

DEVELOPMENT OF BIOREMEDIATION TECHNIQUE FOR USED LUBRICATING OIL CONTAMINATED SOIL BY USING A NOVEL BACTERIAL STRAIN, *Brachybacterium conglomeratum* RUH₁ – A PILOT STUDY

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Contamination of soil by used lubricating oil (ULO) is a widespread environmental problem resulting negative impacts on soil properties, biota, and overall soil productivity. Therefore, development of bioremediation techniques using native microorganisms isolated from ULO contaminated sites has become a promising technology. Proper understanding of the efficiency and effectiveness of the particular strain selected for the bioremediation strategy is a crucial step in planning large scale bioremediation strategies. Therefore, the present study aimed to explore the ULO degradation efficiency and effect of contamination level on ULO degradation efficiency of the RUH₁, isolated from ULO contaminated soil. The initial screening test, well diffusion assay confirmed the potential of *Brachybacterium conglomeratum* RUH₁ to biodegrade ULO by utilizing ULO as the sole source of carbon and energy. Further experiments were carried out in laboratory-scale microcosms with 1-5% w/w contamination levels of ULO at a time interval of 10, 20, and 35 days for the characterization of ULO biodegradation of RUH₁. Results indicated a decreasing trend in residual total petroleum hydrocarbon (TPH) content at all five contamination levels. The calculated biodegradation percentages inferred time-dependent increase in the biodegradation of ULO. At 35 days, the biodegradation percentage were 77.63%, 66%, 55.56%, 50.86%, and 41.66% for the 1-5% w/w contamination level of ULO respectively. Two-way ANOVA revealed significant interactive effects ($P < 0.05$) of contamination level and incubation time period on the residual TPH content. The highest total microbial activity (TMA) was recorded as 2.82 at 1% contamination level while the least as 1.77 at 5% contamination level. Following 35 days of incubation highlighting both time and contamination-level dependent decrease in TMA. Results showed a significant ($P < 0.05$) interactive effect of both contamination level and time on TMA. The measure statistically significant ($P < 0.05$) negative correlation between the residual TPH content and TMA from the microcosms at different incubation time inferred the time-dependent reduction in bioavailability of ULO. Therefore, findings of the study highlight the potential to develop *Brachybacterium conglomeratum* RUH₁ mediated bioremediation technique for ULO contaminated soil.

Keywords: Biodegradation, *Brachybacterium conglomeratum*, Contamination, Used lubricating oil