Sucrose-limited versus Glucose-limited Chemostat Cultures of *Saccharomyces cerevisiae*

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Sucrose-containing molasses are one of the main raw materials used for the production of bioethanol. The majority of the studies concerning yeast physiology in continuous cultures are performed in glucose-limited chemostats, and there are very few examples using sucrose as the limiting substrate. Even remarkably, is the complete lack of data for anaerobic sucrose-limited chemostats. Generally, *Saccharomyces cerevisiae* strains hydrolyse sucrose by the extracellular enzyme invertase, producing glucose and fructose which are transported into the cells and further metabolized. However it has been also reported that sucrose can be actively transported into the cells by a sucrose-H^+ symport system and hydrolysed intracelularly. In this situation, in view of the extra ATP expenditure to remove H^+ co-transported by the H^+-sucrose symport system, physiological parameters in sucrose-limited chemostats may be different from those cultivations limited by glucose. To investigate these possible differences between sucrose and glucose, yeast cells were cultivated in aerobic or anaerobic sucrose-limited or glucose-limited chemostats. When comparing aerobic sucrose-limited with glucose-limited chemostat cultures, there was a difference in the biomass yield and residual sugar, being both parameters somewhat higher in the former condition. In anaerobic sucrose-limited chemostats, several physiological parameters, such as the specific CO_2 and ethanol production rates, as well as the ethanol yield, were all slightly lower when compared to glucose-limited chemostat cultures. Interestingly, a yeast strain deleted in the invertase-coding gene (*suc2* mutant) showed a significant decrease (23 %) in biomass yield when compared to the wild-type *SUC2* strain during growth on anaerobic sucrose-limited chemostats. Consequently, ethanol yield was increased by more than 6 % in this *suc2* mutant. These observations emphasize some important differences in sucrose-limited and glucose-limited chemostats. Moreover, it also points to the idea of engineering sucrose metabolism in yeast cells to increased ethanol yield.