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BIOSURFACTANT PRODUCTION FROM AN ISOLATED MARINE BACTERIAL COMMUNITY

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Abstract

Biosurfactants (BS) are "green" amphiphilic molecules that can potentially substitute industrial surfactants used in the oil-degrading process, based on their emulsification properties. They are complex surfactant molecules, with different structures, comprising of glycolipids, lipopeptides and fatty acids. Their most common origin is marine bacterial isolates grown in petroleum-contaminated areas. In this project a complex microbial marine community has isolated from the Elefsina Gulf sea-water samples. Continuous enrichments of the sea-water samples in nutrient broth with crude oil as sole carbon source has led to the enrichment of a mixture of hydrocarbon degraders and biosurfactant producers. Biosurfactant producing bacteria were further isolated using the bacterial adherence to hydrocarbons (BATH) protocol. The isolated biosurfactant producing community was subsequently used for culture optimization studies. In particular, the effect of temperature, cultivation time, supplementation of N & P and the nature of carbon source (crude oil versus molasses) were examined in an effort to enhance biosurfactant production during the cultivation process. The different types of biosurfactant mixtures produced were isolated from the culture broth, using appropriate extraction methods. Extracts were further purified by silica gel column chromatography and the isolated biosurfactants were analyzed by thin layer chromatography (TLC) and Fourier transform infra red spectroscopy (FT-IR). The types of low molecular weight biosurfactants identified are rhamnolipids, sophorolipids, and trehalose lipids, while the high molecular weight fraction is comprised of lipopeptides and neutral lipids. The biosurfactant production specific yield was found to be in the range of 0.3-0.9 g-BS/g-biomass at the end of 15 day long batch cultivations.

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