

Rā Tuatahi - Rāpare 17 Mahuru 2026
Day 1 - Thursday 17 September 2026
Wāhanga (session) 2: Leaf Cover vs Quality



DR CHANDRÉ KONETH

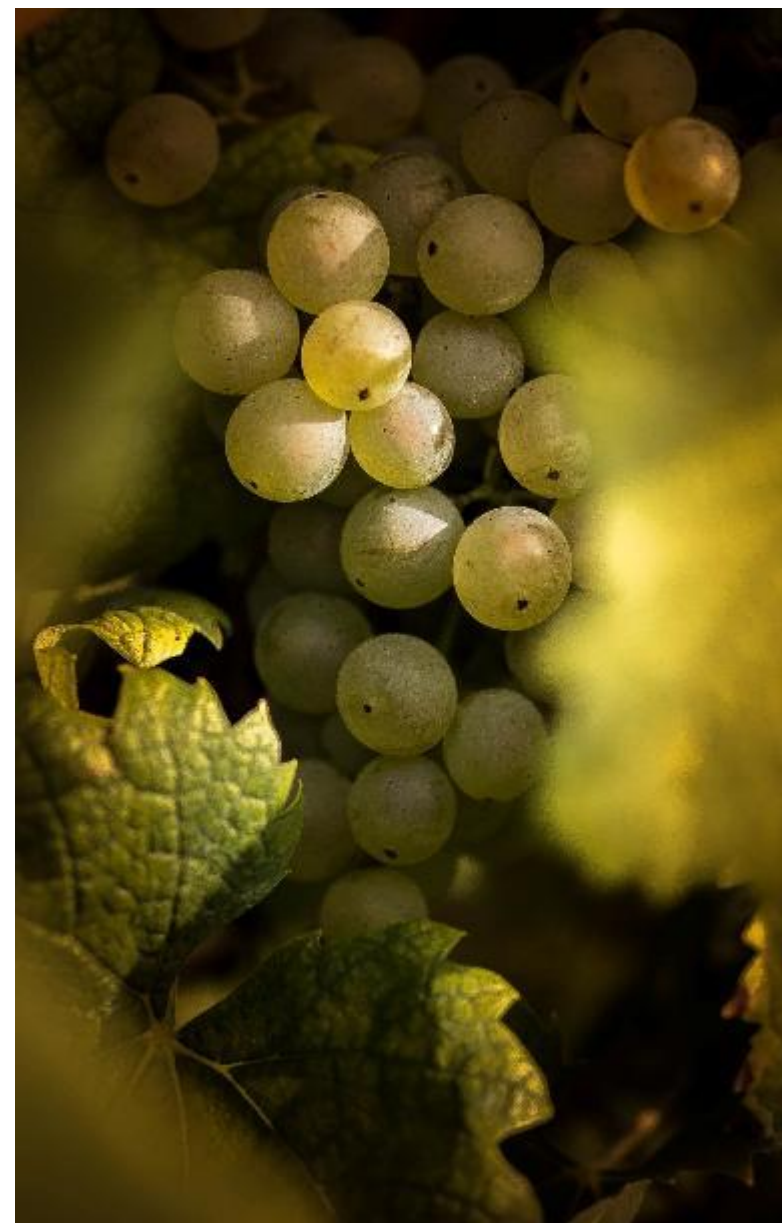
EXPOSING CHARDONNAY: THE EFFECTS OF LEAF REMOVAL

DR CHANDRÉ HONETH



LEAF REMOVAL IN PRACTICE

- Leaf removal is a standard canopy management tool in cool-climate viticulture, but timing, technique, and intensity all vary in practice.
- Hawke's Bay's climate and changing conditions create specific canopy microclimate and disease pressure considerations for Chardonnay
- Growers face trade-offs between fruit exposure benefits (composition, disease control etc.) and risks (compositional changes, cost etc.)
- This trial compares different leaf removal strategies to offer some practical recommendations for the region



LEAF REMOVAL IN CHARDONNAY



Does the leaf removal strategy impact yield at harvest?



Does the leaf removal strategy impact the berry composition at harvest?



Does the leaf removal strategy impact wine quality and composition?

TRIAL DETAILS

- The trial was conducted in a commercial Chardonnay vineyard on the Bridge Pa Triangle.
- Mendoza on 101-14 and planted in 2000.
- The trial included six leaf removal strategies.

