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Biodegradation of petroleum hydrocarbon waste using consortia of *Bacillus* sp

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Abstract

Petroleum hydrocarbons are toxic to all forms of life; therefore, environmental pollution caused by petroleum is of great concern. Bio-based environmentally friendly strategies are preferred for the remediation of these contaminated sites. This study investigated the potential of consortia of *Bacillus* spp for the removal of petroleum hydrocarbons from synthetic media and industrial effluents. Of the 115 isolates, the top three performing isolates, designated as GPA 11.2, GPA 7.1, GPA 3.5, were selected and identified using 16 s rDNA as *Bacillus subtilis* (GPA 11.2), *Bacillus methylophilus* (GPA 3.5), and *Bacillus amyloliquefaciens* (GPA 7.1). The three strains were combined to produce three different consortia designated as prototype 1, prototype 2, and prototype 3. The bioremediation potential of each consortium was evaluated by Gas Chromatography (GC) using industrial effluents that contained hydrocarbons. Results indicated that the bulk of the contaminants were removed during the first 48 h; and removal (%) did not increase significantly after 72h. The total petroleum hydrocarbons (TPH) (C8–C28) removal rates from synthetic effluent after 48h of treatment using prototype 1, prototype 2, and prototype 3 were 64.9%, 30.0%, and 79.8%, respectively. The TPH (C8–C28) removal rate from true effluents after 48h of treatment using prototype 1, prototype 2, and prototype 3 consortia were 64.5%, 53.6%, and 52.7%, respectively. The results showed that the best performing consortium was prototype 1. This study has demonstrated the potential application of *Bacillus* consortia as bioremediation agents for the treatment of hydrocarbon-contaminated sites.