XIIIth International Terroir Congress
17–18 November 2020
Virtual Congress | Adelaide, Australia

DEVELOPING AND ASSESSING DIFFERENT CORDON ESTABLISHMENT TECHNIQUES FOR LONG-TERM VINEYARD MANAGEMENT

Patrick O'Brien[1], Roberta De Bei[1], Cassandra Collins[1,2]*

[1]The University of Adelaide, School of Agriculture, Food and Wine, Waite Research Institute, PMB 1 Glen Osmond, 5064, South Australia, Australia
[2]ARC Industrial Transformation Training Centre for Innovative Wine Production, Waite Research Institute, PMB 1 Glen Osmond, 5064, South Australia, Australia

*Corresponding author: cassandra.collins@adelaide.edu.au

Abstract

Aim: The aim of this research is to quantify the impacts of different cordon establishment techniques on vine health and longevity. It is hypothesised that wrapping developing cordon arms tightly around the cordon wire will cause a constriction of the vascular system, becoming worse over time and disrupting the flow of water and nutrients.

Methods and Results: Training methods including wrapping the cordon tightly around the cordon wire, securing the cordon on top of the wire, and weaving the cordon through a plastic clip system, among others were applied to Cabernet Sauvignon and Shiraz grapevines at two commercial growing sites. At one site a length adjustment was performed on canes selected as permanent cordon arms based on their apparent vigour. Areas of assessment include measurements of vegetative growth, canopy architecture, and yield components, as well as physiological measurements including non-structural carbohydrate status and the microscopic examination of xylem morphology. Susceptibility to fungal trunk diseases is also being investigated. Early results indicate a significantly lower concentration of sugar, starch, and total non-structural carbohydrates in cane samples collected from the distal portion of arms woven through the plastic clip system after one growing season. Additionally, measurements of circumference and pruning weight of the intermediate sections of the cordons were significantly greater in vines which received length adjustments than those that didn't receive adjustments.

Conclusions: Measurements of non-structural carbohydrate status suggest that the use of the plastic clip system may be beneficial in promoting the translocation of carbohydrates from the distal portion of the arm to perennial structures for overwintering. The increase in vegetative growth observed in the vines which received length adjustments suggests that this method may be beneficial in encouraging the growth of more numerous, healthy spur positions.

Significance and Impact of the Study: Suitable vineyard management strategies are needed to minimise the occurrence of cordon decline and dead arm symptoms. Understanding the potential benefits of adopting cordon establishment techniques which avoid constriction of the vines' vasculature will provide vineyard managers with a strategy aimed at improving vineyard health and longevity.

Keywords: Cordon, constriction, vascular system, trunk disease, decline

Developing and assessing different cordon establishment techniques for long-term vineyard management

Patrick O'Brien[1], Roberta De Bei[1], and Cassandra Collins[1,2]

[1] The University of Adelaide, School of Agriculture, Food and Wine, Waite Research Institute, PMB 1 Glen Osmond, 5064, South Australia. Australia. [2] ARC Industrial Transformation Training Centre for Innovative Wine Production, Waite Research Institute, PMB 1 Glen Osmond, 5064, South Australia, Australia.

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Background & Aims

- Wrapping developing cordon arms tightly around the cordon wire may result in a constriction of the vascular system, becoming worse over time and disrupting the flow of water and nutrients along the cordon, leading to early decline.

Figure 1: Signs of visible decline commonly observed in older vineyards where cordon arms have been wrapped tightly around the cordon wire.

- It is likely that the stress resulting from the constriction of the vines vasculature may reduce the vines natural ability to deal with external factors such as the onset of fungal trunk diseases, a condition which could be further exacerbated by water and heat stress events.
- The aim of this research is to quantify the impacts of different cordon establishment techniques on vine health and longevity.

Methods

Table 1: Cordon training techniques applied

Treatment	Description	Variety
Control (C)	Cordon wrapped tightly around cordon wire	Cabernet Sauvignon, Shiraz
Placed on top (P)	Cordon placed on top of cordon wire and secured in place in 3–4 positions	Cabernet Sauvignon, Shiraz
Woven through clips (W)	Cordon woven through plastic clip system centred between parallel cordon wires	Cabernet Sauvignon, Shiraz
S-bend (S)	Cordon wrapped around parallel cordon wires in loose, S-shaped bend	Shiraz
Cane pruned with clips (CA)	Canes arched through plastic clip system annually	Shiraz
Cane pruned without clips (CW)	Canes wrapped around cordon wire annually	Shiraz
Length adjustment (LA)	Length of canes selected as permanent cordon arms adjusted based on their apparent vigour and then extended during growing season	Cabernet Sauvignon

Figure 2: Cordon wrapped tightly around the wire (A), cordon placed and secured on top of wire (B), cordon woven through plastic clip system (C), cordon wrapped in loose, S-shaped bend (D).

