Lipase production of Mucoromycotina fungi: from fermentation studies to enzyme purification

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Many of industrial-biotechnological processes use enzymes derived from different microbial sources. However, developing of modern environmentally friendly technologies is requiring the exploration and application of new microbial enzymes. Zygomycetes fungi belonging to the Mucoromycotina subphylum have been assumed to play an important role in the decomposition of plant and other organic materials. Several members of them are known as good extracellular enzyme sources utilised in the biotechnology and food-industry.

Due to their effective hydrolytic and synthetic properties, fungal lipase enzymes are frequently used in various industrial processes. It has been proven that several zygomycetous fungi are able to produce lipase enzymes in high amount; furthermore, investigation of these enzymes by *Rhizomucor* and *Rhizopus* species is an intensively studied area. However, there are only few reports on the lipolytic activity of oleaginous species such as the members of the genus *Mortierella* and *Umbelopsis*. Although some studies demonstrated that oil based materials affect the lipase production of zygomycetes strains, searching for new inductors able to enhance the enzyme yield is still going on. Similarly, a few studies have been carried out on the effect of solid based cultivation on the productivity.

In our preliminary works, tributyrin hydrolysing capacity of *Dissophora*, *Gamsiella*, *Gilbertella*, *Mortierella*, *Mucor*, *Rhizomucor*, *Rhizopus* and *Umbelopsis* strains were analysed and the effect of several inductor oils on the lipase yield were also tested. On the basis of these studies, 11 isolates were selected for submerged and solid-state fermentation assays in which agro-industrial by-product substrates with high lipid content were used as support. The lipase yield has successfully been improved by many isolates at which the purification and biochemical characterisation of the corresponding enzymes are in progress. In addition, outstanding transesterification activity is also identified at certain *Rhizomucor*, *Rhizopus*, *Mucor* and *Mortierella* lipases using anhydrous reaction conditions.

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