

Research News from Cornell's Viticulture and Enology Program

RESEARCH FOCUS

Alternative Shoot Tip Management Practices to Reduce Laterals and Cluster Compactness

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Anne Kearney Logan demonstrates shoot wrapping, an alternative to summer shoot hedging in VSP-trained vineyards.

In vertical shoot positioned (VSP) vineyards, mechanical shoot tipping (hedging) is often used to manage shoot growth, maintain an open canopy and avoid fruit shading. But removing shoot tips often leads to increased lateral shoot growth, and the need for an additional hedging operation.

We investigated shoot tucking and shoot wrapping as alternatives to hedging for managing canopy growth in two field studies with Cabernet franc and Riesling. Shoot wrapping and shoot tucking both reduced the number and length of lateral shoots, increased spray penetration to the fruiting zone and reduced cluster compactness. In one year of the Riesling study, shoot tucking or shoot wrapping reduced the incidence of botrytis fruit rot. Estimated costs ranged from \$118 (30 seconds per vine) to \$236 (60 seconds per vine), comparable to estimated costs hedging (two passes) plus mechanical leaf removal (\$225/acre).

KEY CONCEPTS

- Mechanical shoot tipping, or summer hedging, is a common canopy management practice for vertical shoot-positioned (VSP) vineyards.
- Shoot-tipping often increases lateral shoot development, and subsequent cluster-zone fruit shading.
- Shoot wrapping (SW) around the top canopy wire and shoot tucking (ST) pointing shoot tips downward) are two alternatives to hedging.
- In two trials, SW and ST reduced the number and length of lateral shoots, reduced cluster compactness in Cabernet franc, and reduced the incidence of botrytis bunch rot in Riesling in one of the two study years.
- Completing SW and ST was estimated at 30-60 seconds per vine. Overall costs were equivalent to mechanical hedging (2x) and mechanical leaf removal.