Treatments

Control - 60% leaf removal both sides @ EL 27

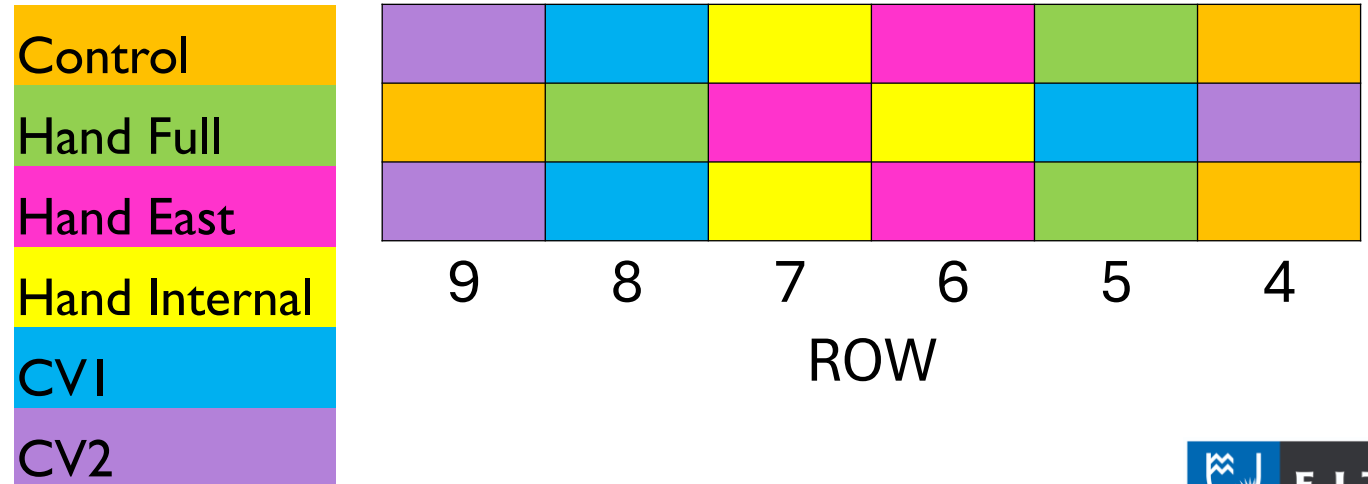
Hand full pick @ EL 27

Hand East @ EL 27

Hand Internal leaf + lower Lats @ EL 27

Collard/Viti pulse @ EL 27

Collard/Viti Pulse X2 @ EL 27 and 31-33



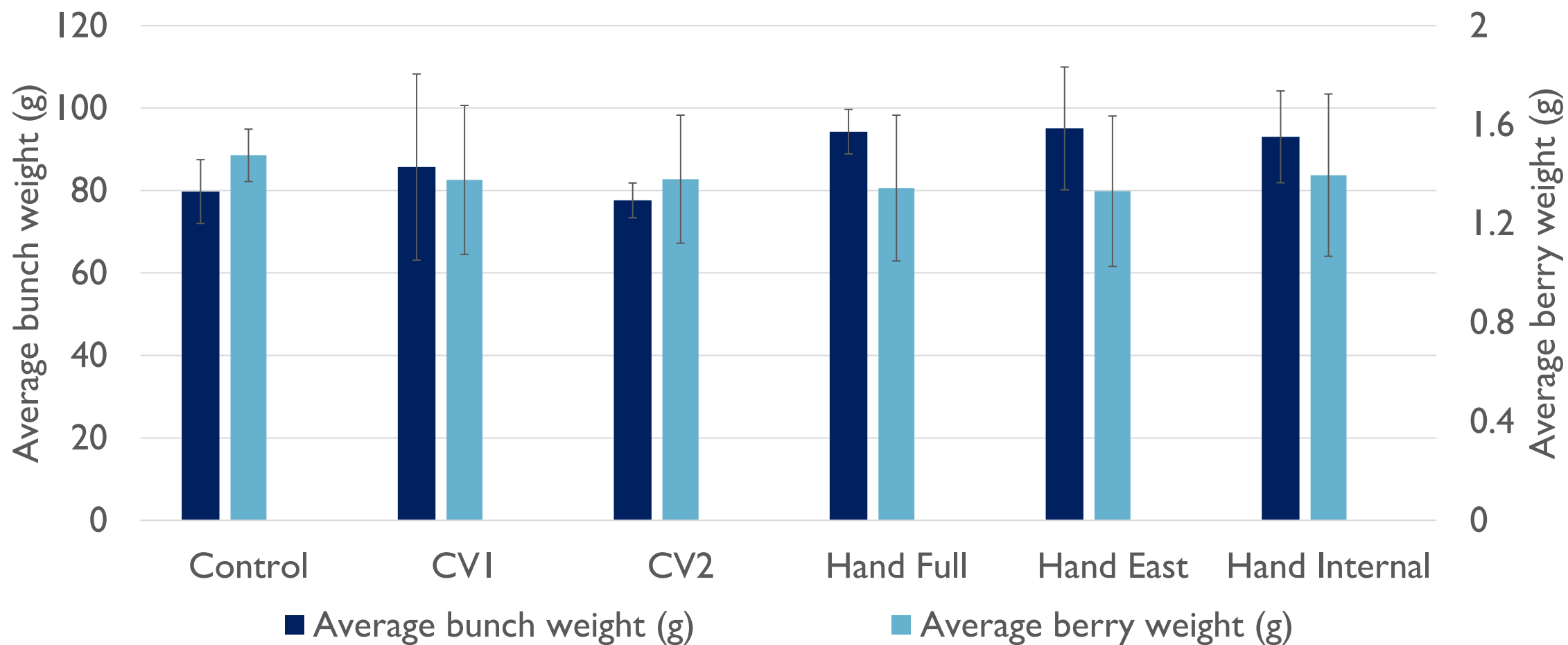
YIELDS

- Although not statistically significant, bunch weights were higher where hand plucking was done.
- Average berry weight remained similar across treatments.
- The larger bunches were likely driven more by differences in berry number per bunch than berry size.

Treatment	Average Bunch Weight (g)	Average Berry Weight (g)
Control	79.7 ± 7.7	1.48 ± 0.1
CV1	85.7 ± 22.6	1.38 ± 0.30
CV2	77.6 ± 4.2	1.38 ± 0.3
Hand Full	94.3 ± 5.4	1.34 ± 0.3
Hand East	95.1 ± 14.9	1.33 ± 0.3
Hand Internal	93.0 ± 11.1	1.40 ± 0.33

YIELDS

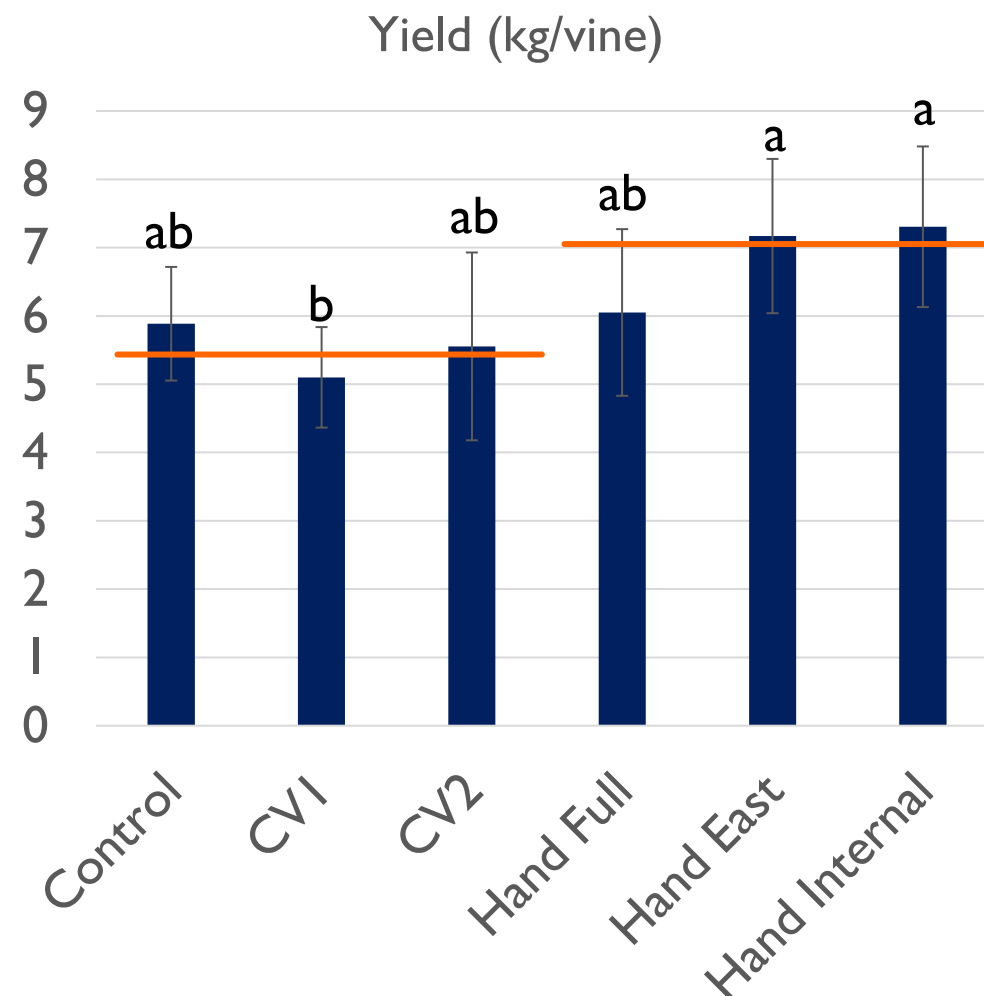
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MACHINE PLUCKING VS HAND PLUCKING

- This resulted in hand leaf-plucked treatments trending toward higher yields.
- Hand leaf plucked bays seemed to retain more berries per bunch.

