

A photograph of a vineyard in the foreground with a modern building in the background. The vineyard is filled with rows of grapevines, some with green leaves and some with yellowing leaves. The building is a large, modern structure with a mix of red brick, grey concrete, and large glass windows. It has a complex roofline with several gables and a central glass tower. The sky is clear and blue. The text "Practical Considerations for Canopy/crop Management" is overlaid in white, bold, sans-serif font. The text "Johann Martinez" is overlaid in white, bold, sans-serif font. The UC Davis logo is in the bottom right corner.

Practical Considerations for Canopy/crop Management

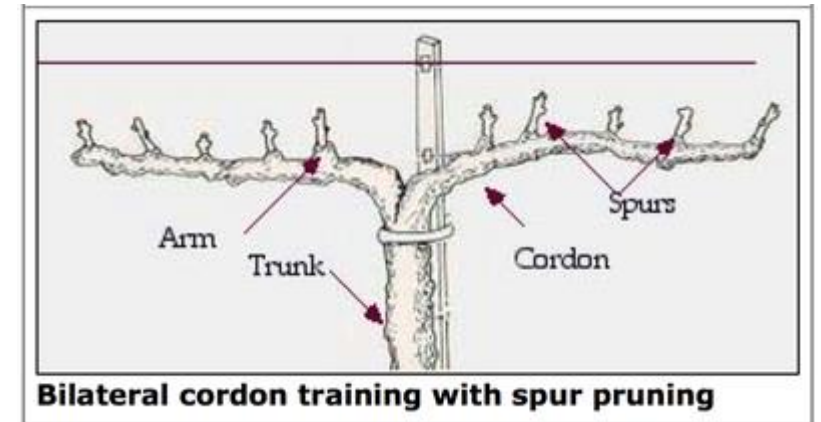
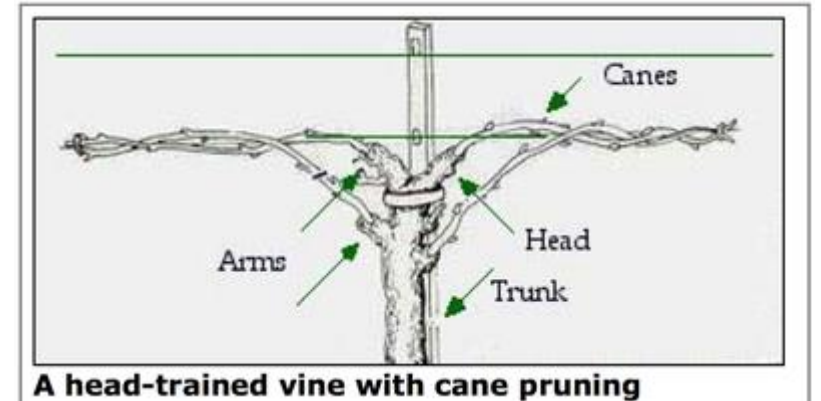
Johann Martinez

Cultural practices affecting canopy and crop load

- Pruning
- Shoot thinning
- Shoot positioning
- Lateral / leaf removal
- Crop thinning
- ...Mechanized versions of it

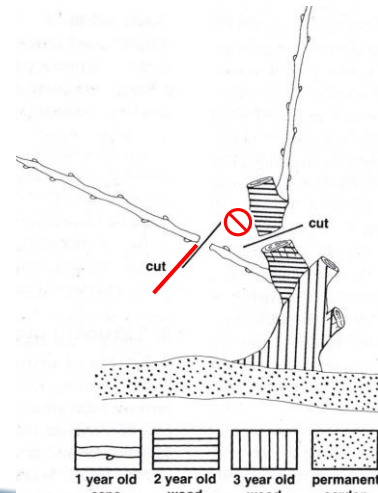
Pruning (first pass of the season)

- Cane +head (no cordons) (aka guyot)
 - # canes and how long
- Spurs + cordons
 - Typically 2-bud spurs (1 bud for relaxed VSP)





Pre pruning vs Mechanical pruning



Shoot thinning and suckering



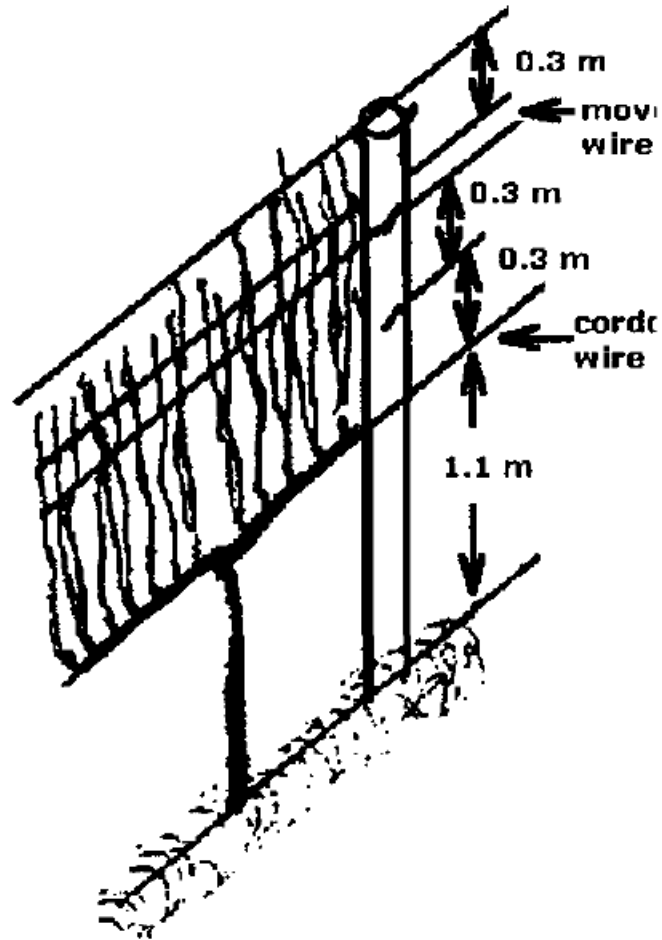
Shoot thinning

- Growth starts with bud break (Late march-April)
- Each spur was pruned to “2 buds” but we may have 6-8 shoots
- Second pass of the season: 2-3 weeks after crews are sent.
Wires down if they are up
- Do it too early and new shoots may appear, too late and shoots may be too hard. Risk of damage to the arm