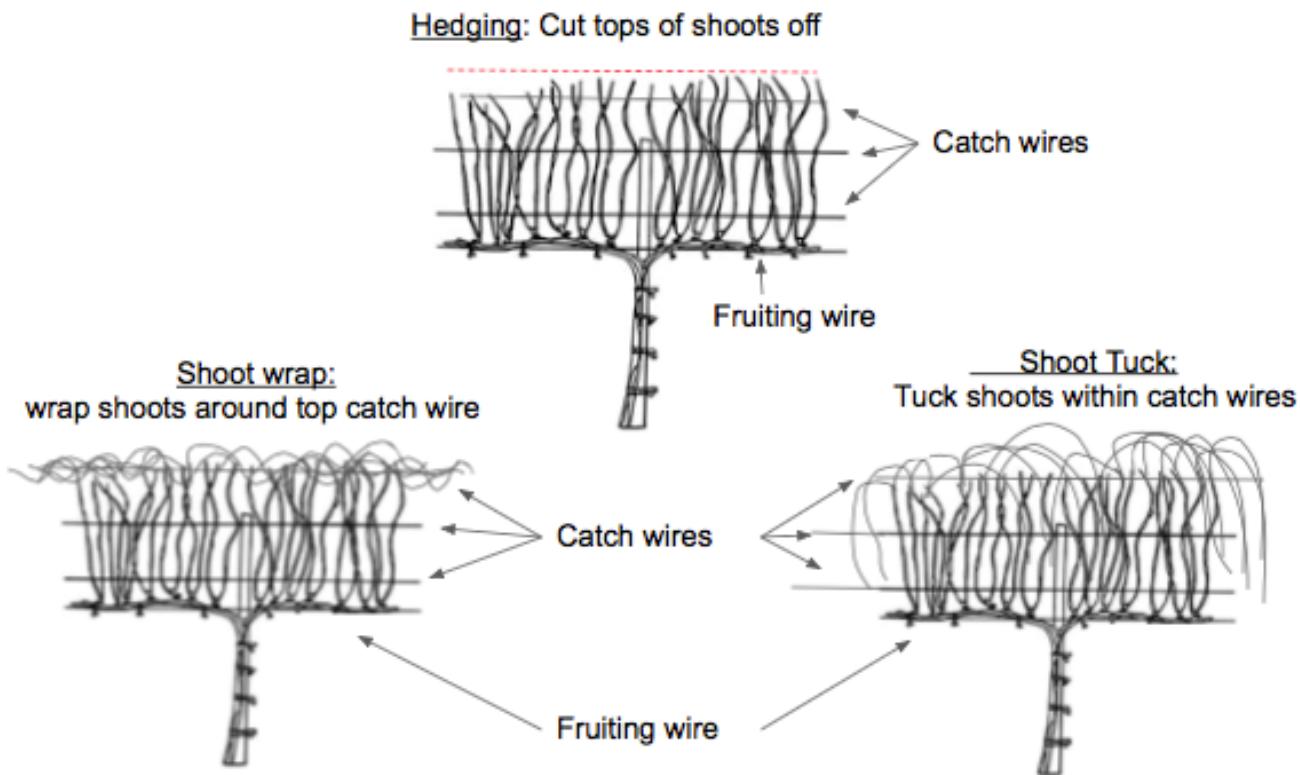


Figure 1. Diagram illustrating treatments applied to Riesling and Cabernet Franc grapevines: Hedged (control, top), Shoot Wrap (bottom left) and Shoot Tuck (bottom right).

Introduction

While mechanical shoot hedging in vertically shoot positioned (VSP) training systems is a common practice, it does not address the long-term problem of excessive vine vigor. Additionally, the hedged treatment results in more vigorous vegetative growth through newly emerged lateral shoots and often leads to greater cluster compactness. Emerging lateral shoots and compact clusters can increase incidence of fungal diseases such as Botrytis bunch rot.

New interest has emerged in the wine grape industry about the use of shoot wrapping or shoot tucking (*Fig. 1*) as a possible alternative hedging. This technique involves wrapping shoots along the top catch wire or tucking shoots into the catch wires - and is known by the French terms “palissage” or “tressage”. Shoot wrapping/tucking instead of hedging is thought to reduce lateral emergence and cluster compactness.

To test these practices, we conducted a two-year study on Riesling and a four-year study on Cabernet franc. The objectives were to test the impacts of shoot wrapping or shoot tucking compared to the hedging on vine growth, fruit composition, cluster morphology, and disease incidence/severity.

Methods

We established trials on 18-year-old Riesling from 2015-2016 and on nine-year-old Cabernet Franc from 2016-2019. Both sites were on the East side of Cayuga Lake in the Finger Lakes region of New York State. We evaluated three shoot tip management methods shoot wrap (abbreviated to SW), shoot tuck (abbreviated to ST), and standard shoot hedge treatment (see diagram in *Fig. 1* and photos in *Fig. 2*). We collected measurements of vegetative and reproductive vine growth and monitored spray penetration to clusters using water-sensitive cards in the fruiting zone.

Results

Lateral emergence and lengths: Cabernet franc vines in the SW treatment had fewer lateral shoots in the fruit zone and those laterals were substantially shorter in each year of the study compared to the hedged treatment (*Fig. 2*). The impact of ST on lateral number and length varied, depending on year (*Fig. 3*). Similar results were noted in the Riesling experiment with the exception of a drought year (2016), when there were no laterals in the fruit zone of any of the treatments (data not shown).

Spray penetration: Water-sensitive cards (*Fig. 4*) were used to assess spray penetration to clusters. The yel-



Figure 2. Top: Shoot wrap, photo courtesy of Alice Wise. Bottom: Shoot tuck, photo courtesy of Justin France.

low cards turn purple when in contact with moisture, so that more purple on a card equates to better spray penetration. Differences among treatments were noted in the Cabernet franc in 2018 when the SW had better spray penetration than the hedged treatment. In 2019 there were no differences among treatments.

Cluster compactness: Cluster compactness, measured as the number of berries per length of rachis, is an indicator of how crowded berries are on the rachis – and how susceptible clusters are to spread of fruit rots within the cluster. In Riesling, cluster compactness was unaffected by treatment but rachis length increased from 9.6 cm in the hedged treatment to 11.0 cm in the ST treatment. In Cabernet Franc, cluster compactness was reduced by SW compared to the hedged treatment in three of the four years of the study (*Fig. 5*).

Disease incidence/severity: There were few differences in incidence of downy mildew in the canopy among Cabernet franc treatments, but anecdotally we observed the highest incidence of downy mildew in the upper portions of the canopy where the shoots were wrapped (SW) or bent (ST).

In Riesling, we quantified botrytis incidence and severity. Botrytis incidence (the percentage of clusters with any infection) was lower in the ST and SW treatments compared to hedged treatment in one of two years, but botrytis severity (the % of cluster volume diseased) did not differ among treatments (data not shown).