Treatment	Mean $\pm$ SD	Yield (t/ha)
Control	5.89 $\pm$ 0.83	11.77
CV1	5.10 $\pm$ 0.74	10.20
CV2	5.55 $\pm$ 1.38	11.11
Hand Full	6.05 $\pm$ 1.22	12.10
Hand East	7.17 $\pm$ 1.13	14.34
Hand Internal	7.31 $\pm$ 1.18	14.61



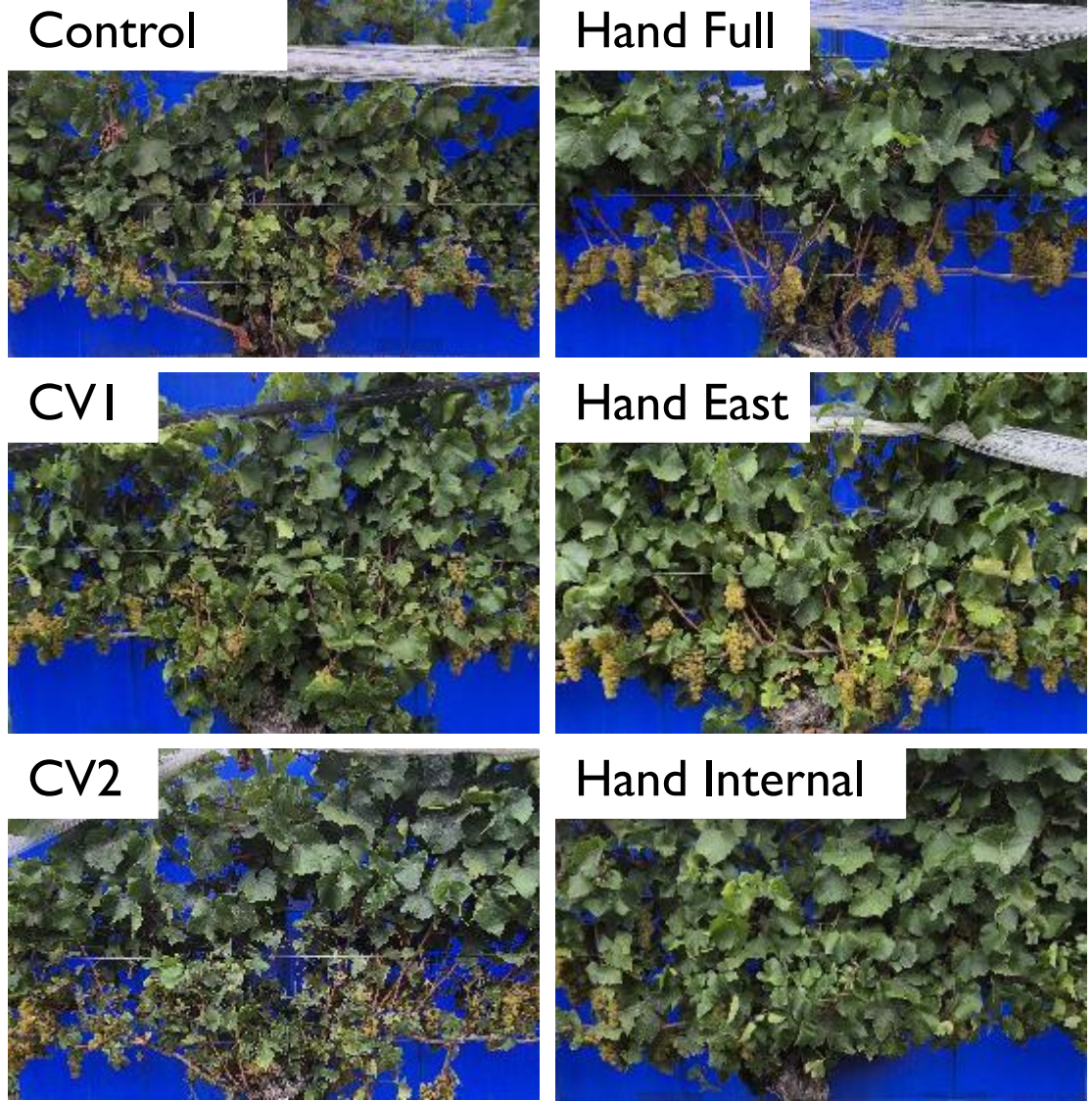
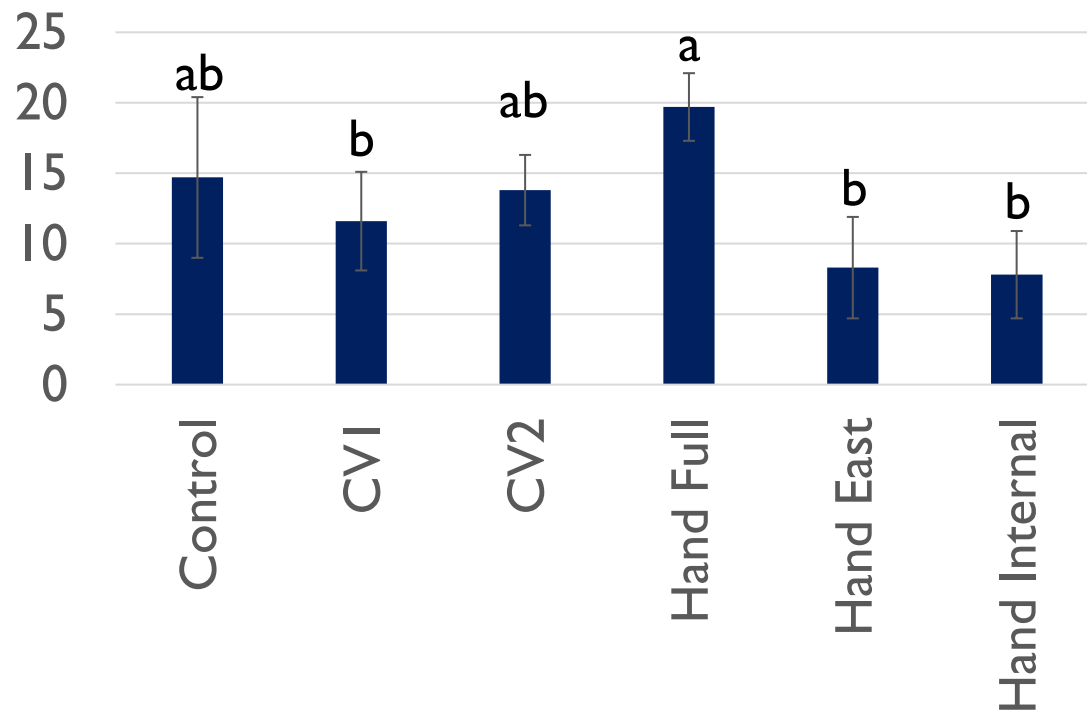
HAND VS MACHINE LEAF PLUCKING

- **The data suggest that the use of mechanical plucking caused berries to abscise leading to fewer berries per cluster and lower yields at harvest.**
- Leaf plucking was done very early after set - damage may cause young berries to abort.
- Not much data on this in grapevine, but it has been evidenced in blueberries.
 - Mechanical injury of the berry accelerated fruit detachment at the pedicel-berry junction.
 - Neighbouring non-injured berries were unaffected - wounding triggers a localized signal that promotes fruit abscission (Vashisth & Malladi, 2014).

CANOPY ARCHITECTURE

- Hand Full appeared to have the most open canopy.
- Hand East and Hand Internal achieved similar, relatively dense canopies.
- The CV treatments produced intermediate canopy openness and were statistically similar to the Control.

Average percentage of canopy gaps



DOES THIS IMPACT ROT INCIDENCE AND SEVERITY?

