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# Effects of vine rootstocks on chloride concentration in Sultana scions

by

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## Introduction

The chloride status of the grapevine can be an important factor in vine health and production in the Murray River irrigation areas of Australia (WOODHAM 1956, ALEXANDER and WOODHAM 1968). Several vine rootstocks are under test in these areas to determine which are most suitable for use in soils infested by the root knot nematode. This paper reports an investigation into the chloride content of Sultana (*Vitis vinifera* var.) vines on these rootstocks at various sites, to examine the effects of rootstocks on chloride status.

## Materials and Methods

All chloride analyses were made on petioles collected from primary leaves on the proximal part (nodes 4 to 7) of primary shoots, oven dried at 65° C, and ground. Dry weight of some samples was recorded as an index of vine vigour. Chloride concentration was determined by electrometric titration (BEST 1929) using cold water extraction.

Two lots of samples were taken from vines in a set of 11 rootstock trials planted in 1966. All scions are of one Sultana clone. Except for some minor variations there are 10 rootstocks on each site, including ungrafted sultana, and 10 vines on each stock, but only 5 stocks are common to all 11 sites. In early November 1967 (flowering time) a composite sample of 40 petioles (4 from each of 10 vines where available) was collected for each stock on each site. In mid January 1968, a sample

Table 1

Mean (and standard error) chloride content (%Cl/dry wt) in leaf petioles of Sultanas on different rootstocks (November 1967)

| Stock | No. of samples | Mean dry wt of sample g ± m | | Mean chloride content $Cl^-$ ± m | |
|---|---|---|---|---|---|
| Ungrafted | 12*) | 4.79 | 0.76 | 1.19 | 0.08 |
| Dogridge | 12 | 10.14 | 1.88 | 0.38 | 0.02 |
| 1613 | 12 | 6.17 | 1.25 | 0.37 | 0.04 |
| Salt Creek | 12 | 7.50 | 0.80 | 0.28 | 0.02 |
| 101—14 | 11 | 6.00 | 0.97 | 0.29 | 0.02 |
| Teleki 5 BB | 8 | 4.46 | 0.96 | 0.30 | 0.04 |
| Rupestris du Lot | 8 | 3.46 | 0.64 | 0.24 | 0.02 |
| R 99 | 8 | 3.50 | 0.67 | 0.21 | 0.02 |
| R 110 | 6 | 3.42 | 1.25 | 0.38 | 0.06 |

*) Stocks with 12 samples are replicated twice on one site

Table 2

Mean (and standard error) chloride content (% Cl/dry wt) in Sultana leaf petiole from 10*) vines on each of 5 rootstocks at 11 sites (January 1968)

| Stock | Site 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | | 8 | | 9*) | | 10*) | | 11*) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m | Cl | ± m |
| Ungrafted | 1.29 | 0.5 | 1.50 | 0.10 | 1.22 | 0.04 | 1.20 | 0.10 | 1.39 | 0.11 | 1.31 | 0.09 | 1.50 | 0.07 | 0.95 | 0.12 | 1.80 | 0.03 | 1.21 | 0.08 | 1.36 | 0.01 |
| Dogridge | 0.69 | 0.07 | 0.42 | 0.04ab | 0.49 | 0.06a | 0.45 | 0.06a | 0.51 | 0.09a | 0.52 | 0.04a | 0.75 | 0.05a | 0.47 | 0.06a | 0.46 | 0.07 | 0.54 | 0.08 | 0.54 | 0.05 |
| 1613 | 0.52 | 0.07a | 0.47 | 0.04a | 0.44 | 0.03a | 0.42 | 0.07a | 0.49 | 0.05a | 0.94 | 0.06 | 0.74 | 0.05a | 0.42 | 0.09a | 0.53 | 0.02 | 0.57 | 0.10 | 0.62 | 0.10 |
| Salt Creek | 0.42 | 0.04ab | 0.27 | 0.03c | 0.25 | 0.01b | 0.27 | 0.03ab | 0.31 | 0.05b | 0.41 | 0.05a | 0.53 | 0.04b | 0.32 | 0.04a | 0.36 | 0.04 | 0.39 | 0.08 | 0.29 | 0.04 |
| 101—14 | 0.32 | 0.05b | 0.30 | 0.04bc | 0.19 | 0.01b | 0.22 | 0.06b | 0.29 | 0.03b | 0.53 | 0.07a | 0.58 | 0.04b | 0.37 | 0.04a | 0.53 | 0.02 | 0.32 | 0.09 | 0.27 | 0.02 |

DUNCAN'S multiple range test: In each column figures followed by the same letter do not differ significantly.

