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Effect of Oxygen Transfer Rate within a Biphasic Medium: Application to Methyl Ricinoleate Biotransformation into Aroma Compounds by the Yeast *Yarrowia Lipolytica*

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Numerous biotechnological processes are based on the development of microorganisms within a biphasic medium formed by an oil-in-water emulsion, in different domains: (i) food, with the microbial growth control in emulsions (milk, dressings, cream...), (ii) environment, in the case of the bioremediation of polluting substances (oil, alkanes...) and (iii) fine chemicals, for the processes which are based on the development of microbial strains on a hydrophobic substrate in order to obtain high-value products.

The yeast *Yarrowia lipolytica* is able to carry out the biotransformation of methyl ricinoleate into γ -decalactone, which is an aroma compound of industrial interest (1).

Recent studies indicate that the oxygen availability in that medium may be a determining factor in the process, intervening in the control of the peroxisomal β -oxidation pathway, which leads to γ -decalactone formation. In order to monitor the microbial activity within a bioreactor containing such a medium it is important to predict the oxygen transfer capacity of the system.

Recently, models of the oxygen mass transfer coefficient (K_La) were reported for biphasic aqueous-organic media (2). Based on this work, an empirical correlation was developed here to represent the K_La as a function of operating conditions (agitation and aeration) and organic fraction in the biotransformation medium within the bioreactor. This enabled then to select operating conditions to study the effect of K_La on γ -decalactone production in an air-sparged fermenter. Moreover, two different strategies of oxygen transfer rate (OTR) improvement are currently carried out: first the use of pure oxygen as sparging gas in an atmospheric bioreactor and also the use of hyperbaric air in a high-pressure reactor. Increased air pressure has been proven to be an effective way of preventing oxygen limitation in high-density cultures of other yeast strains (3).

For *Y. lipolytica*, a relation between OTR of the system and the aroma production will be established and discussed. Since OTR and K_La are important parameters of process scale-up, their prediction based on valid models may be of significant interest in the optimization of this kind of processes.

References:

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