

Department of Horticulture | Oregon Wine Research Institute

Does Vineyard Canopy Management Truly Make a Difference in Wine Quality?

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canopy management





Defining Canopy Management



Defining Fruit & Wine Quality



Spring: Shoot Thinning

- Why: decrease shoot density
- When: less than 6" shoot growth
- How: 3-6 shoots per foot of row
- Benefits:
 - Increased air flow and sun exposure
 - Improved bud development (fruitfulness)
 - Increased bud hardiness
 - Improved spray coverage and disease management
- Influences yield





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Summer - Hedging



Common to do 1x in "healthy" vineyards

Hedge height must not exceed row width to avoid shading



Hedge height = higher than posts Follow row spacing: canopy height rule!



The importance of hedging

In dense canopies, high vigor vines

- Sunlight infiltration
 - Disease management
 - Fruit quantity (fruitfulness)
 - Fruit composition
- Fruit and must pH
 - Potassium concentrations
 - Malic vs. tartaric acid



Most Common Hedging Concern:

Hedging causes lateral growth and greater canopy density. I don't want to create more vigor!



Symptom of high vegetative vigor

Laterals will grow without hedging in high vigor vines.

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This vineyard needs hedging!



Chardonnay vineyard near bloom in Willamette Valley, late June

- High density planting
- High vegetative vigor
- High rainfall area

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Not all vineyards need hedging



Pinot noir (VSP) Willamette Valley, August

Low-moderate vigor

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Not all vineyards need hedging



Sangiovese (VSP) Applegate Valley, July

- Semi-arid region
- Irrigated
- Limiting soil
- Low vigor

Example of 1X hedging vineyard



Pinot noir (VSP) Willamette Valley August

- Moderate vigor
- managed by no-till alleys (grass) and dry-farmed



Cluster-Zone Leaf Removal

Why we remove leaves...

Improves

- Spray coverage
- Powdery mildew and Botrytis control
- Labor efficiency at thinning and harvest
- Fruit and wine composition

*For vines with high vigor or high canopy density



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Cluster-Zone Leaf Removal

- What: leaves in fruit zone
 - Morning-sun side of canopy (E of N-S rows)
 - May remove 50-100% of cluster zone leaves
 - Best in high vigor, high density canopies
- When:
 - Bloom to fruit set (optimum)
 - Pea-size to bunch close (latest)
 - Do not start at véraison or later

Risk of sunburn with late leaf removal Reduced risk early leaf removal (acclimation)



Research: Timing of Leaf Removal





Pinot noir



All cluster zone leaves removed at different phenology stages.



5-7 leaves per shoot

Earliest leaf removal = 20% ↓ in fruit set but no decrease in yield

Skinkis, Mahaffee, & Lee



- Bloom time leaf removal had greater anthocyanin than no leaf removal
- No impact on tannins



Bloom-Time Leaf Removal Adoption



NEED: Sufficient canopy growth, high vigor

HOW: hand labor crews or pulsed air deleafer

Cane pruned vineyard

Bloom-Time Leaf Removal Adoption



Shading provided by upper canopy during midday

Spur pruned vineyard

Hand vs. Mechanical Leaf Removal



2011 Season (COOL)

- Bloom
- Pea-size
- Bunch close
- Bunch close E only



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Leaf Removal at Full Bloom

Mechanical vs. Hand Leaf Removal Trial (2018-2019, HOT)

EARLY





Photos by Justin Litwin

Skinkis, Osborne, and Qian, in progress



Results at Harvest Pre-bloom leaf removal 100% of leaves removed in cluster zone (Harvest 2018)

Skinkis, Osborne, and Qian, in progress



Research: Amount of Leaf Removal

	Treatment	Description
	0%	No leaves removed
	50%	Half of leaves removed from cluster zone, alternating removal from base of shoot to top of upper cluster.
	100%	All leaves removed from cluster zone from base of shoot to top of upper cluster
	IS	Industry Standard practice East side leaves removed only
Skinkis & Qian		