Treatment	Bunches assessed	Bunches affected	% Incidence	% Severity (mean across all bunches)	Severity (mean among affected only)
Control	36	23	63.9%	4.58	7.17
CV1	36	25	69.4%	5.83	8.40
CV2	36	14	38.9%	3.25	8.36
Hand Full	36	21	58.3%	3.19	5.48
Hand East	36	23	63.9%	8.17	12.78
Hand Internal	36	21	58.3%	6.64	11.38

- Incidence = % of bunches with any rot (>0%)
- Severity = mean rot % among only the infected bunches

DOES THIS IMPACT ROT INCIDENCE AND SEVERITY?

- CV2 has by far the lowest incidence but among the bunches that are affected, severity was still moderate (8.36).
- The denser canopies showed greater disease incidence
- Hand East and Hand Internal showed the worst outcomes - high incidence and the highest severity.
 - These are the highest yielding treatments.
- Hand Full performed best on severity among affected bunches (5.48) and ties for lowest incidence alongside Hand Internal



IS ROT LEVEL RELATED TO THE LEAF REMOVAL STRATEGY?

- Higher yielding vines were associated with greater rot severity
 - Hand East and Hand Internal
- These vines also exhibited denser canopies.
- The increased disease severity in these vines was likely linked to tighter bunch architecture and reduced cluster exposure.
- **Yield gains of hand leaf removal may be offset by increased bunch rot susceptibility.**



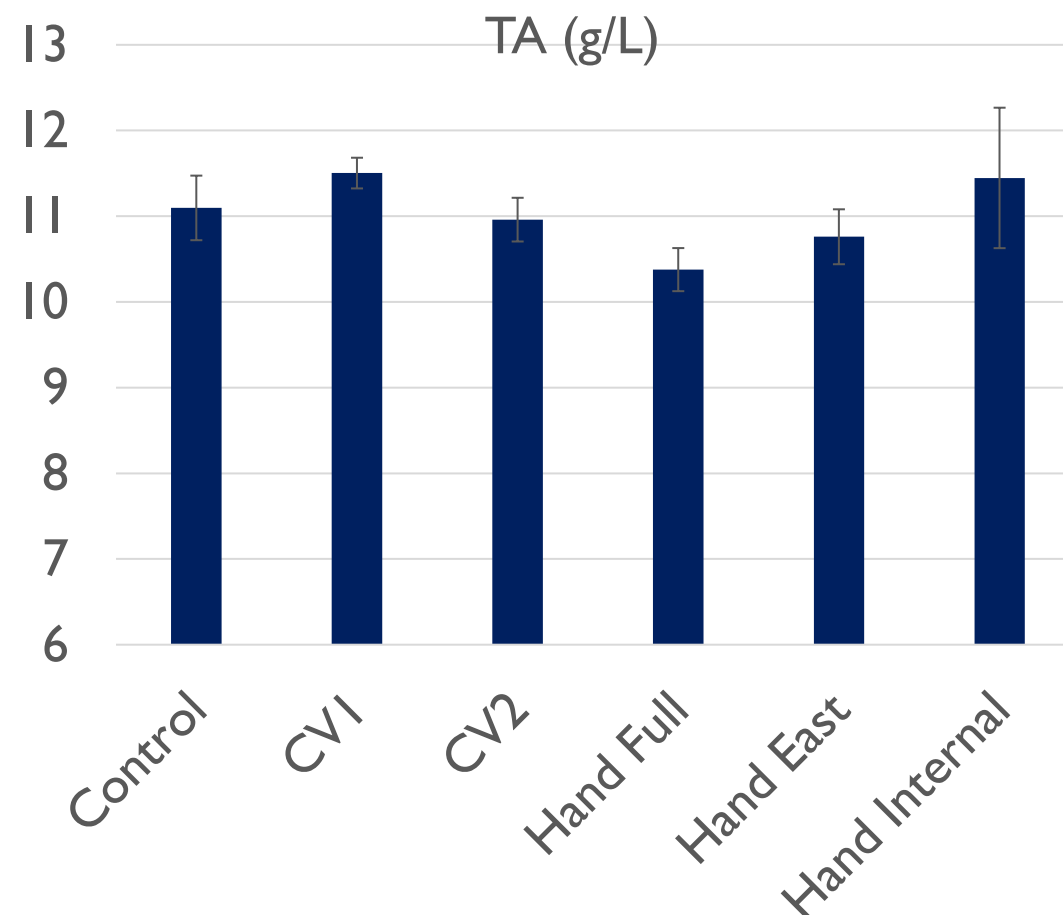
Does the leaf removal strategy impact yield at harvest?

- Machine-based leaf removal appeared to reduce yield.
 - Yield reduction was unlikely due to source limitation, as basal leaves were removed across all treatments.
 - Berry loss may have been driven by stress-induced abscission following mechanical defoliation.
- Despite lower yields, mechanical leaf removal reduced rot severity through improved cluster openness.
- Higher-yielding, hand-plucked vines tended to have denser canopies and tighter clusters, increasing disease risk.
- Leaf removal strategy may impact yield and berry quality – consider options in different vintages.

GRAPE COMPOSITION AT HARVEST

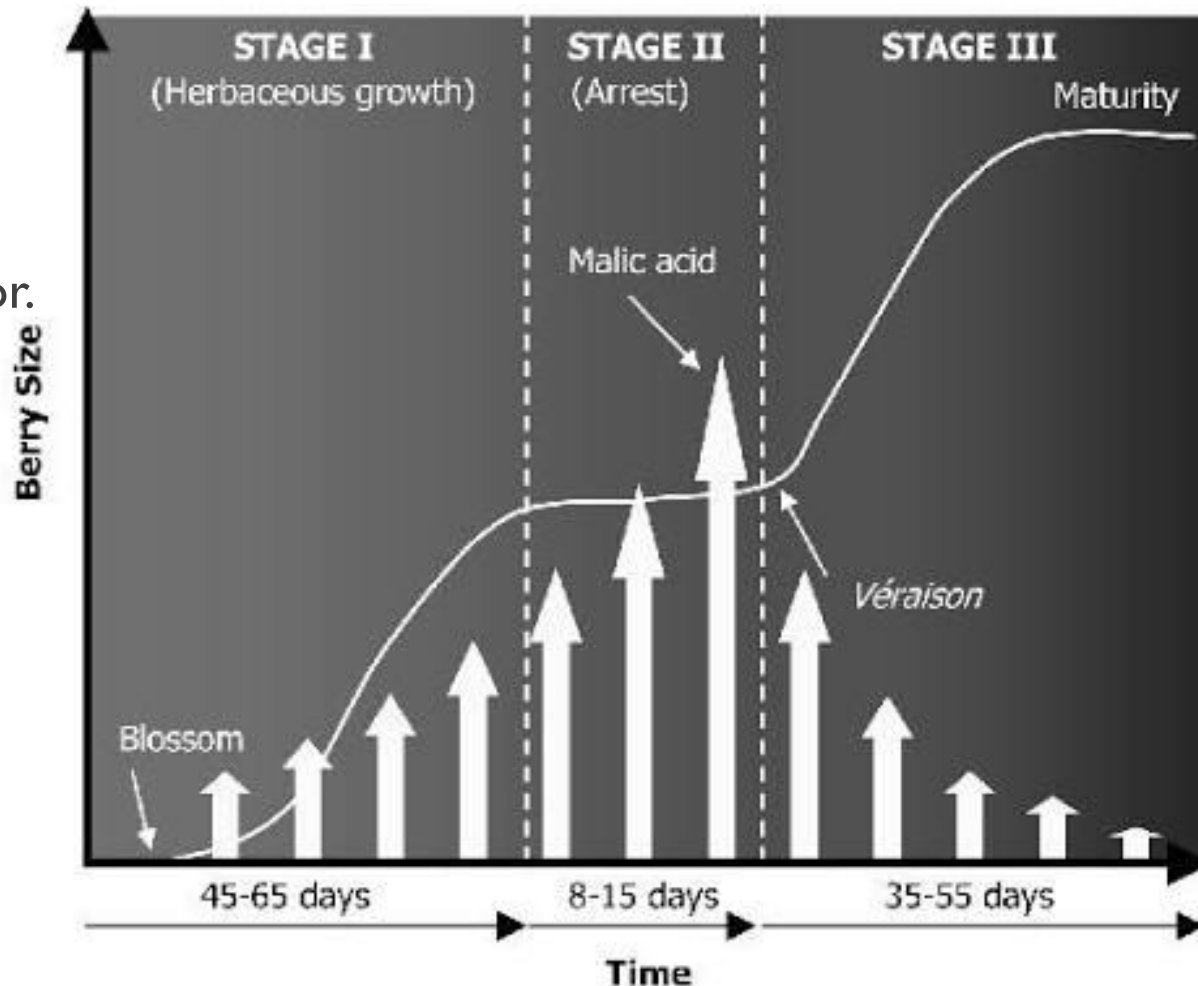
- There was no significant treatment effect on soluble solids (Brix) or juice pH.
- Although not significant, TA was reduced in the Hand Full Treatment
 - Likely related to respiration of malic acid under higher temperatures.