Shoot positioning (3rd major pass)

- When? 50-80% of total shoot length reached (May-June).
Shoots are long enough to be fixed by wires but tendrils are soft
- May be as simple as putting up the wires (low/mid vigor VSP with strong up-ward growth habit)
- Some systems need to be tied
(Relaxed VSP in Oakville: lot of work)
- It may be none at all

Shoot positioning: Moveable Wires

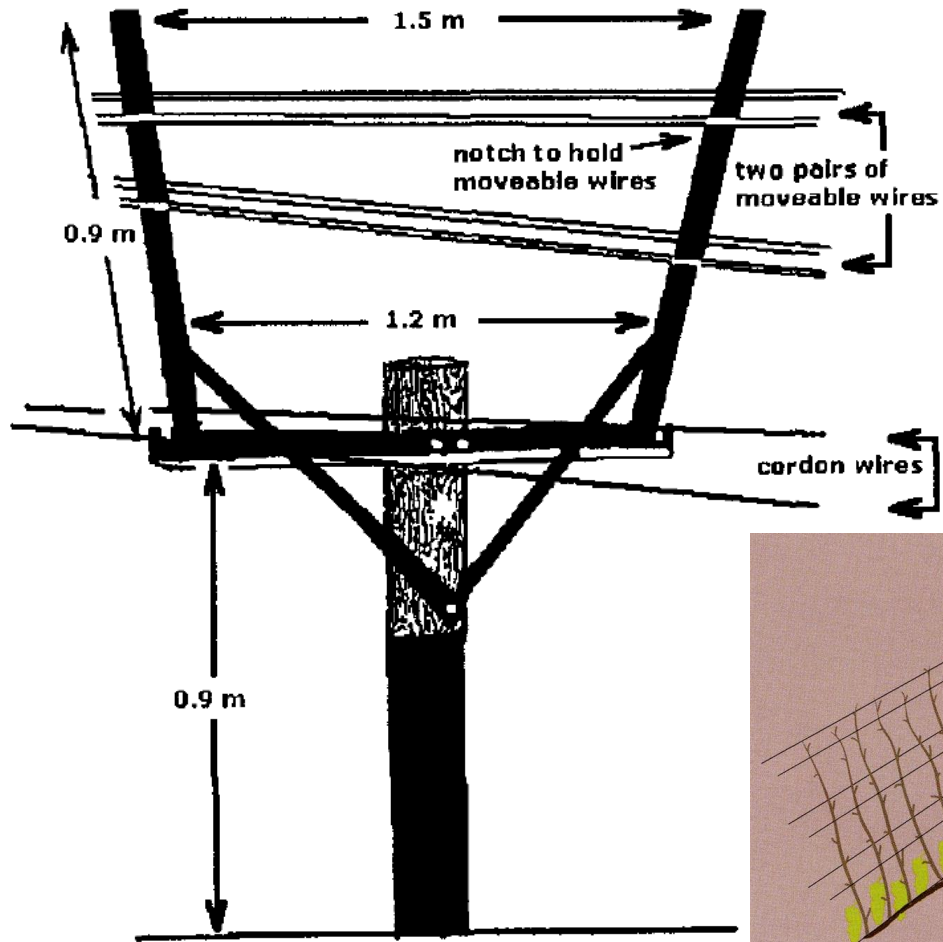


**Vertical Shoot Position
(VSP)**

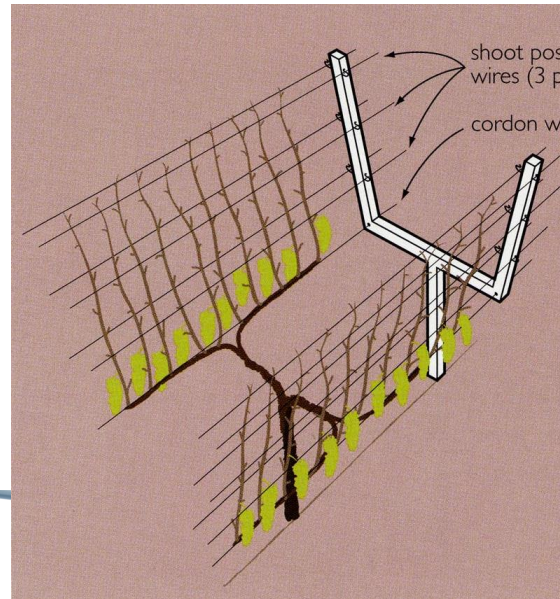


Kliewer et al., 1998

Shoot positioning: Moveable Wires



Lyre Trellis



Kliewer et al., 1998

No wire positioning

There may be wires



Shoot between two wires



Shoot positioning (3rd major pass)

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- May be as simple as putting up the wires (low/mid vigor VSP with strong up-ward growth habit)
- Some systems need to be tied
(Relaxed VSP aka V-trellis in Oakville: lot of work)
- It may be none at all

Hedging (mechanized)