Leaf removal impacts aroma compounds



- 100% cluster zone leaf removal 个 C13-isoprenoids compared to no pull
- Likely linked to increased production of carotenoids

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Intensity of Leaf Removal- Fruit composition

- No impact on
 - Basic ripeness (Brix, pH, TA)
 - Tannins or phenolics
 - Volatile phenols
- Leaf removal increased...
 - Quercetin
 - Anthocyanins: petunidin and malvidin
 - Terpenes and C13 norisoprenoids





Leaf Removal: Take Home Message

- Use if clusters are too shaded
- Timing: the earlier, the better
- 100% leaf removal early = higher anthocyanin and wine color intensity, no sunburn
- Increased + aroma compounds
- Minimal impact on fruit set/yields
- Shown to reduce methoxypyrazines
- Important tool for disease prevention





Defining Vine Balance = Crop Load



Defining Vine Balance = Crop Load



Vine crop load is like vehicle payload

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Stage I: Crop Load Trials 2010-2013 Skinkis, Tomasino, & Qian



Impacts on Vine Growth

Increasing Yields				
	Concerns	Benefits		
	Over-cropping stress	Hold back vigor (later thinning)		
	Severely delayed ripening	More yield (economic)		
	Poor fruit quality	Few differences in fruit quality		
	Increasi Sprin Cano Pruni Vine	i ng yield <u>did not</u> change g shoot growth py leaf area ng weight nutrient status		



Importance of the canopy or the fruit level on fruit composition?

Summary: 3 Years x 2 sites

	Vine Size	Fruit wt.		
Response	Pruning Weight	Yield		
TSS (Brix)	Х	Х		
рН				
TA	Х			
Total anthocyanins	Х	Х		
Total phenolics	Х			
Total tannins				
YAN (fermentable N)	Х			
Alpha amino acids	Х			
Ammonia	Х			
Yield was often too low relative to vine size to have				

impact on vine growth!



Industry Crop Load Trial (2012-2021)

Adelsheim Airlie Winery Archery Summit A to Z Wineworks Alas Vineyard Mgmt
Björnson Vineyard Bethel Heights Vineyard Chehalem Wines
Cristom Dion Vineyard Domaine Drouhin of Oregon Domaine Serene
Duck Pond Forest Hills Farms Jackson Family Wines
Johan Vineyards Ken Wright Cellars Lemelson Vineyards
Results Partners Stoller Van Duzer Vineyards Willakenzie Estate
Winemakers Investment Properties/Precept Wine Winter's Hill Winery

- **Total Participation**
 - 25 companies
 - 28 vineyards
 - **5** Counties
 - 6 AVAs









Project Results

- Vineyard effect with increasing yield...
 - no decline in vine health
 - no consistent impact on fruit composition
 - vineyard (site) differences greater than yield effect
- Wine sensory
 - yield did not affect characteristics (aroma, color, mouthfeel)



Crop Level Effect - Wine Sensory

- Consumer panel –no differences (2012)
- Expert panel 2012-2016
 - No differences by crop level
 - No preferred crop level
 - Differences by site and vintage
- In-house sensory
 - Differences identified
 - Blind: no clear preferences
 - Revealed: identified preference



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Crop Load Project - Summary

- Site and year impact wine quality more than crop thinning
- Most common impact: Brix and anthocyanin
- Not consistent year to year
- Sensory
 - Crop thinning had little/no effect
 - No clear link between yield and wine preference
- Do not judge quality by tons/acre
- Learn to measure and quantify in lb/ft

Take Home Message – Canopy Management & Quality

- Managing quality and quantity is not straight-forward
- Achieving vine balance will ensure optimum quality, quantity, and economics
- Pathway to optimum vine balance varies by vineyard (soils, climate, etc.)
- Need in-depth knowledge of...
 - Vineyard conditions (soil, elevation, etc.)
 - Climate
 - Plant materials
 - Vineyard design
 - Management steps

Work <u>together</u> as vineyard and winery team

Canopy Management Resources