Treatment	Brix (mean $\pm$ SD)	pH (mean $\pm$ SD)
Control	20.83 $\pm$ 0.67	2.96 $\pm$ 0.03
CV1	20.53 $\pm$ 0.42	2.94 $\pm$ 0.02
CV2	20.93 $\pm$ 0.35	2.96 $\pm$ 0.04
Hand Full	21.07 $\pm$ 0.45	2.99 $\pm$ 0.00
Hand East	21.47 $\pm$ 0.60	3.00 $\pm$ 0.01
Hand Internal	20.60 $\pm$ 0.76	2.95 $\pm$ 0.06



MALIC ACID METABOLISM

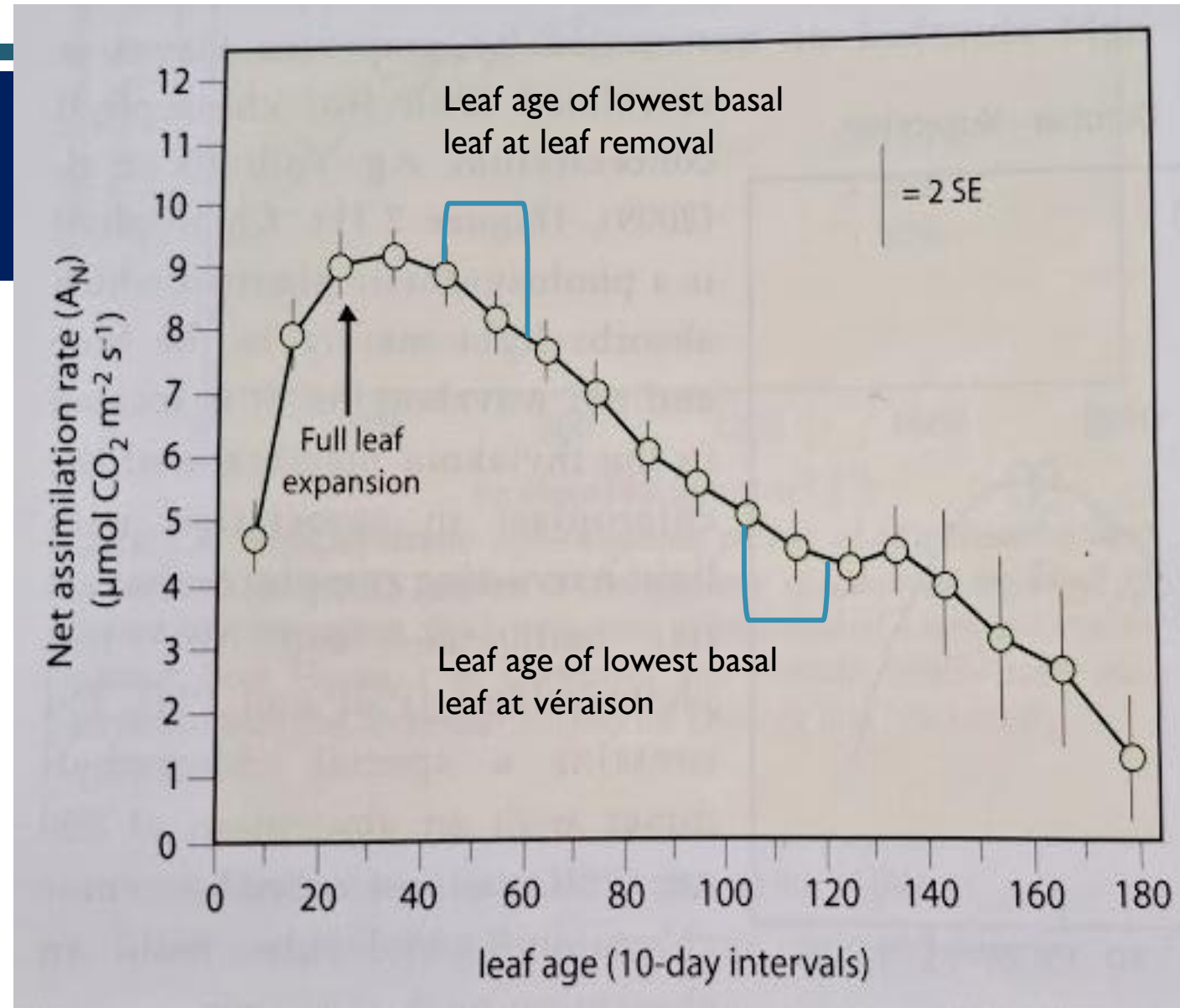
- In the green stage of berry development – malic acid is synthesised using glucose as a precursor.
- It is stored in the berry cell vacuole.
- Content increases during this stage.



- During ripening – malic acid can be used as a substrate for respiration.
- Bypasses the need for glucose, allowing it to be stored instead.
- Higher temperatures increase metabolic need and therefore respire more malic acid

LEAF AGE AND PHOTOSYNTHESIS

- At EL27 (berry set), the oldest basal leaf is typically around 45-60 days old, depending on temperature and shoot growth rate.
 - At leaf removal, basal leaves are already losing photosynthetic capacity.
 - At véraison, they are not contributing significantly
- Younger leaves higher up the shoot are more important for photosynthesis.
- Removal of basal leaves does significantly impact functional canopy.
- Sugar biosynthesis is not significantly impacted.



Relationship between leaf age and net CO₂ assimilation as a representation of photosynthesis (Iland et al., 2011)



Does the leaf removal strategy impact the berry composition at harvest?