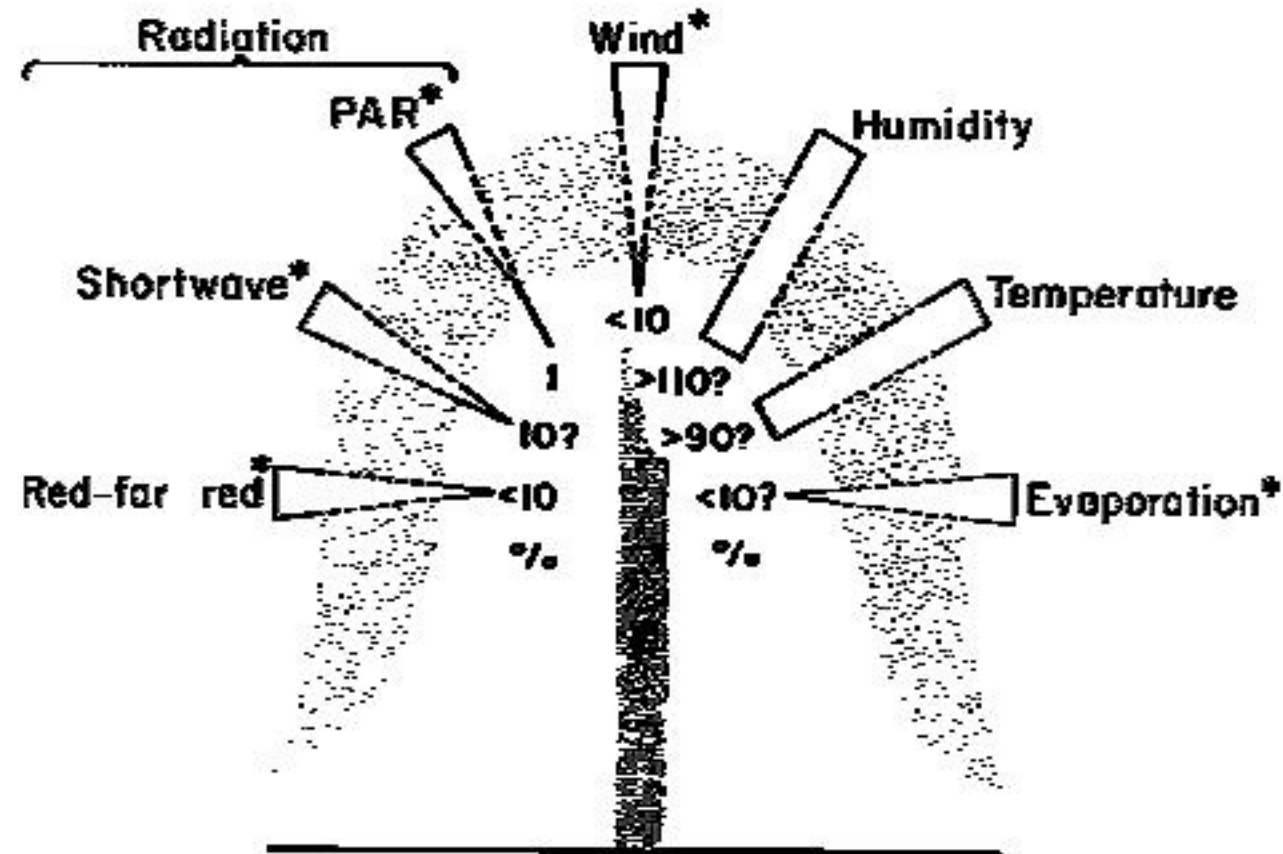


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- When? ~100% of total shoot length reached (June).
- Done at the time can control vigor
- Why? ...looks pretty :-P
- Homogenization

Relative differences in microclimate in a dense canopy



Do we stil need to manage?

Leaf removal

- What cases? VSP, only one side...north or east, never south aspect in warm/hot climate
- When? From fruit set to veraison
- When not to? Early in the morning of a hot day. Check for heat waves. Grapes need acclimation!
- Why? Fruit has more light, temperature less humidity
→ Better ripening, less incidence of fungal diseases

