MALOETHANOLIC DEACIDIFICATION OF HIGH ACID JUICES DURING WINE YEAST ALCOHOLIC FERMENTATION

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I would like to dedicate this thesis to a very special person who has brought much peace and love to my life.

F.R.

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ABSTRACT

Malic acid is a major acid found in grapes. In countries with cooler climates, such as New Zealand, this acid is not fully respired from grapes and will impart a sour taste on grape juices. Therefore steps must be taken to ensure deacidification of the juice or wine occurs. Deacidification is the process whereby the acidity of a juice or wine is lowered by physical, chemical or biological means. Biological methods of deacidification such as malolactic fermentation and maloethanolic fermentation involve the degradation of malic acid to other products. Malolactic fermentation is the bacterial conversion of malic acid to lactic acid and carbon dioxide and is commonly used in New Zealand wineries. Maloethanolic fermentation is the simultaneous conversion of grape sugars and malic acid to ethanol by specialized yeast strains and is the focus of this investigation.

This research examines several commercially available yeast strains (Lallemand Lalvin strains 71B, ACID-, D432 and reference strains EC1118 and Red Star Montrachet (M)) and *Schizosaccharomyces* strain 442, for their ability to degrade malic acid during grape juice fermentation under New Zealand conditions. A Simulated Grape Juice medium was used to mimic these conditions, as well as commercial Chardonnay and Sauvignon Blanc juices. Strains 71B and D432 consistently degraded the greatest percentage of malic acid under all conditions and parameters investigated in this research. Respectively, these strains degraded malic acid by 36% and 22% of the initial concentration (7.0g/L) in industrial Chardonnay juice fermentations and by 47% and 36% of the initial concentration (3.7g/L) in industrial Sauvignon Blanc fermentations. Furthermore, in Sauvignon Blanc wines, a significant (P=0.05) difference was found between the wine made with strain 71B and all other wines. However, in Chardonnay wines, a significant difference was found between the wine made with strain D432 and all other wines. In addition, molecular genetic techniques (CHEF chromosomal banding pattern polymorphisms) were utilised to confirm yeast strain identity.

from industrial fermentations. From this, it was concluded that all strains inoculated into the commercial juices were dominant at the most vigorous stage of fermentation.

Factors influencing malic acid degradation were investigated in Simulated Grape Juice fermentations. These included initial concentrations of malic acid and nitrogen and the initial pH level of the juice. It was found that strains 71B and D432 degraded the greatest percentage of malic acid when the initial malic acid concentration of the juice was high (7.5g/L), the initial nitrogen concentration was low (463mg/L with proline) and an initial pH of pH 3.5.

These results indicate that there is an interaction between yeast and grape variety/maturity, and that proper selection of yeast strain can be used as a tool for deacidification.