Biotechnological applications of *Yarrowia lipolytica*: Optimization of aroma and lipase production

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*Yarrowia lipolytica* is one of the more intensively studied "non-conventional" yeasts that is currently used as a model for many studies, including protein secretion, peroxisome biogenesis, dimorphism and metabolic pathways involved in hydrophobic substrates metabolism, among others. Due to the wide range of substrates that this yeast can use efficiently, such as alkanes, fatty acids, glycerol, and some sugars and to the high secretion capacity of metabolites and proteins, many industrial applications of *Yarrowia lipolytica* have been developed [1]. The fact of being considered as non-pathogenic and as GRAS by FDA, has also contributed to the great interest of developing bioprocesses using this yeast. One of the better known applications is the production of gamma-decalactone, a peach-like aroma, by the biotransformation of ricinoleic acid. *Yarrowia lipolytica* is able to carry out this process and the pathway involves the beta-oxidation of the ricinoleyl-CoA leading to the production of 4-hydroxy-decanoic acid, that lactonises to produce gamma-decalactone. Our work has been focused in the study of oxygen influence on this biotransformation, showing that oxygen is a determining factor in the control of the peroxisomal beta-oxidation pathway. Thus, different approaches have been used to optimize oxygenation of this complex multi-phase system, including the use of increased pressure, aeration and stirring rates [2]. The increase of oxygen transfer rate (OTR) in a 2 L fermenter with 3% (w/v) methyl ricinoleate, at 600 rpm and 3vvm led to the accumulation of gamma-decalactone up to 1 g/L but also of 8 g/L of 3-hydroxy-gamma-decalactone. Aroma production was favoured by increased cell hydrophobicity, which also contributed to lipase activity induction. Lipase production by *Y. lipolytica* is another process with industrial interest and it is well known that enzyme productivity is influenced by oxygen availability in the medium. The use of increased air pressure up to 6 bar as a mean of OTR increase led to a 4-fold enhancement of lipase production compared to atmospheric conditions. Moreover, our work has shown that *Y. lipolytica* can use efficiently agro-industrial wastes like olive mill wastewater to produce lipase from it [3]. [1] Fickers, P. et al., FEMS Yeast Research. (2005) 5:527 [2] Gomes, N. et al., Biochem. Eng. J. (2007) 35 : 380 [3] Gonçalves, C. et al., Bioresour. Tecnol. (2009) 100 : 3759