By hand, but normally mechanized



Pneumatic leaf remover

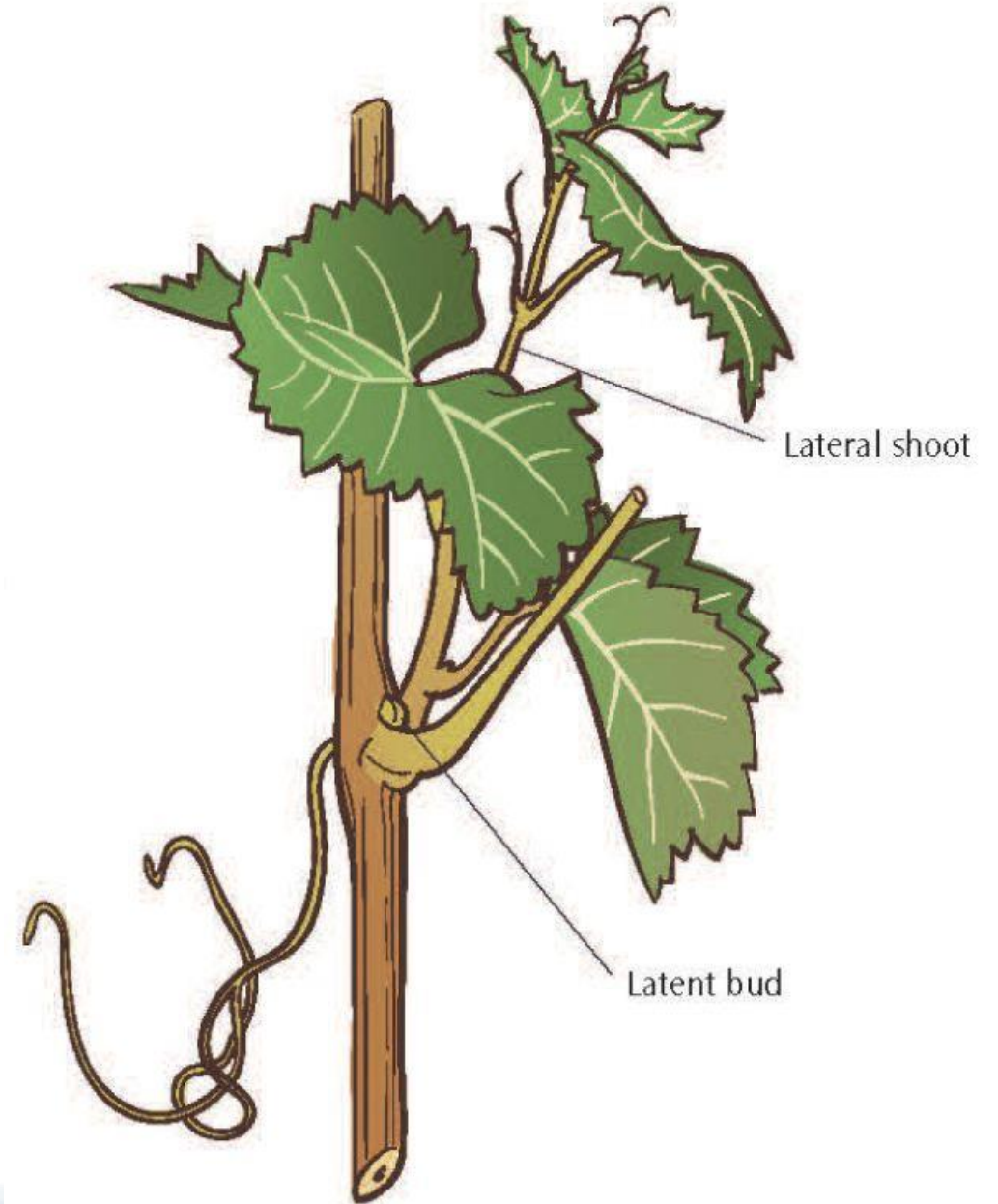


Longer leaves and shoots get hedged

Leaves around the clusters get gently sucked

And/or lateral removal (always manual work)

- It can be combined to leaf removal
- Can be done in head trained
- Helps thicken the shoots

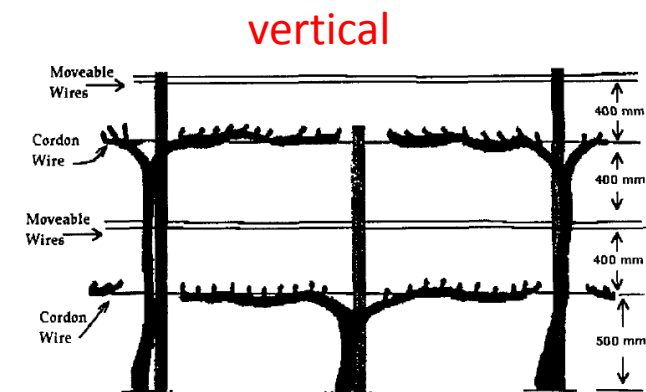


Let's look at some numbers

Systems with two cordons per linear row

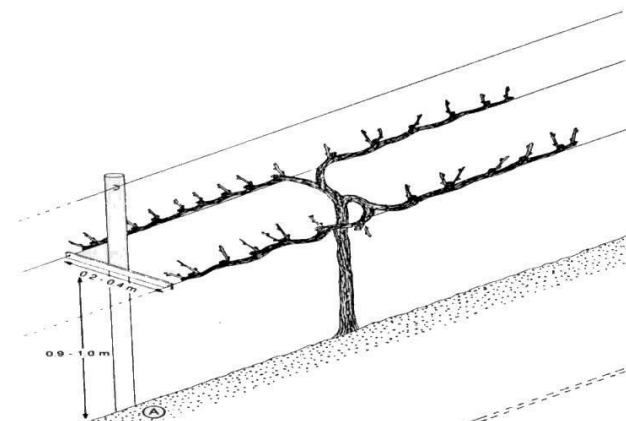
| Parameter | Trellis-Training System | | | | | |
|--|-------------------------|-------------|------|------|------|-----------|
| | Vertical | Scott-Henry | TK2T | GDC | Lyre | V-trellis |
| # Shoots/vine | 27.3 | 34.8 | 46.3 | 45.3 | 46.8 | 49.7 |
| # Shoots/m canopy | 14 | 9.1 | 12 | 11.8 | 12.3 | 13.2 |
| Shoot length (cm) | 130 | 142 | 102 | 120 | 103 | 136 |
| # Nodes/shoot | 24 | 25.5 | 20.2 | 23.8 | 21.3 | 25.2 |
| Internode length (cm) | 5.3 | 5.5 | 5 | 5.1 | 4.9 | 5.3 |
| Primary leaf area/shoot (cm ²) | 2280 | 2470 | 1790 | 2120 | 1810 | 2380 |
| Lateral leaf area/shoot (cm ²) | 1050 | 1190 | 610 | 900 | 600 | 950 |
| Lateral leaf area (%) | 28.5 | 30.5 | 24.5 | 28.7 | 23.9 | 27 |
| Total leaf area/vine (m ²) | 8.4 | 11.6 | 10.7 | 13.2 | 11 | 15.8 |
| Total leaf area/m canopy (m ²) | 4.72 | 3.2 | 2.9 | 3.52 | 2.98 | 4.51 |
| Leaf area/g fruit (cm ² /g) | 14.4 | 15.9 | 11.9 | 13.1 | 11.2 | 15.5 |
| Pruning weight (kg/vine) | 1.58 | 2.04 | 1.74 | 1.99 | 1.73 | 2.51 |
| Pruning weight/m row (kg/m) | 0.89 | 1.17 | 0.99 | 1.08 | 0.97 | 1.43 |
| Pruning weight/m canopy (kg/m) | 0.89 | 0.59 | 0.5 | 0.54 | 0.48 | 0.72 |
| Yield: pruning weight ratio | 4.9 | 4.9 | 6.4 | 7 | 7.4 | 5.8 |
| Shoot weight (g) | 64 | 64 | 40 | 44 | 38 | 53 |

Data represents the average of three in-row vine spacings (1m, 2m and 3m) and two rootstocks (11039-16) for three years, 1993 through 1995. (1m, 2m and 3m)



Te Kauwhata Two Tier (TK2T)

bilateral



UC DAVIS

So you have a canopy...



