

Solid inoculants as a practice for bioaugmentation to enhance bioremediation of hydrocarbon contaminated areas

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Abstract

Vacuum freeze-drying is a scientifically advanced method to prepare solid inoculants from oil degrading bacterium. The introduction of oil-degrading microbes or bioaugmentation can be an efficient way to bioremediate oil spills in marine areas, where oil-degrading bacteria are deficient. The purpose of this study is to evaluate the potential use of solid inoculants of LZ-2 bacteria to enhance the degradation rate of crude oil. In this study, response surface methodology (RSM) was incorporated into the experimental design to optimize a response, which is influenced by different protectants. Our results showed that five factors have interactive and synergistic protective effects on the growth of LZ-2. Optimal growth of freeze-dried LZ-2 (63.8%) was observed with a 10.5% solution of skim milk supplemented with 14.3% sucrose, 14.4% of trehalose, 4.9% of glycerin and 14.7% of β -cyclodextrin. The culture grew in medium containing crude oil (3 g/L) at 37 °C at 150 rpm for 30 days, GC and GC-MS analysis showed biodegradation of 44.2 and 21.6% for total saturate and aromatic hydrocarbons respectively. These results indicated that the solid inoculants of LZ-2 bacteria had the potential to be used for ex-situ bioremediation of hydrocarbon pollutants associated with crude oil.

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