



LEAF REMOVAL TO REGULATE FRUIT RIPENING IN CABERNET SAUVIGNON

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Abstract

Aim: Under the effects of climate change it is becoming increasingly common to observe excessively fast sugar accumulation while anthocyanin and flavour development are lagging behind. Understanding the impact of different leaf removal techniques on ripening will provide vineyard managers with a canopy management strategy suitable for regulating sugar accumulation, phenolic maturity and flavour ripeness, thereby helping to mitigate these negative effects. The aim of this research was to quantify the impacts of three different leaf removal techniques on the canopy architecture and ripening of Cabernet Sauvignon.

Methods and Results: Treatments were performed at veraison (~14 °Brix) and included: i) Control, ii) Leaf plucking around the bunches iii) Leaf plucking the top two thirds of shoots apical to the bunches, and iv) Shoot trimming. On the date of harvest no significant difference in grape TSS was observed between treatments. Other results including the effect of the treatments on acidity, anthocyanins, phenolics, and tannins were somewhat inconclusive.

Conclusions: While various other studies have shown the potential to achieve slower grape sugar accumulation without affecting the concentration of anthocyanins, phenolics, and tannins, the results of this study do not indicate a decrease in the rate of grape sugar accumulation as a result of the investigated defoliation techniques.

Significance and Impact of the Study: Given the cost of implementing these treatments the results of this study do not support the use of these methods for the purpose of delaying fruit ripening in a hot Australian climate.

Keywords: Delayed ripening, leaf removal, shoot trimming, canopy management, Cabernet Sauvignon

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Background & Aims

- Under the effects of climate change it is becoming increasingly common to observe excessively fast sugar accumulation while anthocyanin and flavour development are lagging behind.
- Understanding the impact of different leaf removal techniques on ripening will provide vineyard managers with a canopy management strategy suitable for regulating sugar accumulation, phenolic maturity and flavour ripeness, thereby helping to mitigate these negative effects.
- The aim of this research was to quantify the impacts of three different leaf removal techniques on the canopy architecture and ripening of Cabernet Sauvignon.

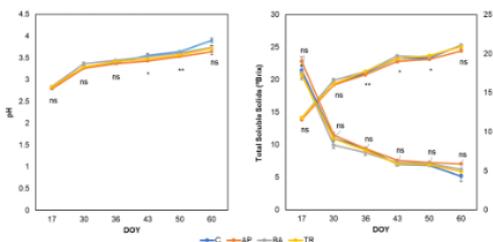
Results

- Yield and yield components did not vary between treatments.

Table 2: Effect of leaf removal treatments on yield and yield components

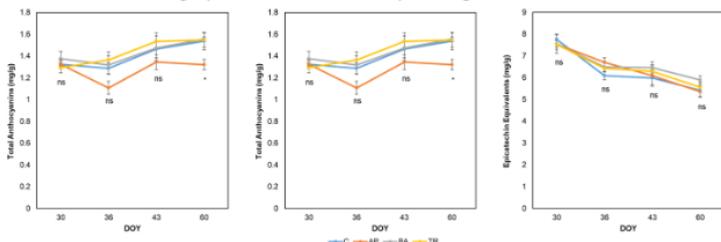
Treatment (T)	Yield (kg/m)	Bunch Number (#/m)	Bunch Weight (g)	Berry Weight (g)
C	2.4	32.3	72.8	0.78
AP	3.3	40.2	80.5	0.89
BA	2.3	30.3	72.1	0.88
TR	2.6	32.3	81.1	0.83
Significance	ns	ns	ns	ns

Means were separated by ANOVA ($P \leq 0.05$). ns = not statistically significant.

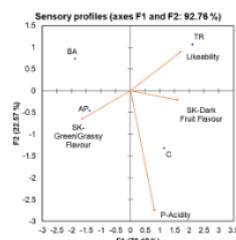
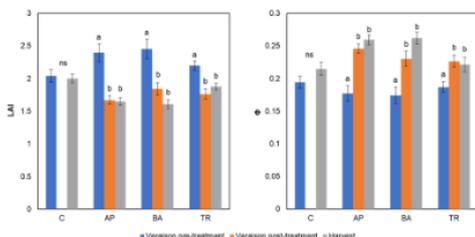


- At harvest no difference in grape TSS, pH or TA was observed between treatments.

- Concentration of grape tannins did not vary among treatments.



- Lower LAI, and higher porosity (Φ) were observed after the application of all three defoliation techniques.



- The basal and apical leaf removals were associated with green/grassy flavours in the skin.
- Both control and shoot trimmed berries were described as having higher dark fruit flavour in the skin.
- The acidity of the pulp was perceived as being higher in the control.
- Shoot trimmed berries were the most well liked.

Methods

Table 1: Leaf removal techniques applied at veraison

Treatment	Description
Control (C)	No canopy intervention performed
Apical leaf removal (AP)	Leaves removed on each shoot apical to the bunches, leaving 3–4 leaves immediately above the bunches and 3–4 leaves at the apex of the shoot
Basal leaf removal (BA)	5–7 leaves removed from the basal portion of each shoot on the eastern side of the canopy
Shoot trimming (TR)	Each shoot on the eastern side of the canopy cut down to approximately 5–6 leaves



Figure 1: Apical leaf removal (AP). Figure 2: Basal leaf removal (BA). Figure 3: Shoot trimming (TR).

Measurements

Canopy architecture

- Leaf Area Index (LAI) and porosity (Φ) using the VitiCanopy App

Yield components and grape composition

- Berry weight, total soluble solids (TSS), pH and total acidity (TA)
- Yield and its components on a per metre basis
- Total grape tannins, anthocyanins and phenolics

Berry sensory analysis

- Berry sensory assessment (BSA) on pulp, skin, and seed characteristics

Conclusions

- While various other studies have shown the potential to achieve slower grape sugar accumulation without affecting the concentration of anthocyanins, phenolics, and tannins, the results of this study do not indicate a decrease in the rate of grape sugar accumulation as a result of the investigated defoliation techniques.
- Lack of difference between LAI or Φ values measured post-treatment and at harvest indicates that there was no compensation in leaf area between when treatments were performed and harvest and in the case of shoot trimmed vines suggests that there was no competitive re-growth of lateral shoots stimulated by trimming.
- Other results including the effect of the treatments on anthocyanins, phenolics, and tannins were somewhat inconclusive.

Significance and impact of the study

- Given the cost of implementing these treatments the results of this study do not support the use of these methods for the purpose of delaying fruit ripening in a hot Australian climate at this time.
- Further research conducted during consecutive growing seasons could be beneficial in determining the efficacy of these treatments in safeguarding terroir via the preservation of heritage grape varieties.

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