Crop load



Why do we want to loose yields?
Vine balance

Purposes of cluster thinning

- Accelerate ripening and/or reduce berry size

When? 2 passes are normal
















- After fruit set
- Veraison

Remarks

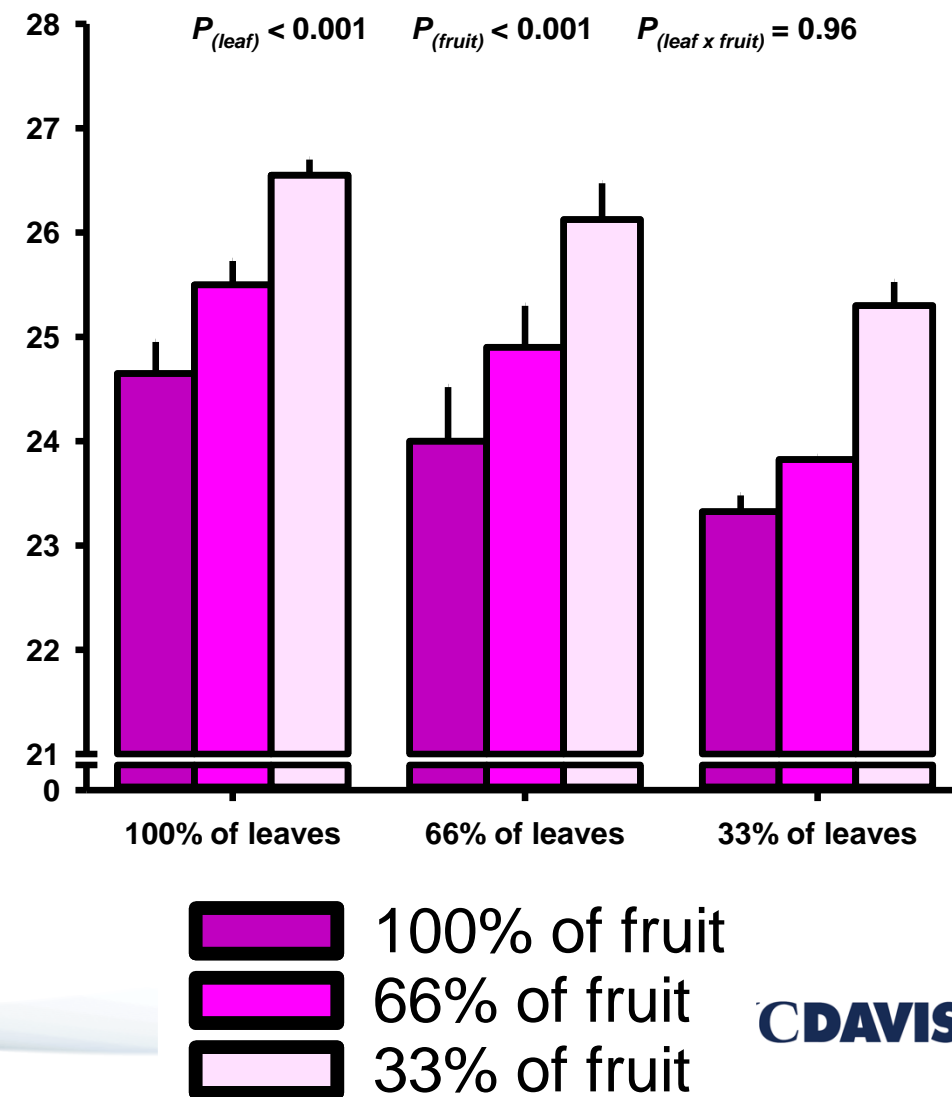
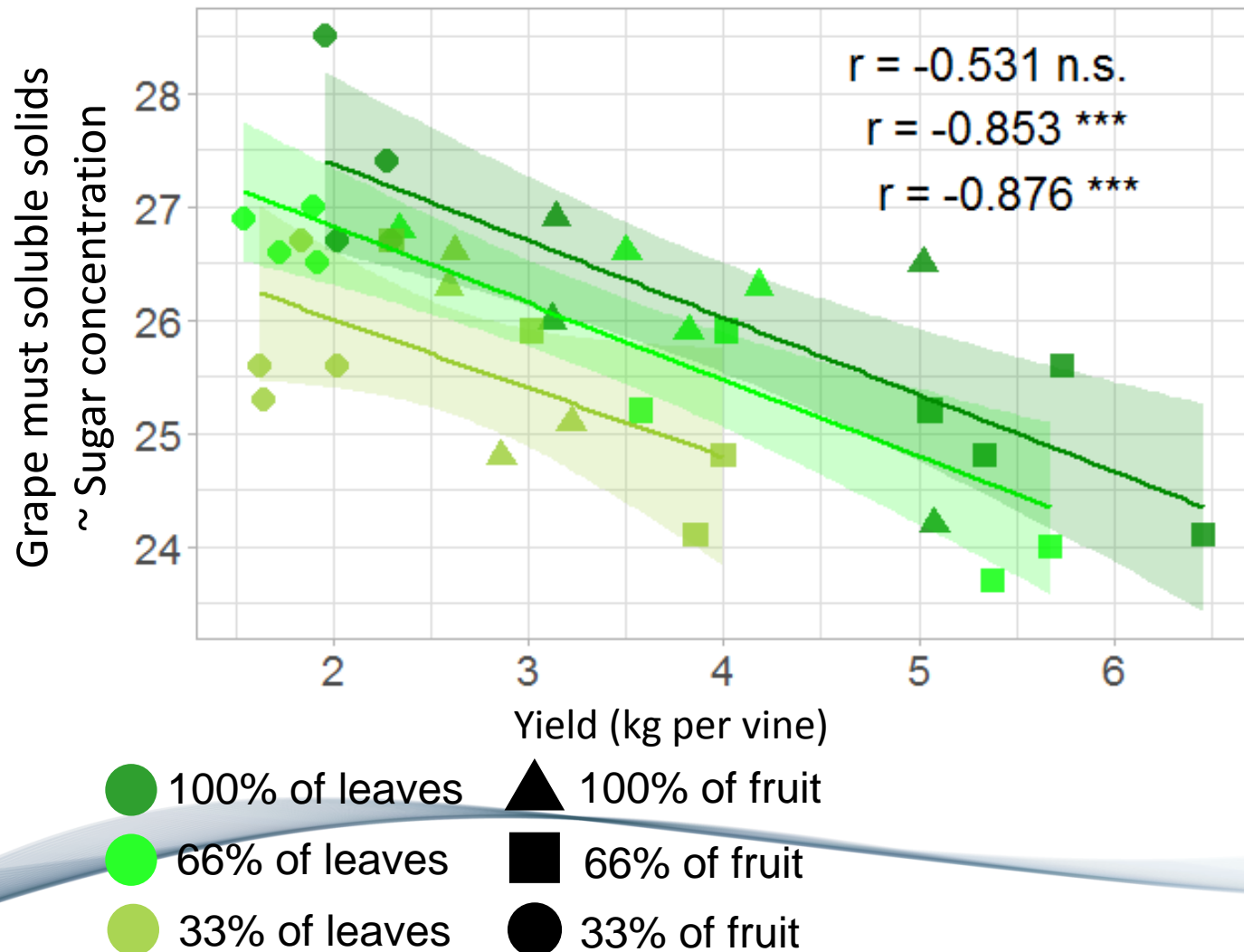
- Cluster thinning delayed to veraison to control berry size (or ripening)
- Cluster thinning delayed to mid ripening
- Some systems go for max yields and do not thin (provide big canopy and K)

