ABSTRACT

Carbazole is the major nitrogen containing heterocyclic aromatic hydrocarbon present in diesel. Presence of nitrogen element in diesel is not desirable as diesel fuel with high nitrogen content, on combustion releases oxides of nitrogen (NO, NO₂, N₂O) in the environment which are responsible for acid rain, smog formation, destruction of ozone layer, global warming and formation of unhealthy particulate matters. Apart from these environmental and health related problems, carbazole and its derivatives also have some major refining and fuel quality related issues. Conventional hydrotreating technology (Hydrodenitrogenation), used for the removal of nitrogen from carbazole, is an expensive and energy intensive process. Biodenitrogenation, a biological approach for the removal of nitrogen from the fuel oil is emerging as an attractive alternative technology in the petroleum industry. During this study four bacterial strains viz. Acinetobacter sp. Alp6, Acinetobacter sp. Alp7, Enterobacter sp. A8 and Pseudomonas sp. GBS.5 were identified and characterized for carbazole degradation. Specific activity of carbazole degradation was calculated as 7.96, 5.82 and 11.36 µmol/min/g dry cells for Alp6, Alp7 and GBS.5, respectively. Pseudomonas sp. GBS.5 showed the biosurfactant production during carbazole degradation and was able to degrade wide range of aliphatic and aromatic compounds. Carbazole degrading car genes, from the strain GBS.5, were identified and sequenced. Carbazole dioxygenase encoding carAaAcAd genes were cloned and expressed in E. coli using pGEX-4T-3 expression vector. Whole cell lysate of IPTG induced recombinant E. coli cells showed a wide range of PAHs degradation but were not able to degrade aliphatic hydrocarbons.