The Effect of Exogenous Aromatic Alcohols on Growth and Flocculation of Commercial Beer Brewing Strains of Saccharomyces cerevisiae in Beer Wort

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Flocculation occurs during fermentation of Saccharomyces cerevisiae. The cells aggregate into dense masses that sink, separating cells from alcohol products easier, due to the binding between lectin receptors and carbohydrates between cells (lectin hypothesis). Aromatic alcohols like 2-phenylethanol (2-PE), tyrosol, and tryptophol stimulate flocculation in lab strains grown in synthetic media. This project explores the effect of 2-PE on the growth and flocculation abilities of 10 commercial and 2 lab strains of S. cerevisiae through a multimethod approach. While growth, measured using Calcofluor White, in different media and of control groups versus groups treated with 2-PE varied between the 12 strains, 2-PE had no significant effect. Sedimentation assays used ImageJ digital analysis to measure flocculation. Differing flocculation rates existed between strains, but strains treated with 2-PE, tyrosol, and tryptophol saw no difference comparatively. Quantification of cell wall carbohydrates with and without 2-PE was measured by Con A assays, and quantification of lectin receptors between strains was measured by Avidin assays. 2-PE did not increase the presence of surface carbohydrates. Cultures mixed with higher concentrations of alpha-methyl-mannoside, an inhibitor of lectin binding, saw lower flocculation, confirming the lectin hypothesis. Co-flocculation experiments were conducted between flocculant and less flocculant strains to see if flocculation could be induced in weaker flocculating strains. In more authentic fermentation conditions, flocculation is unaffected by exogenous aromatic alcohols. These findings enable further studies of factors influencing flocculation in realistic fermentation environments, potentially improving speed and efficiency for breweries.

Awards Won: