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Response of Riesling clones to mechanical hedging and minimal pruning of cordon trained vines (MPCT) — implications for clonal selection

by

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Die Reaktion von Rieslingklonen auf mechanischen Heckenschnitt und Minimalschnitt bei Cordonerziehung (MPCT) — Konsequenzen für die Selektion von Klonen

Zusammenfassung: In einer älteren, bewässerten Versuchsanlage auf einem ariden Standort, die der Prüfung von Rieslingklonen dient, wurden drei Rebschnittsysteme getestet. Im Verlauf von 4 Vegetationsperioden wurden signifikante Ertragsdifferenzen zwischen herkömmlichem Zapfenschnitt (durchschnittlich 12,8 kg Trauben/Rebe) und schwächerem Rückschnitt (14,2 kg bei Heckenschnitt bzw. 13,8 kg bei MPTC) festgestellt. Bei schwächerem Schnitt wurden kleinere Beeren gebildet; Mostgewicht, pH und titrierbare Säure waren jedoch kaum beeinflußt.

Bei gemeinsamer Auswertung der drei Schnittvarianten bestanden zwischen den vier geprüften Klonen — SA173 und SA140, beide in Australien selektiert, und je einem aus Europa und Kalifornien eingeführten Klon — signifikante Ertragsunterschiede. SA173 lieferte die höchsten (14,7 kg/Rebe), SA140 die niedrigsten Erträge (12,7 kg). Die beiden importierten Klone erbrachten ungefähr gleiche Erträge. Bei Zapfenschnitt wurden nie signifikante Ertragsunterschiede zwischen den Klonen festgestellt, während bei schwächerem Rückschnitt in 3 von 4 Vegetationsperioden signifikante Unterschiede nachgewiesen werden konnten. Bei der Prüfung von Klonen kann somit durch den traditionellen starken Rückschnitt die Ertragsbildung verbesserter Klone eingeschränkt werden.

Key words: pruning, yield, must quality, clone, selection.

Introduction

Lighter pruning systems are being used by Australian wine grape growers to decrease inputs and lower production costs. Traditional spur and cane pruning are being replaced by either mechanical hedging (May and Clingeleffer 1977; Freeman and Cullis 1981), where vine shape is maintained by hedging the sides and top, or by minimal pruning of cordon trained vines, MPCT (Clingeleffer 1983, 1984; Cirami *et al.* 1986; Kidd 1986; Clingeleffer and Possingham 1987). In the MPCT system, vines left unpruned are skirted to stop shoots and fruit contacting the ground.

Although first developed for Sultanas in hot irrigated vineyards (Clingeleffer 1984), the MPCT system has also given satisfactory experimental results with traditional wine varieties, including Cabernet Sauvignon, Shiraz, Grenache and Semillon (Clingeleffer 1983; Cirami *et al.* 1986; Clingeleffer and Possingham 1987) and new hybrids (Clingeleffer 1985). It is being used commercially for vigorous vines in both warmer irrigated vineyards and in cooler, premium Australian wine areas such as Coonawarra and Padthaway (Kidd 1986; Clingeleffer and Possingham 1987). The MPCT system offers considerable promise for wine production as it is suited to mechanical harvesting, decreases pruning costs, maximises production and can be used to control excessive vine vigour.

Clonal selection trials in Australia have been based on standard cane and spur pruning systems either using fixed bud numbers, e.g. Sultana (ANTCLIFF *et al.* 1979) and Pinot noir (CIRAMI *et al.* 1984) or by adjusting bud numbers according to vine vigour, e.g. Sultana (WOODHAM *et al.* 1984), Shiraz (PETERSEN 1974) and Cabernet Sauvignon (WHITING and HARDIE 1981). For a range of clones of Semillon and Cabernet Sauvignon, pruned to 8 canes, ANTCLIFF (1973) was able to show significant differences in production, berry weight and soluble solids (°Brix). A similar experiment with clones of Riesling gave no significant differences in these parameters.

The purpose of the experiment reported in this paper was twofold. First, it aimed to compare the low input management systems, hedging and MPCT, with standard spur pruning for a quality white wine variety, Riesling. Second, as ANTCLIFF (1973) did not find significant differences with cane pruning it aimed to study the response of Riesling clones to the three systems of management.

