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Characterization of rhamnolipids produced by non-pathogenic *Acinetobacter* and *Enterobacter* bacteria

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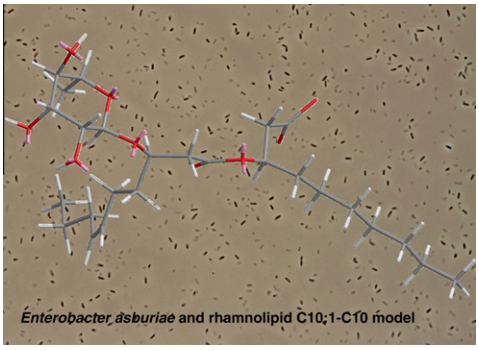
HIGHLIGHTS

- Rhamnolipids were produced by non-pathogenic bacteria *E. asburiae* and *A. calcoaceticus*.
- These rhamnolipids have mild impact on cell properties of soil bacteria.
- Growth media differing in carbon, nitrogen and phosphorus source were tested.
- Correlation of rhamnolipid fatty acid structure and its properties is indicated.

GRAPHICAL ABSTRACT



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ABSTRACT

Rhamnolipid production by two non-pathogenic bacterial strains *Acinetobacter calcoaceticus* and *Enterobacter asburiae*, and established rhamnolipid producer *Pseudomonas aeruginosa* was investigated.

Rhamnolipids were separated from supernatant and further purified by thin-layer chromatography. Mass spectrometry with negative electrospray ionization revealed rhamnolipid homologues varying in chain length and unsaturation. Tandem mass spectrometry identified mono-rhamnolipid and di-rhamnolipid homologues containing one or two 3-hydroxy fatty acids. Several media differing in carbon (sunflower oil, glycerol and sodium citrate), nitrogen (ammonium ions, nitrate) and phosphorus (total content) source, respectively, were tested to obtain enhanced rhamnolipid production. The best production (0.56 g/l) was obtained when nitrate was used as a nitrogen source. Both strains produced rhamnolipids that exhibited excellent emulsification activity with aromatic and aliphatic hydrocarbons and several plant oils. Unlike *P. aeruginosa* the two strains, i.e. *Acinetobacter* and *Enterobacter*, are not pathogenic to humans.

1. Introduction

Biosurfactants are a large heterogeneous group of microbial secondary metabolites. These amphipathic surface-active molecules reduce interfacial tensions on liquid–liquid or liquid–solid phase boundaries. Biological surfactants possess several advantages over synthetic surfactants including high biodegradability, high emulsifying abilities, low toxicity and good general environmental compatibility (Pacwa-Plociniczak et al., 2011). Biosurfactants are therefore products with a broad potential of industrial (bioremediations, cosmetics, food and beverage manufacture) and pharmaceutical applications (Rikalovic et al., 2012).

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