*) Some vines were too small for sampling. On sites marked with asterisk missing values were too numerous to permit reliable analysis.

Table 3

Mean (and standard error) chloride content (%Cl/dry wt) in Sultana leaf petioles from 36 vines on each of 3 stocks (December 1967)

| Stock | Mean chloride content Cl ± m | |
|---|---|---|
| Ungrafted | 1.15 | 0.03 |
| 1613 | 0.27 | 0.02 |
| Salt Creek | 0.17 | 0.01 |

L.S.D. (0.01) = 0.04

of 30 petioles was collected from each vine on each of the 5 stocks which occur in every planting. Analyses of these samples enabled effects of the different rootstocks to be compared.

A more precise comparison between the stocks 1613, Salt Creek, and Sultana was possible on a randomised block trial with clonal sultana scions planted in 1965. A sample of 20 petioles from each of the 36 vines on each of the 3 stocks in this trial was collected for analysis in mid December 1967.

To determine if the graft itself affected chloride status, samples of 20 petioles per vine were taken from 3 sets of Sultana clones in mid December 1967, each set comprising 6 ungrafted and 6 self grafted vines about 5 years old.

## Results

The mean chloride content of the composite samples taken at flowering time from the series of rootstock trials is shown in Table 1, with mean dry weights of the samples. Ungrafted Sultanas contained at least 3 times as much chloride in leaf petioles as any of the grafted vines, and there were probably real differences between other rootstocks. Sample weights though variable because the young vines were not uniform, were related to vine vigour. The most vigorous stocks were Dogridge, which showed relatively high chloride, and Salt Creek, which gave low values. Table 1 does not include all the stocks from the trial plots; some not definitely identified or poorly replicated have been omitted, but the chloride figures for these stocks were within the range of figures presented for grafted vines.

Table 2 shows the mean chloride figures on each site in mid January for the 5 stocks which are planted at every site. Some vines were too small to provide a sample. On 3 sites small vines were so numerous that no valid statistical analysis of the results was possible. From the available figures there were significant differences between stocks. Pooled analyses for sites with complete data showed significantly less chloride in Salt Creek and 101—14 stocks than in Dogridge and 1613, which in turn had less chloride than Sultana stock. There were significant differences between sites, and a significant stock-site interaction.

Results from the randomised block trial comparing Sultana, 1613, and Salt Creek are given in Table 3. Significant differences between stocks were of the same order as differences observed in the 11 site trials.

Finally, Table 4 gives the results of analyses on ungrafted and self grafted Sultanas, which were planted in the same field. There were no differences between grafted and ungrafted vines or between clones.

Table 4

Mean (and standard error) chloride content (%Cl/dry wt) of leaf petioles of ungrafted and self grafted Sultana clones. Each figure mean of 6 vines (December 1967).

| Clone | Mean chloride content | | | |
|---|---|---|---|---|
| | Ungrafted | | Self grafted | |
| | $Cl^-$ | ± m | $Cl^-$ | ± m |
| H 23 | 1.02 | 0.04 | 1.04 | 0.06 |
| H 5 | 0.91 | 0.09 | 1.03 | 0.08 |
| G 2 | 1.03 | 0.04 | 1.00 | 0.04 |

## Conclusions

The Sultana root systems permitted the accumulation of more chloride in sultana petioles than any of the other rootstocks investigated, irrespective of site. Ungrafted Sultana vines accumulated at least twice as much chloride as vines on Dogridge or 1613, and about four times as much as vines on Salt Creek or 101—14. Reasons for site to site variations in these ratios have not been established. There were differences in soil type, in salinity of irrigation water applied, and in vine vigour. Group comparison tests on the data from November 1967 samples suggested that Rupestris du Lot and R 99 were probably significantly better than Salt Creek in limiting chloride, though differences were relatively small. Vines on du Lot or R 99 were among the least vigorous, therefore probably less satisfactory.

Sultana vines grafted on any other rootstock tried should tolerate saline conditions in the field more readily than the ungrafted vines of the standard planting in Murray River areas. The practical importance of the differences between stocks has still to be determined.

## Summary

Sultana vines in the field grafted on any one of a number of rootstocks being tested for compatibility showed substantially reduced petiole chloride as compared with ungrafted sultanas. Self grafted sultanas did not differ from ungrafted in chloride status. There were significant differences between the various effective rootstocks — the degree of reduction of chloride concentration was better than 50 per cent for Dogridge and 1613 stocks, but about 75 per cent for Salt Creek and 101—14.

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