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SELECTION OF MICROFUNGI WITH HIGH LIPOLYTIC ACTIVITY AND THEIR LIPASE CHARACTERIZATION

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Abstract

Lipases are serine hydrolases that catalyze both the hydrolysis and the synthesis of esters from glycerol and long chain fatty acids. They are the third largest enzyme group based on their market value, finding extensive applications in chemical, pharmaceutical, food and leather industries. Additionally, a promising field for the application of lipases and lipolytic microorganisms is in the environmental management, in particular in the biodegradation of plastic and hydrocarbon and in treatment of waste with high fat content. Lipids are major organic matters in municipal and some industrial wastewater and solid wastes and can cause severe environmental pollution. Several research reports and patents describe the use of active lipid degrading microorganisms and/or enzyme pools developed in the laboratory for the biological treatment of effluents or waste with high fat and oil concentrations. In view of the variety in applications, there has been a renewed interest in the development of sources of lipase. Numerous microbial species produce lipases with different enzymological properties but fungi are known to be more potent lipase producers.
The aim of this study was to screen and select microfungi with high lipolytic activity from a strains pool isolated from different sources. Furthermore lipase characterization of two mesophilic strains isolated from wastes selected as good lipase producers was achieved. A semiquantitative evaluation of the lipolytic ability of strains was carried out on solid media including, as carbon source, synthetic and natural fatty substrates. The ability to hydrolyze these compounds was estimated with the measurement of the precipitation/clearing zone around the colony. Among the screened strains, two of the most active towards all the substrates tested, *Penicillium solitum* and *Cladosporium cladosporioides*, were chosen for biochemical characterization of lipolytic enzymes. A preliminary ecophysiological characterization allowed to indicate their thermal and trophic preferences and their growth rate. Moreover, their extracellular lipases were purified to homogeneity and biochemically characterized. The lipase activity was determined spectrophotometrically using *p*-nitrophenyl esters as substrates. Substrate specificity and the effects of pH and temperature on lipase activity were studied. Both lipases showed maximal activity at alkaline pH. However they differed in substrate specificity and in thermal stability. Lipase from *P. solitum* was more active towards long-chain substrates; whereas lipase from *C. cladosporioides versus* short-chain substrates. Finally, the enzyme from *C. cladosporioides* was considerably more thermostable than the *P. solitum* one (T_{50}, nearly 19°C higher). These results are interesting to develop a preliminary *consortium* for waste treatment.