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A preliminary study on the potential use of hydrocarbon degrading bacteria to develop a bio-product for bioremediation

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In Sri Lanka, numerous contaminated sites exist as a result of more than 60 years of environmental issues. Since these sites require cleaning using either physical, chemical or biological methods. The biological method is preferred over the other methods due to it being environmental friendly, efficient and cost effective. The main objective of this study was to assess the hydrocarbon degrading ability of bacterial strains found in Sri Lanka and to develop a bio product by immobilizing bio remediating bacteria using a suitable carrier in order to clean up oil contaminated sites. Three sampling areas were identified with petrol contamination in soil and six samples from each sampling site were obtained randomly using a soil-core (n=18). A composite sample was prepared for each sampling area and bacterial strains in the soil samples were isolated, and identified by 16S rRNA sequencing. A total of 10 bacterial strains were identified from the contaminated soil samples (*Ochrobactrum intermedium*, *Agrobacterium tumefaciens*, *Achromobacter xylosoxidans*, *Enterobacter aerogenes*, *Acinetobacter calcoaceticus*, *Microbacterium oleivorans*, *Pseudomonas aeruginosa*, *Acinetobacter oleivorans*, *Raoutella ornithinolytica*, *Paenibacillus odorifer*). Among them the latter five bacterial strains were recognized as suitable candidates for the bioremediation based on their low pathogenicity and high bioremediation ability and were used to make a bacterial cocktail mixture for immobilization due to the increased efficiency of bioremediation compared to a single strain. In this study powdered saw dust or rice husk together with Yeast Extract Glucose (YEG) were used as immobilizing agents. Single colonies of bacterial strains were grown overnight in Lysogeny Broth (LB) broth and were added to rice husk and saw dust treated with YEG separately. The samples were incubated in a rotary shaker at room temperature for 6 days and were grown on the Bushnell Hass (BH) agar media containing engine oil as the carbon source to confirm their growth. These immobilized bacteria when used to treat artificially contaminated sea water under laboratory conditions were found to be capable of degrading oil. Of the two materials, rice husk appear to be a better carrier as it floats (and therefore is in contact with the oil layer) compared to saw dust, which sank. Furthermore, rice husk was found to degrade at a lower rate and the bacterial growth was greater than observed with saw dust.

Keywords: Bioremediation, hydrocarbons, immobilization, rice husk, saw dust