

Effect of biosurfactant on degradation of polyaromatic hydrocarbons in different agricultural soils under different environments

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A lipopeptide biosurfactant isolated from *Lysinibacillus* sp. MW444883 and characterised using liquid chromatography-high resolution mass spectroscopy. The production of the biosurfactant was optimised under conditions of 27°C and 150 rpm (yield ~2.65 g/l), and Oil dispersion varied from 6 to 8.5 cm. Degradation and half-life of polyaromatic hydrocarbons in inceptisol soils (collected from Delhi and Jharkhand agricultural field) under different environments (28°C and 37°C) varied for naphthalene (20.8%–100%; 1.16–9.86 days), fluorene (5.8–93.8%; 5.6–14.4 days), phenanthrene (6.0%–94.1%; 5.4–22.5 days) and pyrene (5.8%–78.7%; 10.3–27.0 days) respectively. Additionally, dehydrogenase and carbon dioxide varied from 9.6 to 45.1 $\mu\text{g TPF g}^{-1}$ soil h^{-1} and 146.6 to 401.4 $\text{mg kg}^{-1} \text{ d}^{-1}$, 1 respectively, over 0–21 days.

Keywords: Carbon dioxide release, lipopeptide biosurfactant, oil dispersion, optimisation, PAHs degradation.

The majority of surfactants sold commercially are made from petroleum derivatives. Biosurfactants are substances of microbiological origin that display surfactant characteristics, such as the ability to emulsify and a decrease in surface tension². Compared to chemical surfactants, biosurfactants are more environmentally friendly, less toxic, more biodegradable, more selective, and more active at high salinity, pH and temperature extremes.

Over the past few decades, as offshore oil exploration and marine traffic have risen, more crude oil spills have entered the marine environment. Over 210 million gallons of oil were spilt into the Gulf of Mexico in 2010 due to the Deepwater Horizon oil leak. Reducing the size of oil droplets by lowering the interfacial tension between the oil and water under wave action is the fundamental idea behind the dispersant used in oil spill response. In this emulsification process, the oil slick must be transformed into distinct droplets that are stable until coalescence by using an efficient dispersant.

According to the United States Environmental Protection Agency (USEPA), 16 polyaromatic hydrocar-