Experimental Design

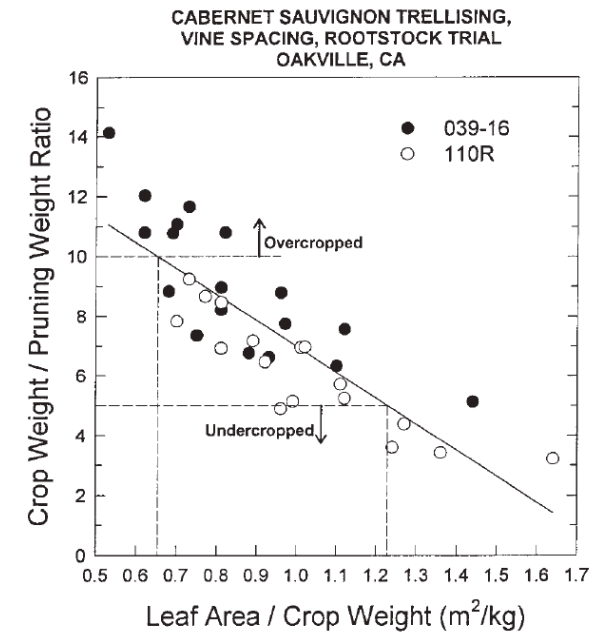
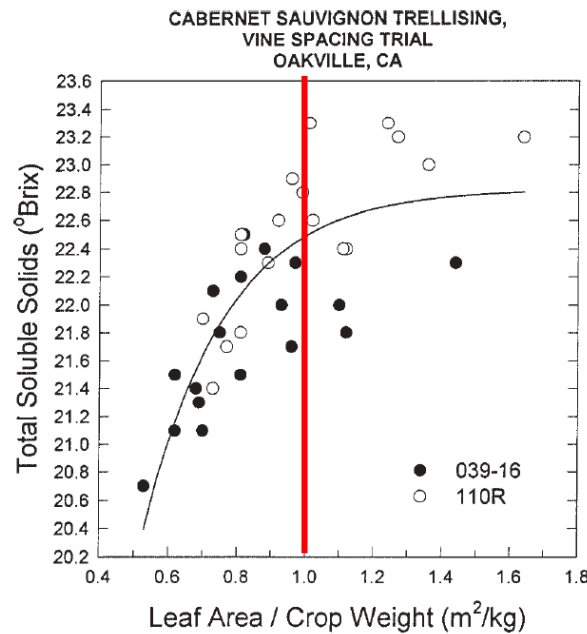
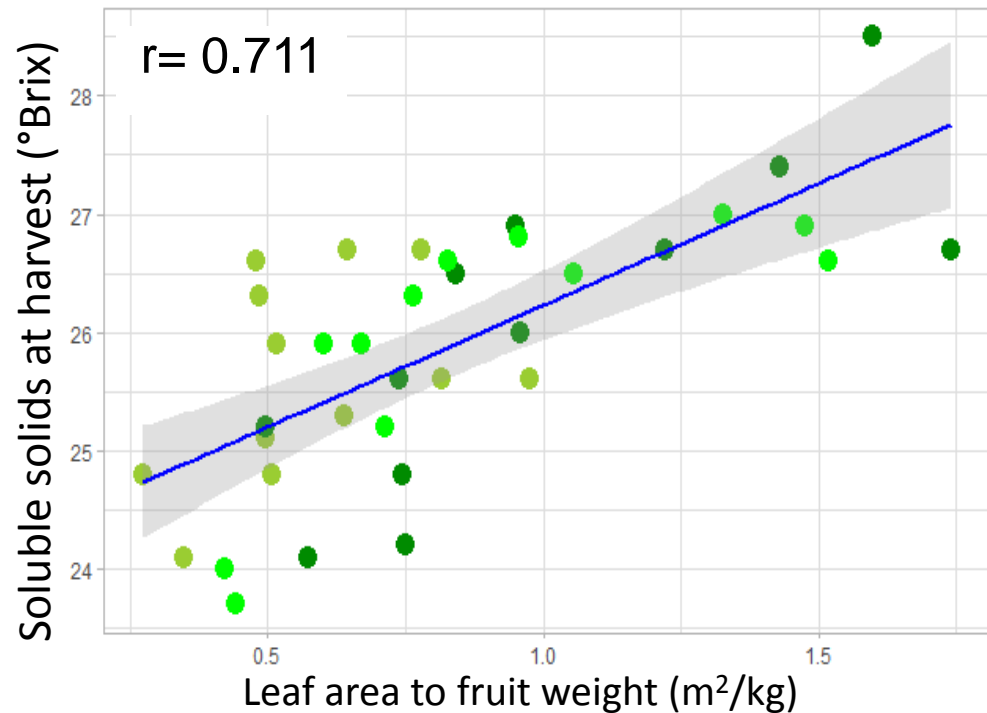
Pre treatment: laterals removed and vines adjusted to 22 shoots per vine in 6m