Yield and vine size: The canopy management treatments had an inconsistent impact on yield of Cabernet franc and Riesling. Since vine size is usually expressed as pruning weight, we were unable to assess the impacts of treatments since the hedged treatment involved cutting off shoots above the wire while the other treatments did not involve removal of any shoot length.

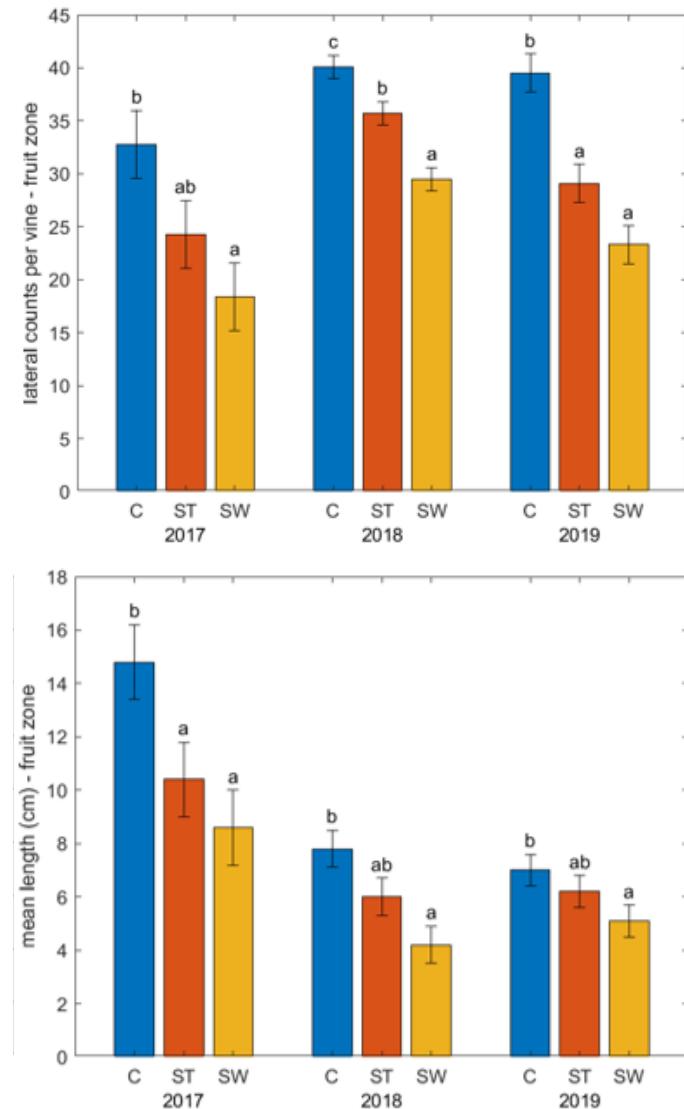


Figure 3. Top: Fruit zone lateral counts. Bottom: Average lateral length (right) in Cabernet Franc subjected to Hedging (C), Shoot Tuck (ST), and Shoot Wrap (SW). If letters above the bars are different, the means are statistically different from each other. The SW treatment had fewer and shorter laterals than the Hedging (control) treatment in each of the three years.

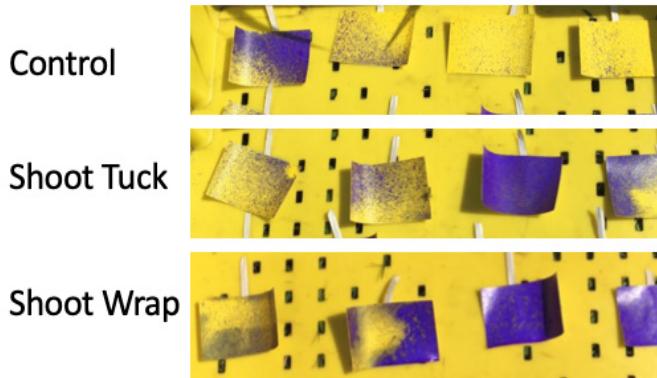


Figure 4. Water-sensitive cards hung directly in front of clusters to estimate spray coverage. Purple indicates that cards were hit by spray; yellow indicates that it was not hit by spray. In Cabernet Franc in 2018, only 45% of the card area was purple in the control, while both shoot tuck and shoot wrap were at least 70% purple, indicating better spray coverage and a more open canopy.

