

Marla Trindade
Department of Biotechnology
University of Western Cape
South Africa
ituffin_mt@uwc.ac.za

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