Revealing Efficient Oil-Degrading Microbes and Uncharacterized Strains From Oil-Contaminated Soil for Bioremediation

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Oil contamination in soil poses a significant threat to ecosystems and human health, underscoring the need for effective remediation strategies. This study aimed to isolate and identify oil-degrading bacteria from contaminated soil and evaluate their bioremediation potential. Soil samples were collected from an oil storage facility in Chungbuk, South Korea, and from a non-contaminated control site. These samples underwent chemical analysis for Total Petroleum Hydrocarbons (TPH) and BTEX, and microbial community composition was assessed via 16S rRNA sequencing, revealing that oil contamination markedly alters microbial diversity. Seventy bacterial isolates were obtained using kerosene minimal medium and subsequently identified by colony PCR and BLAST analysis, resulting in the identification of 21 species across six genera. Notably, strain K3, classified within the Pseudomonas genus, displayed distinct differences from known species, suggesting that it may represent a novel, unrecorded species. The degradation efficiency of these isolates was evaluated by monitoring growth curves in minimal media containing either kerosene or diesel and by analyzing residual hydrocarbons using THF-GPC. Among the isolates, Bacillus paramycoides exhibited superior kerosene degradation efficiency compared to the others. These findings indicate that targeted bioremediation using indigenous oil-degrading bacteria can effectively mitigate petroleum contamination while also contributing to the discovery of new microbial resources. Further optimization of growth conditions and comparative studies with engineered strains may enhance the practical application of these bacteria in remediating oil-polluted soils.

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