

Growth and beta-galactosidase activity in cultures of *Kluyveromyces marxianus* under increased air pressure

R. Pinheiro, I. Belo, M. Mota, ESTG - IPVC, CEB-IBQF (Viana do Castelo, Braga, P)

Objectives: In this work the effect of total air pressure on cell growth and intracellular beta-galactosidase activity in batch cultures of *Kluyveromyces marxianus* CBS 7894 was investigated.

Results: A pressurized bioreactor was used for *K. marxianus* batch cultivation under increased air pressure from 1.2 bar to 6 bar. The use of 1.2 bar of total air pressure had a strong positive effect on yeast growth, when comparing with micro-aerated experiment (Figure 1). When the pressure was increased from 1.2 bar to 4 bar and 6 bar no significant difference on cell growth was observed. The intracellular activity of the antioxidant enzyme, superoxide dismutase, was analysed and a slight activity induction by the air pressure raise was observed. However, since no cell growth retardation or ATP synthesis inhibition was observed under pressurized conditions, it is safe to say that the cells of the strain used could cope with air pressure values up to 6 bar. During the exponential growth phase the beta-galactosidase activity increased 2.8-fold when 6 bar air pressure was used (Figure 2). For all the experiments made with air pressure the beta-galactosidase activity decreased after reaching its maximum value. The reduction of beta-galactosidase activity after 22 hours leads to the conclusion that the operation should be stopped immediately after the stationary phase has been reached. The results obtained in the case of the micro-aerated experiment indicate that the oxygen limitation, could repress beta-galactosidase expression. The good results achieved in the experiment with 6 bar air pressure may be explained by the combination of the high cell concentration and the high oxygen transfer rate in culture medium.

Conclusions: The results here reported proved that in what biological aspects are concerned it could be possible to use the air pressure raise up to 6 bar, as an optimisation parameter of beta-galactosidase production processes, specially in high density cell cultures where oxygen is a limiting factor of growth.