| | 33% of fruit  | 66% of fruit  | 100%: ~45 clusters  |
|---|--|--|--|
| 33%: 2/3 of leaves removed  |  |  |  |
| 66%: 1/3 of leaves removed  |  |  |  |
| 100%: No leaf removal  |  |  |  |

Effect of cluster thinning

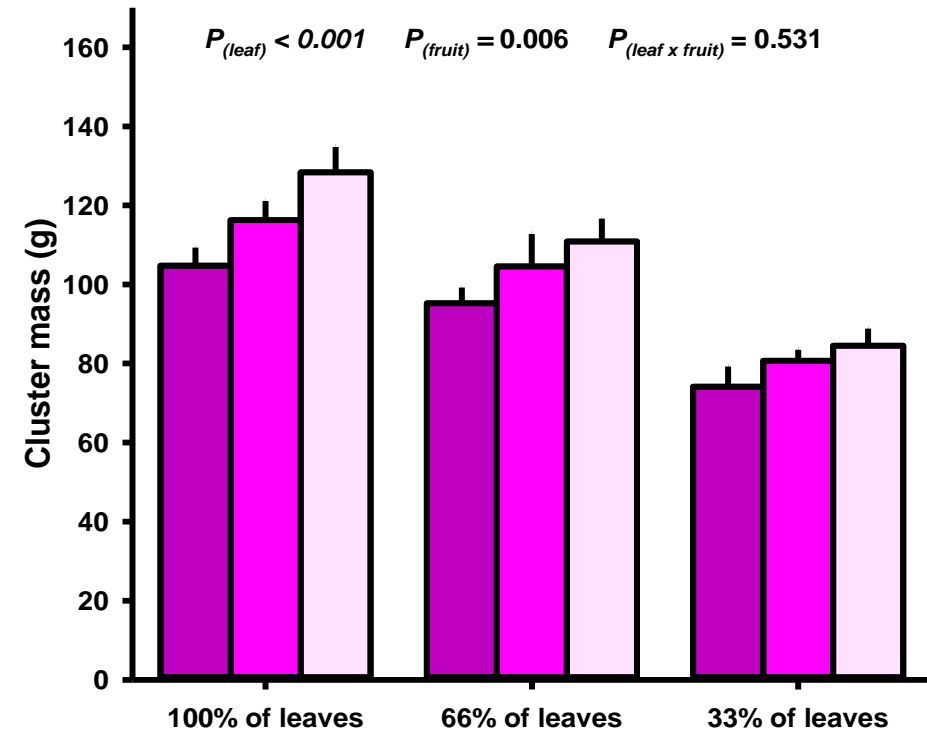
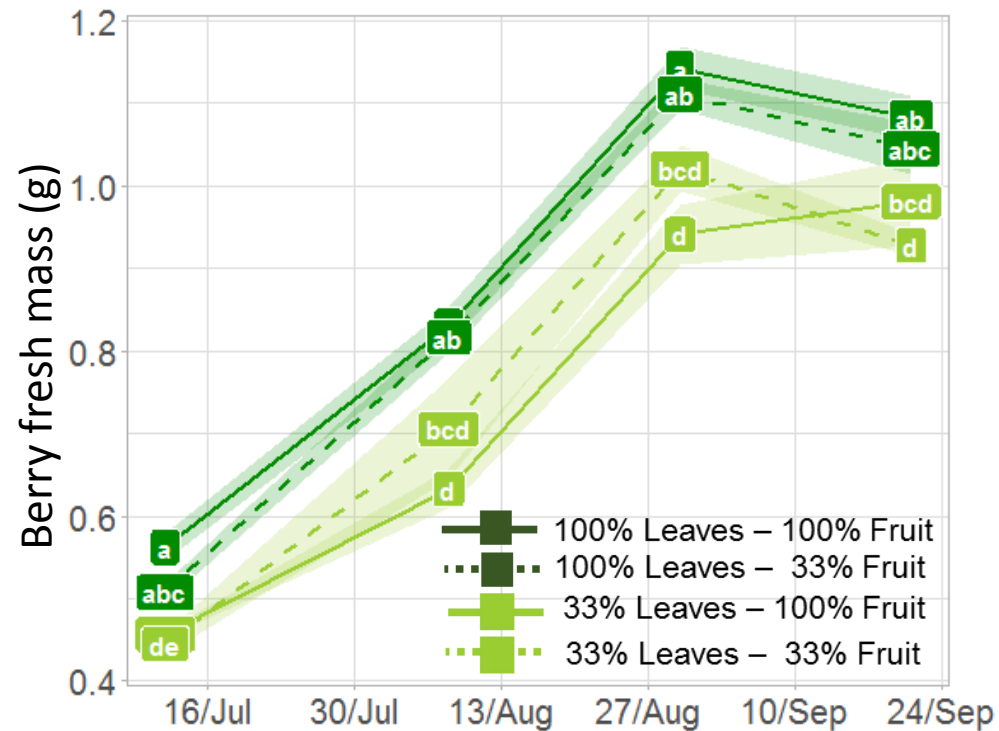