- All treatments were within about 1°Brix of each other, suggesting leaf removal had little influence on sugar accumulation during ripening.
- The trend suggests that more intensive fruit-zone opening may have promoted slightly greater acid degradation during ripening.
- Fruit composition was relatively stable across leaf-removal treatments.

CHARDONNAY MICROVINS



Grapes were harvested as close to commercial harvest date as was practical



These were processed at the EIT winery.



Grapes were crushed, destemmed and pressed.



Inoculated with EC-1118 yeast and fermented until dry.



Wines underwent cold stabilisation.



Filtration was done prior to bottling.

- One wine made per treatment
- Basic analysis carried out

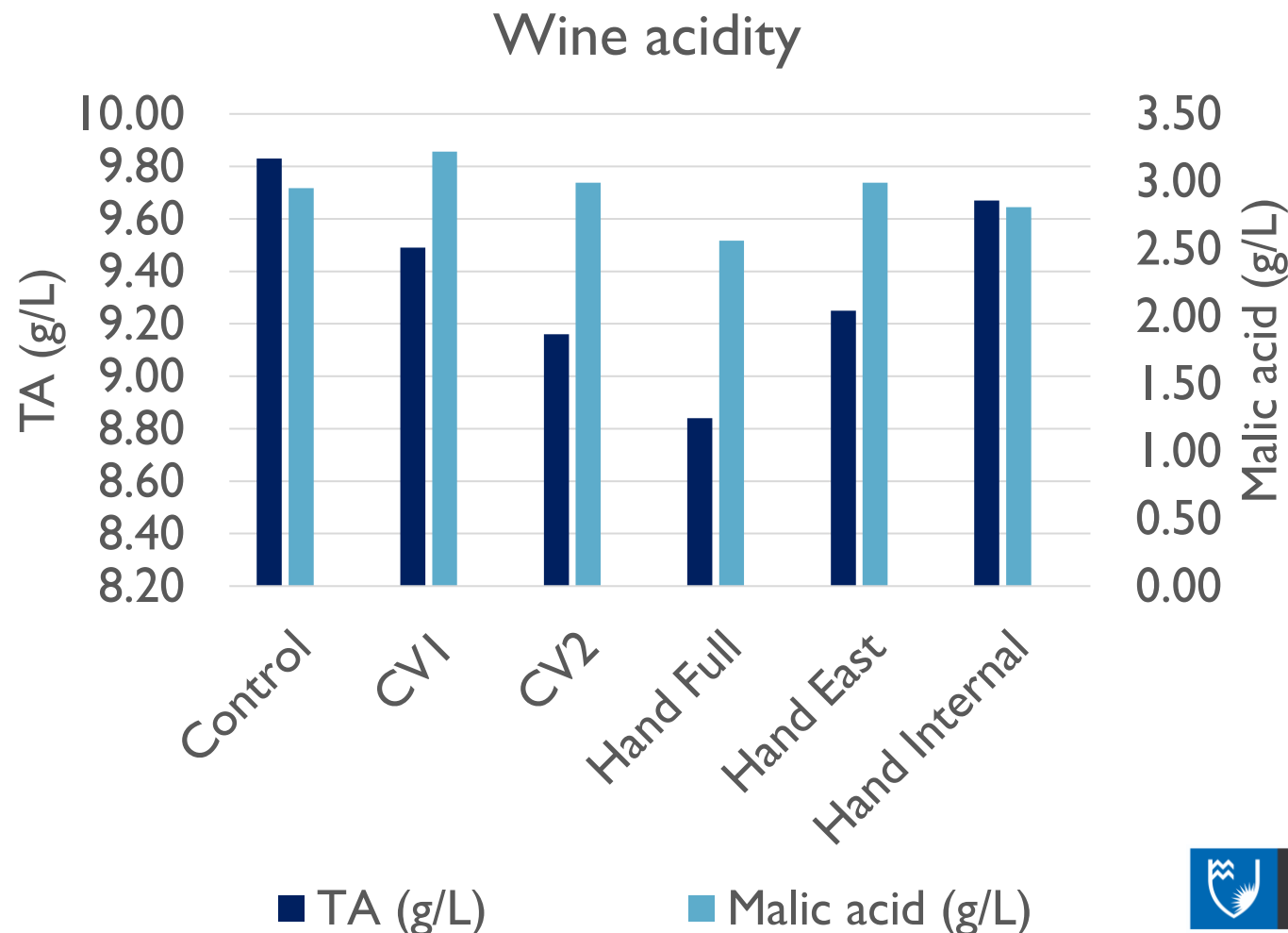
WINE ANALYSIS

- The treatments were fairly similar overall in terms of basic wine analysis:

Post Bottling Analysis	pH	TA (g/L)	Malic Acid (g/L)	RS (g/L)	VA (g/L)	%Alc
Control	2.96	9.83	2.95	2.25	0.2	12.2
CV1	2.95	9.49	3.22	2.17	0.2	12.3
CV2	2.98	9.16	2.99	2.06	0.18	12.5
Hand Full	2.97	8.84	2.56	2.21	0.23	12.8
Hand East	2.98	9.25	2.99	2.16	0.24	12.8
Hand Internal	2.94	9.67	2.81	2.22	0.21	12.5

WINE ANALYSIS

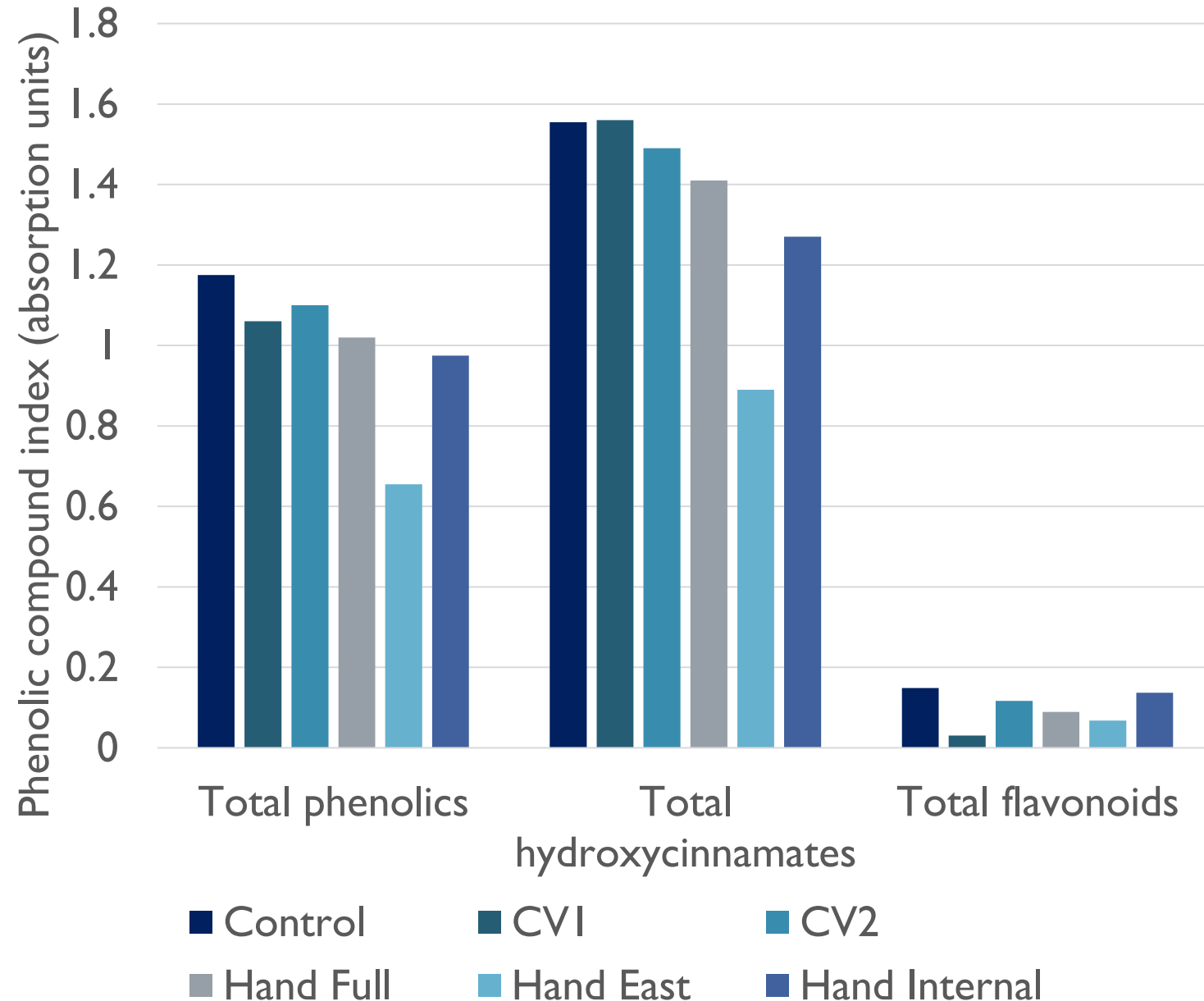
- Full bunch expose did reduce the TA in the wine compared to the other treatments.
 - Similar observation noted in the grapes.
- Higher berry temperatures accelerate malic acid loss.
- Shaded fruit typically retains more malic acid and higher acidity.
- Response is driven more by temperature than light alone.



