

## ABSTRACT

Optimization of Fermentation Characteristics  
in Rum Yeast Strains

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This thesis focuses on the yeast species, Saccharomyces cerevisiae, which is used in the rum fermentation process. The work seeks to optimize the ability of yeast strains used in the local rum industry to degrade saccharides in molasses more efficiently and to tolerate higher alcohol concentrations.

Initially, DNA transformation experiments were carried out. The aim of these transformation experiments was to select desirable characteristics present in other strains of yeast and to introduce these characteristics, via genetic engineering, into the recipient strains.

The transformation was achieved by extracting the DNA from the strain of interest and inserting it into spheroplasts of the parent strain. Transformants were selected on the basis of alcohol tolerance, flocculation and killer tests. The fermentation characteristics of these transformed strains were then examined.

From the small scale fermentation experiments, some of the transformed strains and one parent rum strain, A1, showed a decline in the number of cells present in the liquid broth. This decline also produced a corresponding reduction in the fermentation efficiency. This pattern of cell decline was found to be caused by the presence of killer characteristics in these strains.

Experiments were also done to characterize the strains biochemically. The rate and the extent of sucrose utilization by the different strains were investigated. These experiments were done using the Warburg and Fermentation Methods.

Large scale fermentation studies were also carried out. The rates of sugar utilization and alcohol production were monitored using an immobilized enzyme system. This system enabled the constant monitoring of sucrose utilization and alcohol production during the fermentation experiment.

This investigation has identified two transformants which have the ability of utilizing sugars at a faster rate while being able to tolerate the high alcohol levels generated in the fermenter.