Comparison of aroma production from castor oil by *Yarrowia lipolytica* in airlift and STR bioreactors

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In aerobic cultures using hydrophobic substrates, such as the use of castor oil (CO) for γ-decalactone production by *Yarrowia lipolytica*, the selection of bioreactor type is particularly important. Although stirred tanks (STR) are the most common industrial bioreactors used for aerobic fermentations, agitation conditions tend to cause some shearing stress to the cells. This can be prevented using aeration as driving force to promote agitation that is the principle of airlift reactors.

This work analyses the influence of agitation (mechanical or pneumatic) and oxygen mass transfer coefficient (k_La) on γ-decalactone production by *Y. lipolytica* in a biphasic culture medium with CO as substrate. *Y. lipolytica* has the ability of performing the biotransformation of ricinoleic acid (the major fatty acid of CO), into γ-decalactone through peroxisomal β-oxidation.

For both bioreactors γ-decalactone productivity increased with k_La, in spite of the lower γ-decalactone maximum concentration. On the other hand, higher oxygen transfer rate favoured the accumulation of other lactone, such as 3-hydroxy-γ-

decalactone. Higher values of γ-decalactone concentration were obtained in the airlift (up to 3 g/L) compared to STR (up to 1.5 g/L).

Also, the impact of agitation type in cell morphology was investigated using image analysis. Significant differences were observed between cellular populations of both bioreactors; in STR an increase in loose cells and quite irregular structures was observed, indicating that pneumatic agitation has less impact in cells morphology than mechanical agitation.