Evaluation of Different Carbon Sources for Growth and Biosurfactant Production by *Pseudomonas fluorescens* Isolated from Wastewaters

Emilia Stoimenova[a], Evgenia Vasileva-Tonkova[b,*], Anna Sotirova[b], Danka Galabova[b], and Zdravko Lalchev[a]

[a] Department of Biochemistry, Faculty of Biology, Sofia University "St. Kliment Ohridski", 8 Dragan Tzankov str., 1164 Sofia, Bulgaria

[b] Bulgarian Academy of Sciences, Institute of Microbiology, Department of Microbial Biochemistry, Acad. G. Bonchev str., bl. 26, 1113 Sofia, Bulgaria. Fax: +3 59 28 70 01 09. E-mail: evaston@yahoo.com

* Author for correspondence and reprint requests

Z. Naturforsch. **64 c**, 96–102 (2009); received June 13/September 22, 2008

The indigenous strain *Pseudomonas fluorescens*, isolated from industrial wastewater, was able to produce glycolipid biosurfactants from a variety of carbon sources, including hydrophilic compounds, hydrocarbons, mineral oils, and vegetable oils. Hexadecane, mineral oils, vegetable oils, and glycerol were preferred carbon sources for growth and biosurfactant production by the strain. Biosurfactant production was detected by measuring the surface and interfacial tension, rhamnose concentration and emulsifying activity. The surface tension of supernatants varied from 28.4 mN m^{-1} with phenanthrene to 49.6 mN m^{-1} with naphthalene and heptane as carbon sources. The interfacial tension has changed in a narrow interval between 6.4 and 7.6 mN m^{-1}. The emulsifying activity was determined to be highest in media with vegetable oils as substrates. The biosurfactant production on insoluble carbon sources contributed to a significant increase of cell hydrophobicity and correlated with an increased growth of the strain on these substrates. Based on these results, a mechanism of biosurfactant-enhanced interfacial uptake of hydrophobic substrates could be proposed as predominant for the strain. With hexadecane as a carbon source, the pH value of 7.0–7.2 and temperature of (28 ± 2) °C were optimum for growth and biosurfactant production by *P. fluorescens* cells. The increased specific protein and biosurfactant release during growth of the strain on hexadecane in the presence of NaCl at contents up to 2% could be due to increased cell permeability. The capability of *P. fluorescens* strain HW-6 to adapt its own metabolism to use different nutrients as energy sources and to keep up relatively high biosurfactant levels in the medium during the stationary phase is a promising feature for its possible application in biological treatments.

Key words: Biosurfactants, Carbon Sources, *Pseudomonas fluorescens*