The effect of saline irrigation water on wine quality

Progress Reports from Annual Reports to
GRAPE AND WINE RESEARCH & DEVELOPMENT CORPORATION

Project Number: **UA 7**

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Research Organisation: **The University of Adelaide**

Date: **1991 - 1993**

Title	The effect of saline irrigation water on wine quality
Project No	UA7
Organisation	University of Adelaide
Location	Roseworthy Campus
Supervisor	A. Ewart
Funding	$7,200
Time Span	July 1991 - June 1992

Objective

To establish if the application of high salinity water to vines has a measurable effect on the sensory properties of the wine. To establish threshold levels for sodium and sodium chloride in white table wine.

Progress

The three levels of annual salt loading in the irrigation water low (A 0.5dS/m), moderate (B 0.7dS/m) and high (C 1.6dS/m) resulted in the free sodium of all wines exceeding the 60ppm maximum set by the EEC.

The percentage increase in sodium and chloride in the wine between treatments was similar ie 42% and 63% respectively A to B and 167% and 117% for treatment B to C. This is in contrast to the increases in sodium and chloride in the petioles where the increases were 133% and 35% for A to B and 30% and 11% for treatment B to C. The sodium levels in the must also show a large increase between the moderate and high salt treatments suggesting slower uptake of sodium into the berry and hence the resultant wine.

The fruit maturity of the high salinity treatment was slightly above that the other two treatments probably due to the effect of lower yield. The must pH of the moderate and high salt treatments were higher than the control due to the effect that the increased level of sodium has on the "extent of cation exchange". The high titratable acidity of the moderate salt was due to the higher malate levels. Tartrate levels were not significantly different. the highest salt load reduced yield by eight per cent.

The difference threshold of sodium chloride in a white wine was 220ppm and for sodium 830ppm. Sensory differences were established between wine from the high salt treatment and that from the moderate and low salt treatments.

Project Title The effect of saline irrigation water on wine quality

Project No UA7

Organization University of Adelaide

Location Roseworthy Campus

Supervisor A Ewart

Funding $9989

Time Span July 1991 - 1993

Objectives

- To establish if the application of high, moderate and low salinity water has a measurable effect on the composition and sensory characteristics of wine.
- To establish threshold levels for sodium and sodium chloride in a dry white table wine.

Progress

In both years the application of normal river water (low salt 0.05 dS/m) resulted in the lowest must and wine pH. In year one of this treatment also resulted in the lowest must titratable acidity. The must acidity was not significantly different for the three treatments in the second year of the trial.

In year two grape maturity for the low and moderate salt (0.7 dS/m) treatments was slightly lower than the high salt (1.6 dS/m). The juice tartrate levels were only different in the second year, the low salt treatment having significantly lower levels than the other two which were similar. Malate levels in the low salt treatments were lower than the moderate salt in both years, but only higher than the high salt in the second year of the trial. Juice potassium levels for the moderate salt treatment were higher than the other two treatments, with the exception of the low salt treatment in year two. Whilst potassium levels were relatively consistent for the high and moderate salt applications, the low salt had a major change in potassium from one year to the next. The generally low potassium in the high salt treatment may be due to slower transport of potassium into berries containing high levels of sodium ions.

Sensory evaluation of salinity trial wines

The 1991 wines were presented four months after vintage in simple difference tests comparing the combinations low salt - moderate salt, low salt - high salt, and moderate salt - high salt. A total of 64 responses were recorded for each combination. All combinations were found to be significantly different from each other, however, there was no significant preference for one treatment over another.

A total of 13 judges scored the wines four months after vintage the Australian Wine Show 20-point system. The wines were very similar in quality and the most reliable judges were unable to pick treatment differences. For example, scores ranged from 15.1 for the low salt up to 15.7 for the high salt.

The 1992 wines were similarly presented in simple difference - preference tests which were carried out eight months after vintage. From a total of 68 responses for each combination significant differences were established between each combination with no overall preference occurring.

The 1992 wines were reassessed at 20 months by expert and consumer panels. The expert panel were asked to rank the wines in order of preference and the same wines were also scored on a 20-point scale for wine quality. The consumer panel was presented with a wine from each treatment and asked to rank them in order of preference.

Results from rank total analysis of the expert panel's preference scores showed that the high salt treatment wine was the least preferred of all treatments. Rank totals were: high 164.5, moderate 126 and low salt 105.5 (highest rank total indicates lowest preference).

Differences in rank totals between the high and moderate salt treatments and the high and low salt

treatments were significant at the 5% level. The difference between the moderate and low salt treatment was not significant at this level but was significant at 7.5%. This suggests that many of the panellists preferred the wines from the low salt treatment. In terms of quality scores using the 20 point scale, the respective scores of those judges that found significant treatment differences ranged from: 11.6 to 12.5 for the high salt, 13.3 to 15.4 for the moderate salt, and 14.9 to 16.4 for the low salt treatment wines.

Results from the consumer panel rankings were similar to those from the expert panel. Again the high salt treatment wine was least preferred, with a rank total of 173. This panel ranked the moderate and low salt treatment wines more closely with 146.5 and 142.5 respectively. (77 respondents).

Conclusion

The wines showed a greater treatment difference when assessed with some age. the high salt treatment was the least preferred wine by both the expert and consumer panels. There was some indication by the expert panel of a preference for the low salinity treatment.

This study has shown that the use of highly saline irrigation water has a significant negative impact on the sensory properties of wine.