Proportion leaves: fruit determines ripening speed



Kliewer and Dokoozlian (2005)

Doing all the thinning at fruit set increases berry size



Some more practical numbers

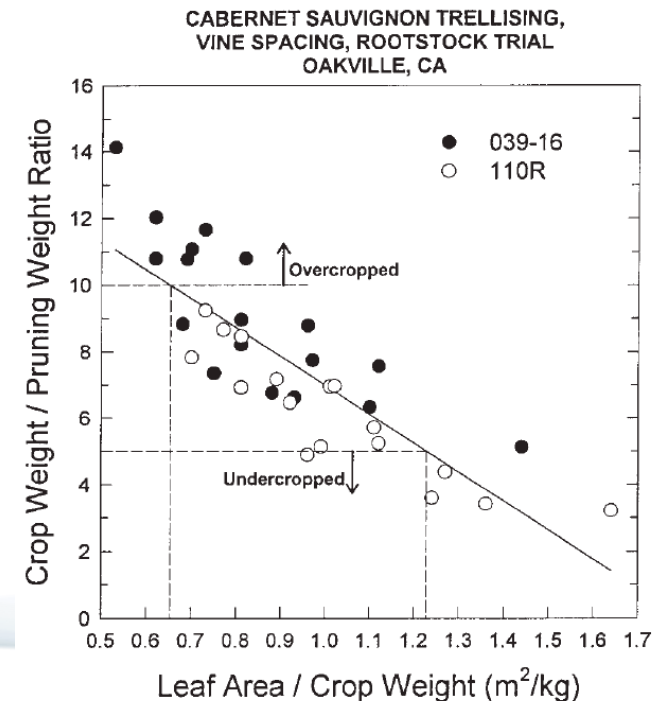
leaves and clusters (example)

- 2 m in row spacing per vine
- 350 leaves in main shoots (100%)
- 24 shoots
- 33 clusters
- 10-12 leaves per cluster

- Cool climates may need more
- White varieties: higher yields with same canopy

lbs fruit/lbs pruning wood weight

- <5 underpropped
- 5-10 adequate
- >10 over cropped



Vine balance: Fruit to pruning wood ratio

- Weight the fruit at harvest
- Weight all the shoots collected after pruning
- Do it on few vines keeping track which vines



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Duplicating the cordons to increase yields with low impact on vine balance and quality

| Trellis system | Crop yield (mt/ha) | Shoots/ vine (no.) | Clusters/ shoot (no.) | Cluster/ vine (no.) | Berries/ cluster (no.) | Berry wt (g) | TSS (°Brix) |
|----------------|--------------------|--------------------|-----------------------|---------------------|------------------------|--------------|-------------|
| Vertical | 9.9 | 27 | 1.75 | 47 | 123 | 1.34 | 23.3 |
| Scott-Henry | 12.8 | 35 | 1.86 | 66 | 108 | 1.33 | 22.8 |
| TK2T | 15.3 | 46 | 1.63 | 75 | 116 | 1.3 | 22.6 |
| GDC | 15.9 | 45 | 1.71 | 76 | 122 | 1.28 | 23.1 |
| Lyre | 16.8 | 47 | 1.66 | 80 | 125 | 1.24 | 22.6 |
| V-trellis | 18.6 | 50 | 1.63 | 79 | 131 | 1.3 | 22.7 |

How is done commercially (even more practical)

- 1st pass (after berry set):
 - If 3 clusters per shoot: remove the upper. Misshaped (round), lagged, lower quality...
 - Excessive thinning can lead to big berries
- 2nd pass (at veraison):
 - Low/mid vigor premium: One cluster per shoot
 - Big canopies (>5ft shoots) can support 1.5 or 2 clusters per shoot
 - Veraison helps to spot lagged clusters and remove them

Questions?

Characteristics of the Ideal Wine Grape Canopy

| Canopy Character | Optimal Value |
|--|---|
| Shoot density | ~ 5 shoots per foot |
| Shoot length, | 15 to 20 nodes |
| Lateral shoot development | None to very minimal |
| Growing shoot tip presence | Ideally none |
| Ratio of leaf area to fruit weight | 3 to 8 ft ² /lb (0.6 to 1.5 m ² /kg) |
| Leaf layer number | 1-2 |
| Percent exterior leaves | 80-100% |
| Percent exposed clusters | 50 to 80% |
| Cane weight | 0.7 to 1.4 oz (20 to 40 g) |
| Internode length | 2.4 to 3.1 in 6 to 8 cm |
| Pruning weight | 0.2 to 0.4 lb/ft (0.3 to 0.6 kg/m) |
| Ratio of crop weight to pruning weight | 5-10 |