

NOVEL PRODUCTION OF BIOSURFACTANT BY *Mucor hiemalis* UCP 1309 USING SOLID-STATE FERMENTATION

MONTERO-RODRÍGUEZ, D.; ANDRADE, R. F. S.; SOUZA, A. F.; RUBIO-RIBEAUX, D.; SILVA, G. K. B.; LUNA, M. A. C.; MENDONÇA, R. S.; ALVES, M. F.; SANTOS, R. A.; CAMPOS-TAKAKI, G.M.

NÚCLEO DE PESQUISAS EM CIÊNCIAS AMBIENTAIS E BIOTECNOLOGIA, UNIVERSIDADE CATÓLICA DE PERNAMBUCO, RECIFE, PE (RUA NUNES MACHADO 42, BLOCO J TERREO, BOA VISTA, CEP 50050-590, RECIFE - PE, BRAZIL)

ABSTRACT:

Solid-state fermentation (SSF) is a process that occurs in the absence or near absence of water and has gained significant attention for the development of industrial bioprocesses. It offers a cost-effective alternative that uses agricultural wastes and byproducts for the production of various high-value added microbial metabolites such as biosurfactants. They are amphipathic molecules with ability to display diverse functional properties such as surface activity, emulsification and foaming, making them feasible to be used in environmental, food, cleaning and industrial applications. In this context, this study aimed to investigate the potential of *Mucor hiemalis* UCP 1309 for the production of biosurfactant by SSF using agro-industrial byproducts and wastes. Fermentations were carried out during 120 h at 28°C in Erlenmeyers flasks containing 5 g of each solid substrate (sugarcane bagasse, wheat bran, corn bran, instant noodle waste, pineapple peels, pineapple crown or tangerine peels), supplemented with salt solution containing 5% waste soybean oil (WSO). After cultivation, Erlenmeyers flasks were incubated three times with distilled water and the production of biosurfactant was investigated by measurement of surface tension in cell-free metabolic liquids obtained post-filtration and centrifugation of extracts. Then, the substrate with better results was used in a second fermentation, carried out by a 2² full-factorial design (FFD) in order to investigate the influence of inoculum size and concentration of WSO in surface tension. According to the results, *M. hiemalis* showed higher ability to produce biosurfactant in medium composed by wheat bran, with reduction of surface tension to 28.1 mN/m. To our knowledge this is the first report regarding the production of biosurfactant by Mucoralean fungi using SSF. Also, the statistical analysis demonstrated significative influence of concentration of WSO in the reduction of surface tension. The biosurfactant exhibited excellent potential for environmental applications due to its ability to form emulsions with WSO, motor oil and burned motor oil, that remained stable after 90 days of incubation. The present study confirmed the suitability of SSF to convert cheap and under-utilized agro-industrial byproducts into industrially relevant biosurfactant, making attractive this bioprocess for the industry.

Keywords: Mucoralean fungus, surface tension, static fermentation, wheat bran, waste soybean oil.

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