WINE PHENOLICS

- Hand East showed the lowest phenolics compared to the other treatments.
- This treatment was more shaded than the others which may have contributed to lower phenolic biosynthesis.
- Light exposure generally increases total phenolics.
- Stimulates phenylpropanoid metabolism and phenolic synthesis
 - Implicated in defence against stress including UV radiation.

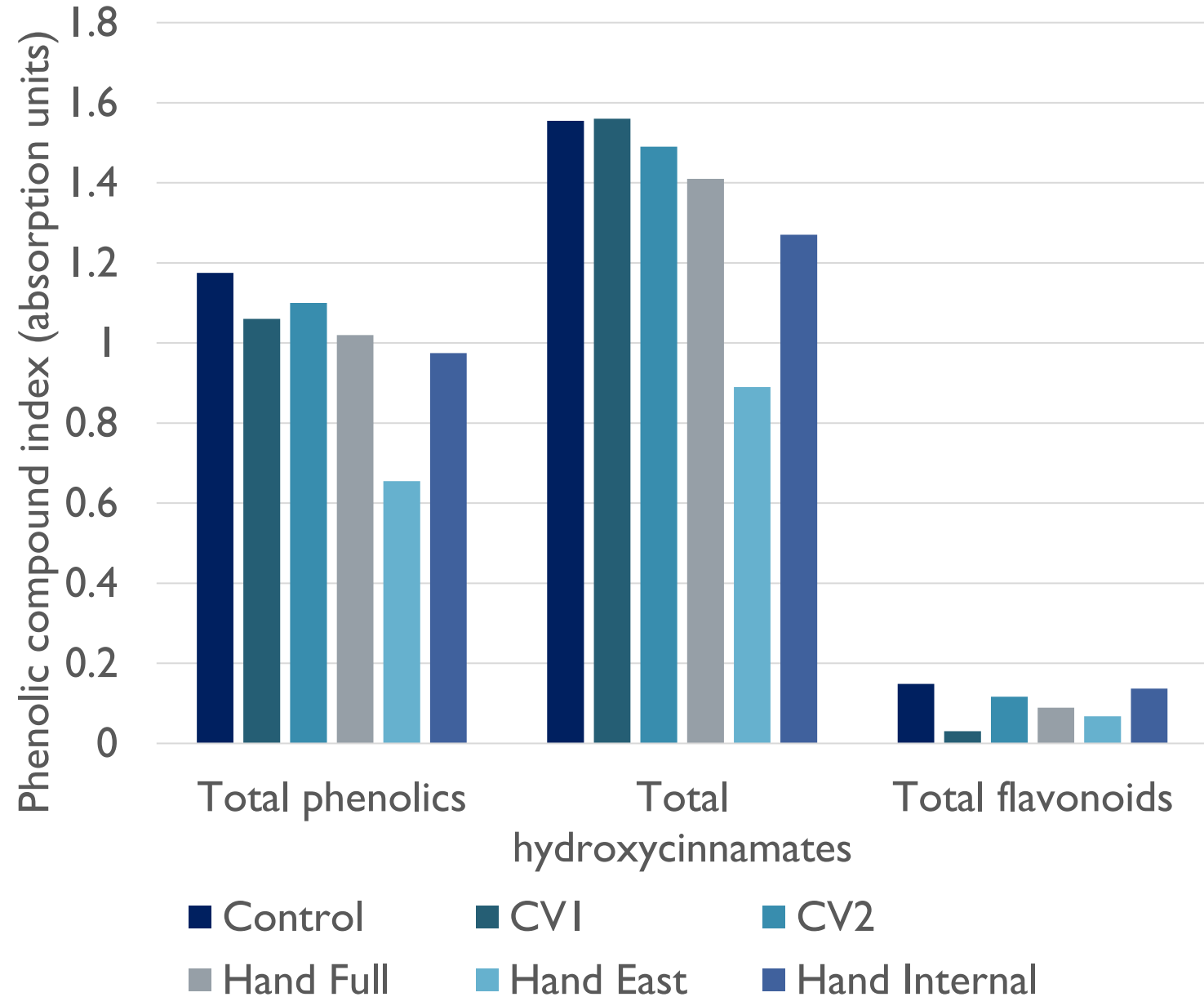
Wine phenolic estimates based on spectrophotometric absorbance