Materials and methods

The clonal Riesling vines used in this study were planted in the CSIRO Division of Horticultural Research Coomealla vineyard in 1966 in soil classed as Dareton sandy loam (NORTHCOTE 1951). The original experiment (ANTCLIFF 1973) aimed to compare two selections from Nuriootpa in South Australia, SA173 and SA140, with two imported clones from Europe, 1959/NX/Europe and California, IV 62.2056 which proved to be Geisenheim clone 110. The vines were planted at a 3.35 m × 1.83 m, row × vine spacing and trained on a 0.3 m narrow T-trellis with fruiting wires at 1.0 m and a foliage wire at 1.35 m above the ground. The vines were cane pruned.

In winter 1981, three pruning treatments were superimposed on the original experiment which had contained 26 vines of each clone, arranged as single plots in randomized blocks along 2 rows. Each pruning treatment was allocated at random to one of 3 adjacent blocks along the row. In all, 24 of the original blocks were used to give 8 replicates of the pruning treatments arranged as a split plot experimental design with the pruning treatment (3) as the main plot treatment and the clones (4) as subplots. All data were subjected to analyses of variance.

The three systems of pruning were:

1. Spur pruning: A quadrilateral cordon was formed by retaining one cane on each quarter from the previous season and spuring strong, well spaced shoots to 2-buds.
2. Hedging: A quadrilateral cordon was formed as in (1). Hedging was simulated by making cuts 100 mm above and to the side of the fruiting wires. The cuts were maintained in the same place each year.
3. MPCT: In 1981 4—6 long canes from the vine crown were wrapped on to the foliage wire. Shoots arising from 1980 canes on the lower wires were lightly skirted about 200 mm below the wire leaving many buds. In winter 1982, after the 1st crop, all wood was removed from the lower wires and the vine skirted 200 mm below the original foliage wire.

The vines were harvested individually and the yields recorded in seasons 1982—1985. Prior to harvest, samples of about 150 berries were collected from main plots (pruning treatments) to determine berry weights, °Brix, pH and titratable acidity expressed as g/l of tartaric acid.

Results

The cane pruned Riesling vines were readily converted to the three pruning treatments. Detailed measurements of vine growth were not made but it was noted that MPCT vines had many small bunches spread over the complete canopy, short close-noded shoots with 'self-regulation' of vine size by abscission of immature shoot growth in late autumn as observed for other varieties (CLINGELEFFER 1983, 1984; CLINGELEFFER and POSSINGHAM 1987). The more severe spur and hedge pruning treatments produced vines with larger bunches, which were positioned close to the cordons, and vigorous shoots, which were removed at winter pruning.

Harvest results from the pruning treatments are presented in the table. Hedged vines consistently produced more crop than the spur pruned vines, the difference being significant in 2 seasons and for the 4 year average. The significant increase in production with the MPCT system was due to the large yield in the conversion year when the vine carried a crop on both the original fruiting wires and the upper foliage wire. When the lower cordons were removed in year 2 (1983) the yield of the MPCT vines was less than the controls.

Berry weights (Table) tended to be lower with both hedging and MPCT compared to the spur pruned control. Differences were only significant in 1 season (1985) for the hedged treatment and 2 seasons (1982, 1985) for MPCT vines. Analyses of the juice samples (Table) indicate that the MPCT system slightly delayed maturity compared to the controls. Soluble solids of MPCT vines were lower in all seasons except 1983 when yields were low; pH was significantly lower in 3 seasons and titratable acidity significantly higher in 2 seasons. Juice parameters for the hedged treatment and spur controls were similar except for a significant difference in sugar in 1985 and pH in 1983.

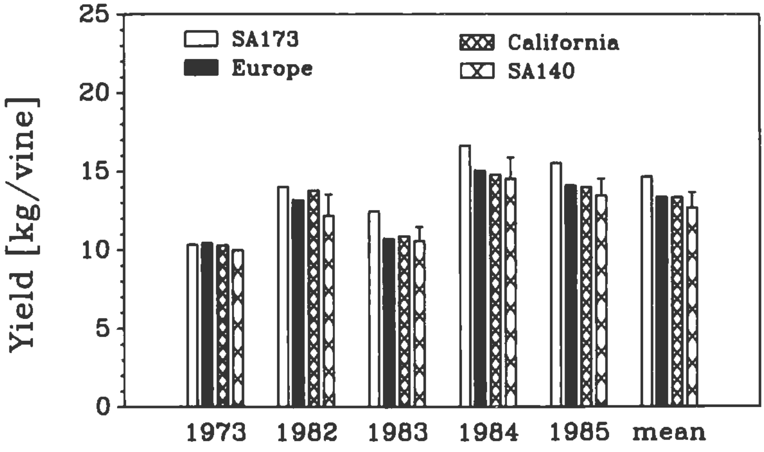

Fig. 1: Mean yield of the subplot treatments, i.e. clones from different sources, harvests 1982—85. Data from ANTCLIFF (1973) is included for comparison. Where differences are significant the LSD (P = 0.05) is included as a vertical bar.

