Lactones are well-known aroma compounds found in a variety of foods and beverages, reason why the food industry has a high interest in their biotechnological production. Gamma-Decalactone, a peach-like flavor, is the most widely biotechnologically produced lactone and can be obtained from the biotransformation of ricinoleic acid, catalyzed by *Yarrowia lipolytica*, a yeast with GRAS status. This is one of the yeast species able to grow on hydrophobic substrates such as oils, n-alkanes, fats and fatty acids, for which it has specific metabolic pathways. The main metabolic degradative pathway of fatty acids, in yeasts, is through peroxisomal Beta-oxidation. Fatty acids are degraded through a multiple step process, involving four different enzymes. Oxygen may influence the activities of those enzymes, since it is necessary for the regeneration of the cofactors FAD and, more indirectly, NAD<sup>+</sup> and therefore, influence the production of gamma-decalactone. For this reason it is imperative to define the most appropriate conditions for lactones production.

Thus, the main aim of this study was to determine the influence of dissolved oxygen concentration on the production of lactones from the biotransformation of castor oil in batch mode and thereafter to explore fed-batch operation strategies to increase the yields of gamma-decalactone production.

There are several works in literature describing the effect of operating conditions in the production of lactones carried out by *Y. lipolytica*, however some discrepancies were shown in the results obtained in those works, especially in what concerns the effect of oxygen.

Different experiments were conducted in a 3.7-L bioreactor (RALF PLUS SOLO, Bioengineering, Switzerland) at constant dissolved oxygen (DO) concentrations of 20%, 30%, 40% and 50%, controlled automatically by a control unit coupled to the bioreactor. The DO concentration was controlled by manipulating the agitation and aeration rates, through a cascade control mode. The best condition for lactone production was 40% DO leading to 1158 mg L<sup>-1</sup> of g-decalactone production.

Also, considering that the primary goal of fermentation research is the cost-effective production of the products, it is important to develop a culture method that allows the production of the desired product at high concentrations and with high productivity and yield. Fed-batch operation allows achieving higher cell density than batch mode and is often applied to obtain high yields and productivities of the desired product, by controlling the nutrient feeding. This feature is especially interesting for substrate inhibition processes, such is the case of the toxicity of ricinoleic acid to the *Y. lipolytica*. With this approach, it is possible to supply more substrate to the cells, simultaneously preventing toxic effects. Fed-batch experiments were performed with intermittent substrate feeding strategy, were in order to maintain a constant concentration of 30 g L<sup>-1</sup> in the medium. With this approach it was possible to prevent the g-decalactone consumption by the cells as a carbon source, as occurs in batch mode, keeping the aroma at high concentrations till the end of the fed-batch experiment.