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Inhibitory Effect of Acetic Acid on the Fermentative Metabolism in *Saccharomyces Cerevisiae* ATCC 9804 At pH 3.0.

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ABSTRACT

Acetic acid (AA) is a typical byproduct of alcoholic fermentation in *Saccharomyces cerevisiae,* and it was found that its low concentrations can be used as carbon sources, while high levels reduce fermentation efficiency. This study examines the impact of 10-50 mM AA on acetic acid on glucose consumption and ethanol production in *Saccharomyces cerevisiae* ATCC 9804 under oxygen-limited conditions at pH 3.0. Ethanol and AA concentrations were determined using gas chromatography combined with mass spectrometry. The results indicate that 10 mM AA has no significant effect on glucose consumption rate, while 50 mM AA inhibits ~2-fold. The AA consumption rate was directly proportional to exposed AA concentration, and the highest consumption rate (~8 mM h^{-1}) was observed at the 6th h of growth under 50 mM AA stress conditions. 10 mM has no significant effect on ethanol production, while 20 mM AA exposure results in ethanol production inhibition by ~35% at 24th h of growth. 50 mM AA was observed to inhibit ethanol production by ~45% at the 48th of growth, which correlated with inhibited specific growth rate (0.05 h^{-1}) and viability (~10^7 CFU). Understanding the mechanisms of yeast adaptation to AA is vital for the construction of robust yeast strains that can be used to enhance biotechnological production of various food and desired products.

Keywords: *Saccharomyces cerevisiae*, acetic acid stress, GC-MS, ethanol

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