Efficiency of polycyclic aromatic hydrocarbons (PAHs) degrading consortium in resisting heavy metals during PAHs degradation

ABSTRACT

Polycyclic aromatic hydrocarbons (PAHs) comprised of many dangerous organic pollutants which affect human cell. The choice of phenanthrene and pyrene as model substrates was based on their classification among the most hazardous PAHs group by the US EPA where they belonged to low and high molecular weights PAHs respectively. Biodegradation of these PAHs is the best strategy that completely removes such pollutants in an environmentally friendly manner. However, the bacteria involved are challenged degradation difficulties as a result of PAHs inhibitory effects to the organisms. This research is aimed at formulating phenanthrene and pyrene degrading consortium that effectively perform best even in complex mixture with hazardous heavy metals. Different bacteria consortia were formulated using the compatibility testing and mathematical permutation approach and the best consortium selected. This selected consortium was then subjected to the degradation of both phenanthrene and pyrene separately in a combined mixture with the selected heavy metals from the inductively coupled plasma optical emission spectrophotometer (ICP-OES) analysis. Consortium composition of *C. sakazakii* MM045 (2%, v/v) and *Enterobacter* sp. MM087 (2%, v/v) were found to be much effective during phenanthrene (500 mg/L) and pyrene (250 mg/L) degradation. This consortium also resisted more than 6 mg/L each of Nickel (Ni), Cadmium (Cd), Vanadium (V) and Lead (Pb) in such complex degradation which was found to be more than the concentration in the natural habitat the consortium exists prior to isolation. Such performance makes the selected consortium to be an extremely efficient tool for the PAHs degradation application as many biodegradation agents were reported to be less effective when significant concentration of Ni, Cd, V and Pb are present.

Keyword: PAHs; Biodegradation; Hazardous metals; Resistance