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RHAMNOLIPID PRODUCTION BY BACTERIA ISOLATED FROM CONTAMINATED SOIL

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Abstract

The present study aims to evaluate the ability of bacterial strains isolated in situ from contaminated soil with hydrocarbons in Brazil to produce biosurfactants with the extracts from spent coffee grounds (SCGs). Surfactants are amphiphilic compounds containing hydrophobic (nonpolar) and hydrophilic (polar) moieties that confer ability to reduce the surface and interfacial tensions and forming emulsions in fluids with a wide range of applications. Many microorganisms produce this type of compounds with surface-active properties which were designated as biosurfactants. Biosurfactants bear some advantages, when compared to the conventional surfactants, such as low toxicity and high biodegradability, wide range of temperature and pH. These characteristics allow them to be applied in many different areas such as agriculture, health, food products and environmental protection. Moreover, biosurfactants can vary in terms of nature, size and properties depending on the type of producing microorganisms and each class of biosurfactant has a specific range of application. However biological production of surfactants has high production costs. A possibility to decrease these costs is the use of industrial residues of by-products and the selection of microorganisms able to use these raw materials.

SCGs are rich in carbohydrates and lipids and results from the coffee drawing. Due to the worldwide popularity of coffee as a beverage, SCGs are a cheap residue and produced in high amounts. Two extracts were obtained from the SCGs, one rich in sugars and other rich in lipids (coffee oil). The oil extracted from SCGs can be used as substrate for biosurfactant production.

The coffee oil was characterize by nuclear magnetic resonance (NMR) and gas chromatography with flame ionization detector (GC-FID), verifying that it was rich in palmitic acid (C16:0), oleic acid (C18:1) and linoleic acid (C18:2). The sugar solution was characterized by HPLC.

After its characterization, the oil and sugars extracted from SCGs were supplied to four bacterial strains and their ability in producing biosurfactants was verified and the most efficient were selected. In order to maximize the biosurfactant production the effects of parameters, as the amount of carbon substrate, type of nitrogen source and the C:N ratio, were studied.

Finally the obtained biosurfactants were characterized by mass spectrometry MALDI-TOF/TOF verifying that the selected cultures produced rhamnolipids.