WINE PHENOLICS

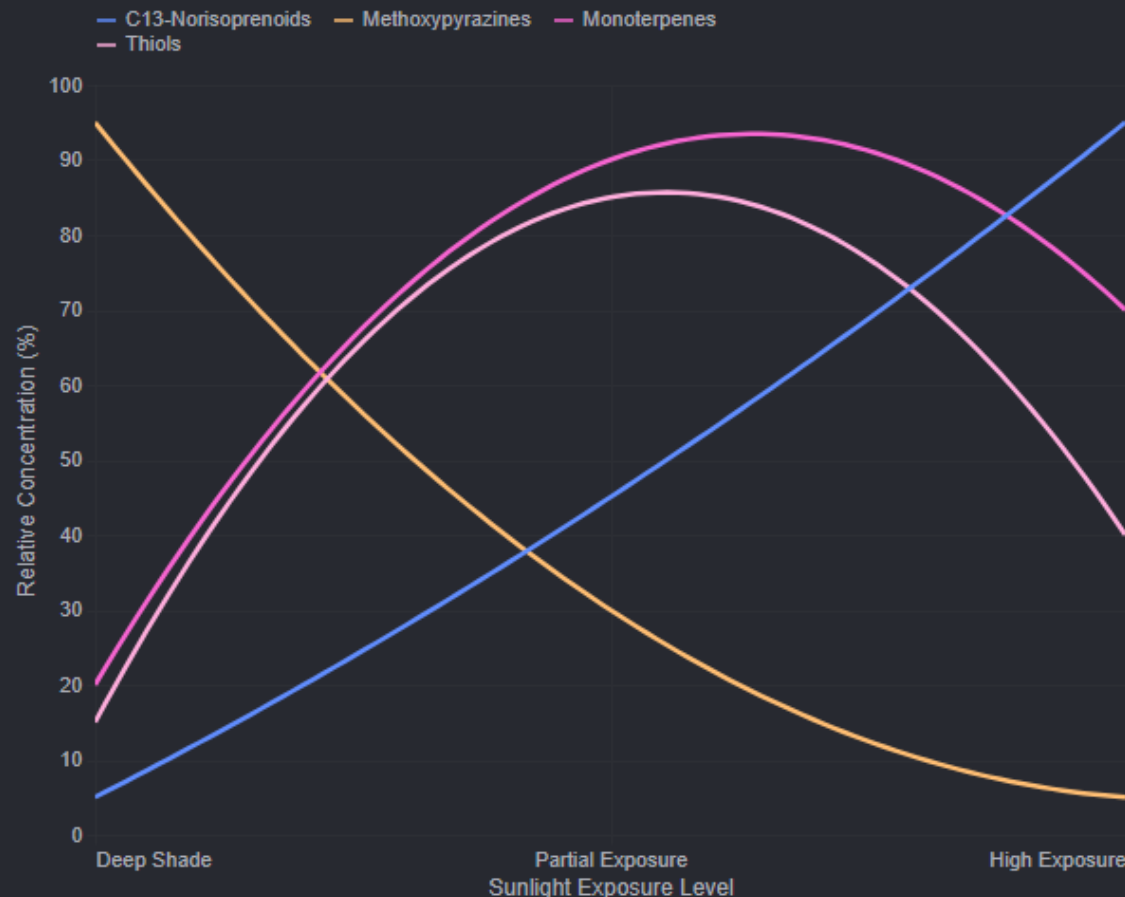
- Increased light exposure lead to increased hydroxycinnamates.
 - Implicated in defence against UV radiation
 - Synthesised during early stages, so early leaf removal would impact their levels.
 - Continue decreasing through ripening with lowest concentrations found at harvest.
 - Final concentration related to initial biosynthesis and rate of degradation
- Higher hydroxycinnamate levels increase the risk of thiol-trapping oxidation.

Wine phenolic estimates based on spectrophotometric absorbance



WINE AROMATICS?

Impact of Sunlight Exposure on White Grape Aroma Compounds



- A number of aroma related compounds may also be impacted by grape exposure.
- Reduces methoxypyrazines
 - Decreases herbaceous, green capsicum, and vegetal aromas.
 - Typically results in riper fruit sensory characteristics.
- Increases norisoprenoid precursors
 - Can enhance floral, citrus, and stone-fruit aroma expression.
- May increase terpene concentrations
 - Contributes floral and fruity notes.
- Can alter volatile thiol precursors
 - May influence tropical fruit and passionfruit aromas.

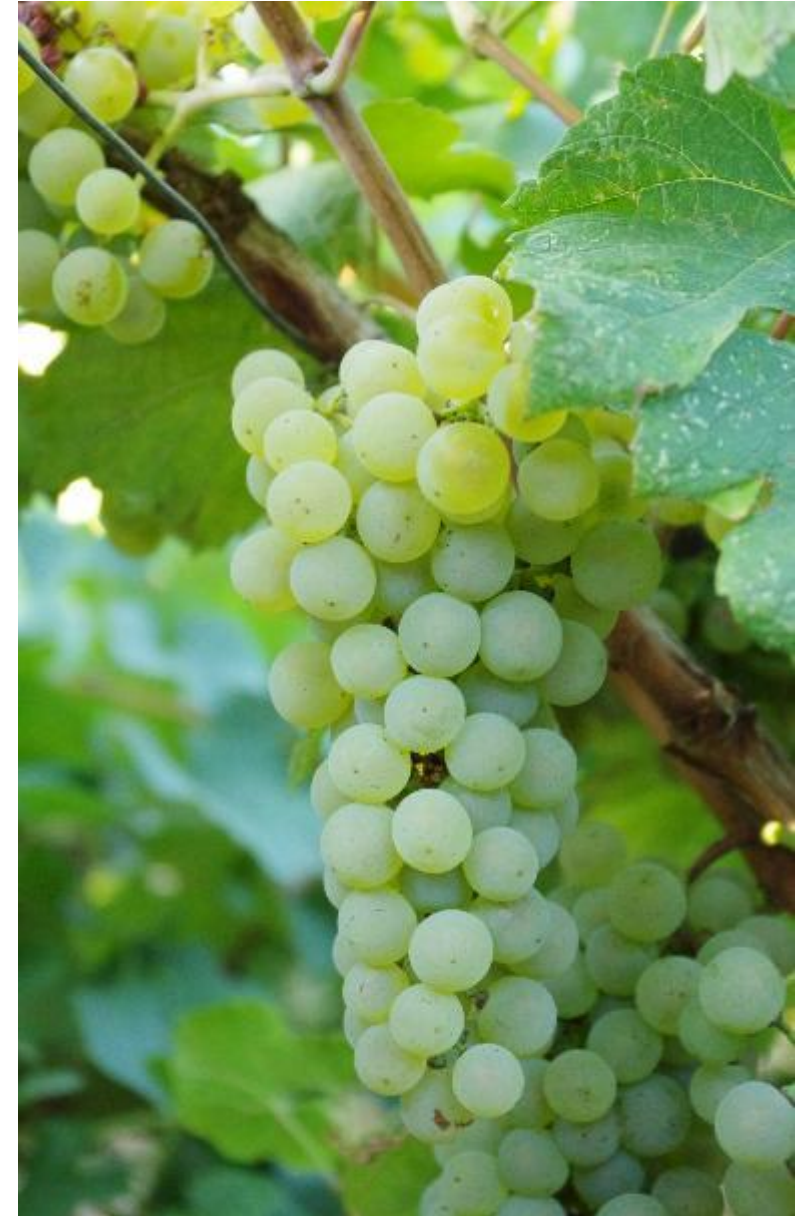


Does the leaf removal strategy impact wine quality and composition?

- Most wine composition parameters were unaffected by leaf removal.
 - Malic acid was higher in the more shaded treatments
 - Greater shading also reduced wine phenolics and hydroxycinnamic acids.
- Fruit exposure had a greater influence on wine composition than the method of leaf removal.
- While malic acid and phenolics showed measurable responses, leaf removal may also have altered key aroma precursors and compounds that were not measured in this study.
- While some differences were not evident analytically, tasting the wines may reveal treatment effects not captured by the measured parameters.

IN CONCLUSION

- The yield was impacted by the leaf removal strategy but the amount of fruit exposure mattered more for berry composition.
- Both strategy and exposure were however linked to berry health.
- Achieving the optimal balance between exposure, yield, and fruit quality remains the key objective of canopy management.



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