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Effect of castor oil hydrolysis in the production of gamma-decalactone by the yeast *Yarrowia lipolytica*

Braga, Adelaide; Gomes, Nelma; Teixeira, José A.; Belo, Isabel

IBB-Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, University of Minho, Campus de Gualtar 4710-057, Braga, Portugal

E-mail: adelaidebraga1@gmail.com

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Abstract

The production of aromas by biotechnological processes is of great interest due to its increasing acceptability, especially in the food industry, in comparison with similar products obtained by chemical synthesis.

Gamma-decalactone, a peach-like flavour compound, is an example of those products and can be obtained biotechnologically by the biotransformation of ricinoleic acid, the main constituent of castor oil, a natural and non-toxic oil, biodegradable and a renewable resource, obtained from the seed of the castor plant, *Ricinus communis*. That biotransformation can be carried out by various microorganisms, such as the non-conventional yeast *Yarrowia lipolytica*, considered as non-pathogenic and as GRAS by the American Food and Drug Administration. In addition, this microorganism has also the ability to produce lipases that play an important role in the hydrolysis of castor oil.

The purpose of this work is to improve the biotransformation of ricinoleic acid into gamma-decalactone, integrating an enzymatic hydrolysis of castor oil in the process, using commercial lipases and a lipase produced by the yeast. The study of different microbial lipases aimed at producing the best hydrolyzed oil to use as a precursor for the production of gamma-decalactone.

The castor oil hydrolysis essays were conducted in flasks, using four different commercial enzymes: lipase of *Candida rugosa* from Sigma and lipases CALB L®, Lipozyme TL IM® and Lipolase ® 100T from Novozymes. The effect of temperature (37, 55 and 75ºC) and pH (6, 7 and 8) was estimated for each enzyme. Results demonstrated that the highest hydrolysis percentage (95%) was obtained with Lipozyme TL IM® after 54 h of reaction, at 37 ºC and pH 8.

Furthermore, different strategies for gamma-decalactone production in flask experiments were also investigated, namely the addition of previously hydrolyzed castor oil to the culture medium, the addition of an immobilized lipase to the biotransformation medium and finally, inducing lipase production prior to the biotransformation stage. These strategies were compared with the usual biotransformation process (without addition of lipase or previously hydrolyzed oil) and the results obtained will be presented.