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Enhanced growth of *Pichia pastoris* under increased air pressure on different carbon sources

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Pichia pastoris has many biotechnological applications. Two aspects of the species have contributed to its utility: (1) fermentation techniques were developed for maintaining extremely high cell densities in excess of 100 g/L dry weight, and (2) because *P. pastoris* assimilates methanol, the expression system is linked with alcohol oxidase, which is abundantly produced in the presence of methanol.

The high oxygen demand of methanol metabolism and cultivation at very high-cell-density makes oxygen supply a major parameter in *Pichia pastoris* cultivation. Previous work demonstrated that hyperbaric air could be successfully applied to yeast cultivation, as a way of improving the oxygen transfer rate (OTR) to aerobic cultures [1].

In the present work, we investigate whether increasing air pressures may lead to increasing biomass yields of *P. pastoris*, growing with four carbon sources, without giving rise to unbalance oxidative stress.

Pichia pastoris strain was grown in glucose, pure glycerol, crude glycerol from biodiesel industry and methanol media under total air pressure from 1 bar to 5 bar. In all the experiments, the cultures reached maximum cell density at 5 bar of total air pressure. A 4-fold increase on specific growth rate was obtained at 5 bar on glycerol and crude glycerol compared to the value at atmospheric pressure. Biomass yield was also enhanced by air pressure rise, for all carbon sources. With 5 bar air pressure biomass yield (g cells/g carbon) was 0.97 and 1.86 whereas at 1 bar was 0.67 and 0.77, respectively in methanol and glycerol media.

[1] Lopes M, Gomes N, Mota M, Belo I, "*Yarrowia lipolytica* growth under increased air pressure: influence on enzymes production", *Appl. Biochem. Biotechnol.* (2009) 159(1): 46-53.