CONVERSION OF AGRO-INDUSTRIAL WASTES BY *Serratia marcescens* UCP/WFCC 1549 INTO BIOSURFACTANT AND EVALUATION OF STABILITY AND EMULSIFICATION PROPERTIES

Dayana Montero-Rodríguez[1,2], Rosileide F. S. Andrade[2], Daylin Rubio-Ribeaux[1,2], Dafne Luana Ramos Ribeiro[3], Roberto A. Lima[2], Hélvia W. C. Araújo[4] and Galba M. Campos-Takaki[2].

[1]Center of Biological Sciences, Federal University of Pernambuco (Rua Nelson Chaves s/n - Cidade Universitária – Recife - PE, 50670-420), [2]Nucleus of Research in Environmental Sciences and Biotechnology, Catholic University of Pernambuco (Rua Nunes Machado 42 Bloco J Térreo - Boa Vista – Recife – PE, 50050-590), [3]Chemical Engineering Department, Federal University of Pernambuco (Av. Prof. Artur de Sá s/n - Cidade Universitária - Recife – PE, 50740-521), [4]Chemistry Department, State University of Paraíba (Rua Baraúnas 351 - Bairro Universitário - Campina Grande – PB, 58429500).

Abstract

Microbial surfactants are found to play an important role in various fields like bioremediation, biodegradation, oil recovery, food, pharmaceutics and many other industrial sectors. The diverse application of biosurfactants in different areas depends on its ability to reduce surface tension at air/water interfaces, emulsify hydrophobic compounds and its stability at extreme conditions of temperatures, pH and salinity. They can be obtained using agro-industrial wastes as substrates, which helps to reduce overall production costs. This work aimed to investigate the bioconversion of cassava wastewater (CW) and waste corn oil (WCO) into biosurfactant by *Serratia marcescens* UCP/WFCC 1549 and the evaluation of stability and emulsifying properties of biosurfactant. Cultivations were carried out in 250 Erlenmeyer flasks containing 100 mL of production medium, with varying concentrations of CW and WCO, in according to a 2^2 factorial design. Fermentations were performed on a rotatory shaker at 150 rpm and 28ºC, for 72 h. After this period, the surface tension was determined on metabolic cell-free liquid obtained by centrifugation and subsequent filtration of cultures, by the Du Nouy ring method at room temperature. Crude biosurfactant obtained in the better condition of the factorial design was submitted to stability studies in varying values of temperature (0-120 °C), pH (2-14) and NaCl concentrations (2–12%, w/v). In addition, emulsification index (EI_{24}) was determined against petroleum derivatives (diesel, kerosene, engine oil and burned engine oil). Thus, *S. marcescens* UCP/WFCC 1549 demonstrated its ability to produce biosurfactant using a low-cost fermentative medium composed by 6% CW and 7.5% WCO, with reduction of surface tension to 27.8 mN/m. Also, it showed good property to emulsify petroleum derivatives, mainly burned engine oil (EI_{24} = 75%), as well as be stable in a wide range of pH, temperature and salinity. These results suggest the feasibility of biosurfactant produced to be applicated in bioremediation processes in extreme conditions.

Keywords: Biosurfactants, agro-industrial wastes, stability, emulsification, *Serratia marcescens*.

Acknowledgements: Programa PEC-PG/CNPq, CAPES, FACEPE, NPCIAMB-UNICAP.