Phytoremediation of Diesel Contaminant using Antarctic Fresh Water Algae

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Phytoremediation emerges as a sustainable technique in mitigating organic and inorganic pollutants, apart from using microbes in the conventional bioremediation process. It comprises several mechanisms using plants, fungi and algae (either in part of the organism or as a whole) to remove, stabilise or degrade toxic heavy metals and xenobiotics. Algae, as the most abundantly found photosynthetic organism in polar regions that form the basis of the food webs in ecosystem, are of particular interest to explore their phytoremediation potential. In fact, few studies have reported the capability of algae in metal absorption and accumulation. However, the study about the response of algae on oil and hydrocarbon contaminant is still very limited, especially those originated from Antarctica. This study encompasses the phytoremediation ability of Antarctic fresh water alga, isolate G4 in degrading diesel hydrocarbon at optimised condition. The working culture was isolated from Greenwich Island, Antarctica and cultivated in Bold's Basal Medium at 12:12 h light/dark (L/D) cycle (42 µmol m^{-2} s^{-1}). The result showed 60% -70% of degradation efficiency at the early screening phase with 1% v/v diesel concentration. Gravimetric method was adopted to quantitatively analyse the hydrocarbon degradation efficiency using n-hexane as solvent to extract residual oil. Abiotic factors (nitrogen source type and its concentration, salinity, pH, photoperiod and diesel concentration) that recorded the highest biodegradation efficiency at one-factor-at-a-time level were analysed further using Plackett-Bruman design revealing nitrogen concentration, salinity, photoperiod and diesel concentration prevail as significant factors (R^2=0.9980).

References

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