Durchschnittlicher Traubenertrag der Klone unterschiedlicher Herkunft (Subvarianten), Jahrgänge 1982—85. Zum Vergleich sind die Werte aus ANTCLIFF (1973) mitaufgeführt. Grenzdifferenzen (senkrechte Balken) sind eingetragen, wenn signifikante Unterschiede bei P = 0,05 vorliegen.

Mean yield, total soluble solids, pH and titratable acidity of the main plot pruning treatments, i.e. spur, hedge and MPCT, harvests 1982—85

Mittlerer Traubenertrag, Mostgewicht, pH und titrierbare Säure der Schnittvarianten (Hauptvarianten) — Zapfenschnitt, Heckenschnitt und Minimalschnitt (MPCT) — Jahrgänge 1982—85

	Year	Spur	Hedge	MPCT	LSD (P = 0.05)
Yield	82	11.42	13.45	15.23	1.23
(kg/vine)	83	11.13	12.50	9.80	1.16
	84	14.75	16.05	14.91	NS
	85	14.01	14.57	14.12	NS
Mean		12.83	14.15	13.82	0.76
Berry weight	82	1.26	1.22	1.12	0.07
(g)	83	1.12	1.06	1.08	NS
	84	1.32	1.30	1.22	NS
	85	1.27	1.14	1.07	0.10
Mean		1.24	1.18	1.12	0.06
Soluble solids	82	20.9	21.0	20.6	0.3
(°Brix)	83	22.5	22.3	21.9	NS
	84	20.1	19.8	18.7	0.7
	85	21.5	21.1	19.9	0.3
Mean		21.3	21.1	20.3	0.20
pH	82	3.47	3.44	3.41	0.03
	83	3.38	3.34	3.33	0.03
	84	3.25	3.24	3.24	NS
	85	3.39	3.36	3.29	0.05
Mean		3.37	3.35	3.32	0.03
Titratable acidity	82	5.11	5.58	5.73	0.53
(g/l)	83	5.77	6.02	5.72	NS
	84	6.46	6.15	6.88	NS
	85	5.26	5.43	5.77	0.27
Mean		5.65	5.80	6.03	0.38

The combined yield data for the four clones (subplot means) are presented in Fig. 1. Data from ANTCLIFF (1973), which showed no differences between the clones is included for comparison. The results show significant differences between clones in all seasons. SA173 had significantly more crop in all seasons and over the 4 years than

SA140 and the imported clones, except in 1982. The imported Californian and European clones were similar in all seasons. SA140 had the lowest yield each year but the difference from the imported clones was only significant in 1982.