Measurements

Vegetative growth

- Leaf Area Index (LAI) using the VitiCanopy App
- Cordon circumference, pruning weight

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

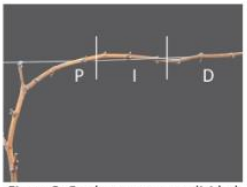


Figure 3: Cordon arms were divided into Proximal (P), Intermediate (I), and Distal (D) sections for some measurements.

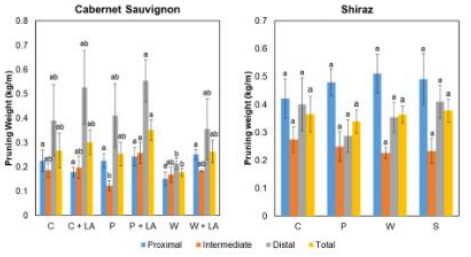
Physiological

- Midday stem water potential, transpiration rate per unit of leaf area and hydraulic conductivity
- Non-structural carbohydrate (NSC) status of cane samples collected from the distal portion of arms during dormancy
- Microscopic examination of xylem morphology

Fertility

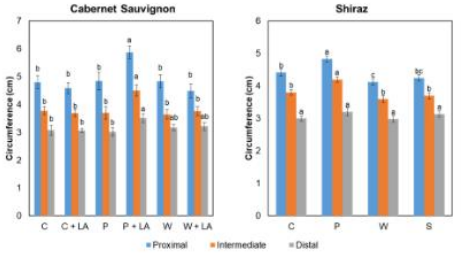
- Incidence of primary bud necrosis (PBN) and bud fertility

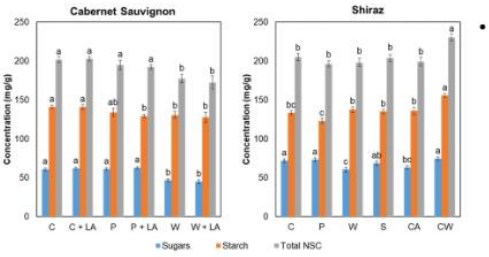
Results



- No difference observed between the pruning weights of any of the three arm sections or total pruning weight for Shiraz after one growing season.

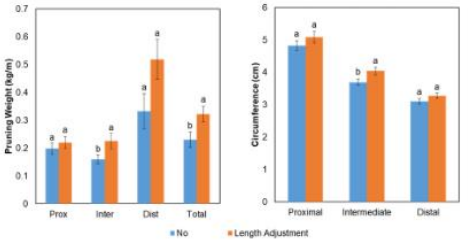
- Circumferences of the proximal, intermediate, and distal portions of cordon arms were higher for the cordons that were secured on top of the wire and received a length adjustment.





- A lower concentration of sugars and total NSC was observed in cane samples collected from the distal portion of arms woven through the plastic clip system after one growing season for Cabernet Sauvignon.

- Measurements of circumference and pruning weight of the intermediate sections of cordons were greater in vines which received length adjustments after one season.



Conclusions

- Early measurements of non-structural carbohydrate status suggest that use of the plastic clip system may be beneficial in promoting translocation of carbohydrates from distal portion of arms to perennial structures for overwintering.
- Increase in vegetative growth observed after a single growing season in vines which received length adjustments suggests that this method may be beneficial in encouraging growth of more numerous, healthy spur positions.

Significance and impact of the Study

- Suitable vineyard management strategies are needed to minimise the occurrence of cordon decline and dead arm symptoms.
- Understanding the potential benefits of adopting cordon establishment techniques which avoid constriction of the vines vasculature will provide vineyard managers with a strategy aimed at improving vineyard health and longevity, thereby protecting terroir via the avoidance of costly, premature reworking or replanting.

For more information

Patrick O'Brien
patrick.obrien@adelaide.edu.au
Cassandra Collins
cassandra.collins@adelaide.edu.au
Roberta De Bei
roberta.debei@adelaide.edu.au

Acknowledgements

Australian Government
Wine Australia
THE UNIVERSITY of ADELAIDE

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