Fruit Composition: Fruit composition was generally not impacted in our studies, although yeast assimilable nitrogen was occasionally greater in ST or SW compared to the hedged treatment.

Cost Comparison: Shoot wrapping and shoot tucking involve human labor. We did an analysis to assess potential costs of applying either the SW or ST technique, including cost reductions resulting from avoidance of other canopy management practices such as hedging and cluster-zone leaf removal. According to the most recent “Cost of establishment and production of *V. vinifera* grapes in Finger Lakes Region of New York – 2019” bulletin (Davis et al., 2020), the cost of hedging a block twice is approximately \$110 per acre, while hedging twice plus mechanical leaf removal is about \$225 per acre.

For 9x6 ft. vine spacing, we calculated that the cost

of applying shoot wrapping or shoot tucking would be approximately \$118 per acre, if the task could be completed spending only 30 seconds per vine. At 60 seconds per vine, the cost would be about \$236 per acre. If either technique (ST or SW) could be completed in 30 seconds per vine for a vineyard with a standard 6 x 9 ft vine by row spacing, then the cost would be comparable to that of two mechanical hedged passes, which is a common practice in the Northeastern US (Wolf, 2008). If two mechanical hedge passes plus mechanical leaf removal in the fruit zone could be avoided due to the reduced lateral emergence and length, growers could spend up to about 60 seconds per vine implementing SW or ST without greatly increasing production costs.

Conclusion

Wrapping or tucking shoots may be a viable alternative to hedging to reduce vegetative growth through reductions in lateral emergence and cluster compactness. As a function of reduced lateral emergence and length, these treatments also have the potential to eliminate leaf removal and replace the hedged treatment.

With respect to potential negative impacts of these practices, we noted anecdotally that downy mildew was more prevalent at the top of the canopy in the ST and SW treatments. Additionally, pulling canes from wires during pruning may take longer for the ST and SW treatments.

Wrapping or tucking are likely to be of most interest to growers with sufficient labor availability who want to reduce lateral growth in the fruit zone and potentially bring down vine size over time. If vine-

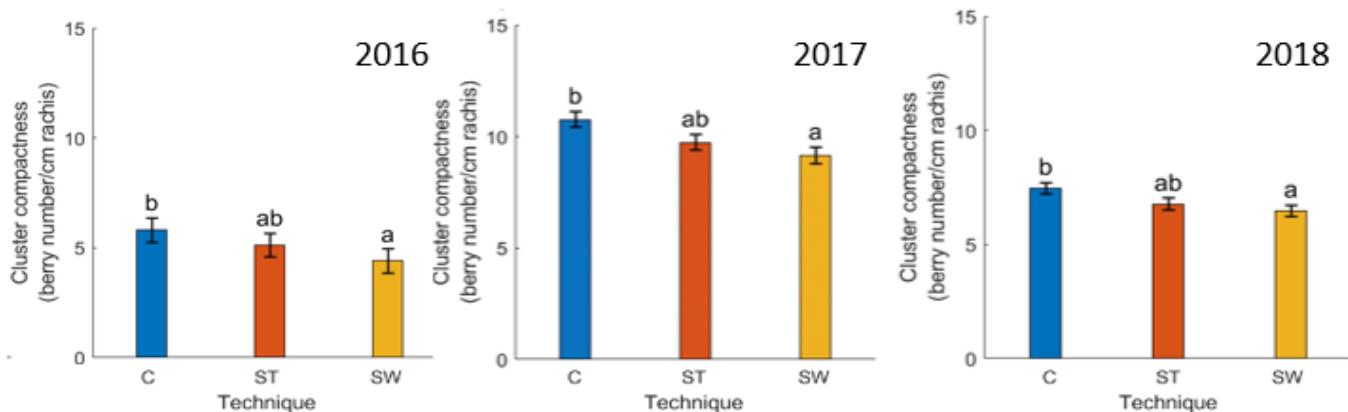


Figure 5. Cluster compactness in Cabernet Franc subjected to Hedging (C), Shoot Tuck (ST), and Shoot Wrap (SW). If letters above the bars are different, the means are statistically different from each other. From 2016-2018, SW had lower cluster compactness compared to the Hedging (control) treatment. There were no differences among treatments in 2019.

yards are interested in trialing SW or ST, they should conduct a small experiment on a moderate-to-high vigor block to determine whether the task could be completed expediently so costs of production are not significantly increased.

References

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Questions?

If you have questions about this work, please contact me at Justine@cornell.edu.

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