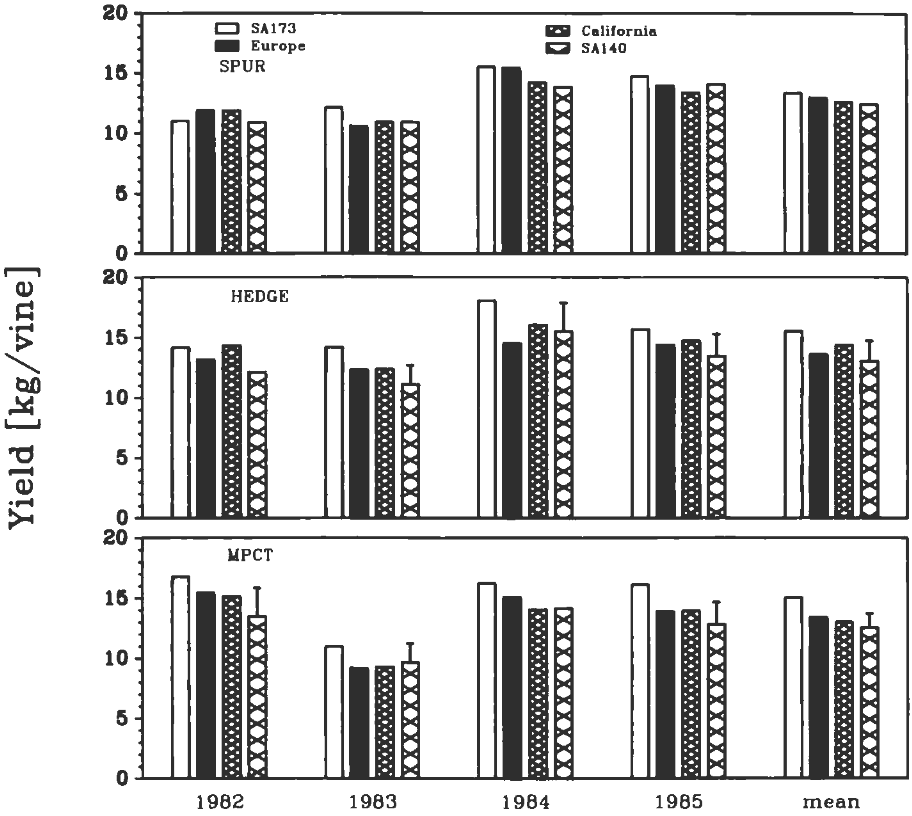

Fig. 2: Mean yield of the four clones for each pruning treatment, spur, hedge and MPCT, harvests 1982—85. Where differences are significant the LSD (P = 0.05) is included as a vertical bar.

Durchschnittlicher Traubenertrag der vier Klone für die einzelnen Schnittvarianten — Zapfenschnitt, Heckenschnitt und Minimalschnitt (MPTC) — Jahrgänge 1982—85. Grenzdifferenzen (senkrechte Balken) sind eingetragen, wenn signifikante Unterschiede bei P = 0,05 vorliegen.

A detailed comparison of clonal yield for each pruning treatment is presented in Fig. 2. The interaction between clone and pruning treatments was not significant in all seasons and for the 4-year mean. Clonal differences with standard spur pruning were not significant in any season or over the 4 years. Clonal differences were significant with both MPCT and hedging in 3 seasons and over the 4 seasons. The yield results confirm the superiority of SA173 and the inferiority of SA140.

Discussion

The results show that irrigated Riesling vines grown in warm environments can be maintained by the light pruning techniques found satisfactory for other wine varieties, i.e. hedging (MAY and CLINGELEFFER 1977; FREEMAN and CULLIS 1981) and MPCT (CLINGELEFFER 1983; CLINGELEFFER and POSSINGHAM 1987). Treatment effects on wine quality are unlikely, as shown for Riesling in other management studies where yield differences were small (EWART *et al.* 1986). The small delay in maturity (3—4 d) with MPCT vines would be insignificant in commercial practice. It may have been caused by an increase in the fruit to leaf ratio, a result of changes in canopy size and shoot growth as reported for Sultana (CLINGELEFFER 1984).

The light pruning systems offer considerable savings in pruning costs. The MPCT system may be the better option because of the benefits associated with vigour control and easier mechanical harvesting resulting from the flexible canopy (CLINGELEFFER 1984; KIDD 1986; CLINGELEFFER and POSSINGHAM 1987), in particular when compared to spur and hedge pruning of quadrilateral cordons on a T-trellis. Furthermore, for the MPCT system, trellis is simple and inexpensive and the mechanical pruning equipment required may be less robust and faster to operate than that currently used for hedging (KIDD 1986).

The clonal effects have important implications for viticultural research. They indicate that traditional severe pruning imposes a production constraint to improved clones. Differences between the Riesling clones were not significant with cane pruning (ANTCLIFF 1973) and in these studies with hand-spur pruning. The results indicate that the lighter pruning treatments which are in commercial use must be included in all clonal selection trials. Both the hedging and MPCT systems produced significant clonal differences which showed SA173 to be superior and SA140 to be inferior in performance. The two imported clones were very similar in performance.

Summary

Three pruning treatments were superimposed on an established Riesling clonal selection trial situated in a hot irrigated Australian vineyard. Significant yield differences over 4 seasons between conventional spur pruning (mean 12.8 kg/vine) and the light pruning treatments, hedging and MPCT (means 14.2 and 13.8 kg respectively), were found. Light pruning treatments produced smaller berries, but effects on soluble solids, pH and titratable acidity were small.

Yield differences between the four clones, two Australian selections SA173 and SA140 and imported clones from Europe and California, were significant in the combined analyses of the three pruning treatments. SA173 (mean 14.7 kg/vine) had superior production while production by SA140 (12.7 kg) was inferior. The two imported clones gave similar yields. Clonal differences were not significant with spur pruning in any season but significant differences with the light pruning treatments were evident in 3 out of 4 seasons and over the 4 years. This suggests that traditional severe pruning used in clonal selection trials may limit the production of improved clones.

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