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Biodegradation of Petroleum hydrocarbons and Biosurfactant production by an extremely halophilic Archaea Halovivax sp. A21

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ABSTRACT/RESUME

Abstract: *Over the recent few years, biosurfactant has played an important role in the industrial application especially in oil recovery; even in high salinity conditions. The potential of biosurfactant production by the extreme halophilic archaeon Halovivax sp. A21 in the presence of petroleum hydrocarbons (2% v/v) as sole carbon source at high salinity (25% NaCl) has been investigated. The results show the ability of Halovivax sp. A21 to grow and reduce surface tension under an optimum range of pH (7-9), salinities (15-35% NaCl) and temperature (40-45°C) for an optimized volume of 100 ml of the medium for 1000 ml capacity Erlenmeyer flasks with an optimum agitation of 120 rpm. The rates of biosurfactant production on petroleum hydrocarbons were enhanced with increasing NaCl concentration in the medium with an optimum of 25%. Biosurfactant production by Halovivax sp. A21 showed high emulsifying activity (more than 80%) and decreased surface tension (24.5 mN/m). The stability of the produced biosurfactant was determined by different physico-chemical conditions like pH, temperature and salinity. Moreover, the partial purification of the derived biosurfactant by silica gel column chromatography and Thin-layer chromatography revealed that it belongs to the lipopeptide group. Although both catechol dioxygenases participated in the degradation of petroleum hydrocarbons, more induction of catechol 1,2 dioxygenase was observed than the catechol 2,3 dioxygenase which indicated the predominance of the ortho cleavage pathways in the petroleum hydrocarbons degradation by the halophilic strain Halovivax sp. A21.*

The results demonstrated that strain Halovivax sp. A21 was able to increase the bioavailability of insoluble hydrocarbons, thus facilitating their uptake and their biodegradation even at high salt concentration. Likewise, the search of novel biosurfactants in extremophiles, or the use of microorganisms that present excellent degradation capacity together with the production of stable biosurfactant from contaminant (hydrocarbon compounds) as a carbon source seem to be particularly promising since they have particular adaptations to increase stability in adverse extreme environments.