

Cultural practices impacts on norisoprenoids – deeper look at β - damascenone content

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My Background

- ▶ Published work on cultural practices impacts on secondary metabolites (mainly anthocyanin and tannin content) as influenced by the following;
 - ▶ Rootstock selection
 - ▶ Pruning system
 - ▶ Deficit irrigation regime
- ▶ Recently involved in observational studies quantifying impacts of cultural practices on nor-isoprenoid content (β -damascenone) as influenced by;
 - ▶ Leaf removal
 - ▶ Fruit thinning
 - ▶ Varietal
 - ▶ Clone/rootstock selection
 - ▶ Trellis design

Impacting grape quality from a manager's perspective

- ▶ Biggest obstacle
 - ▶ Dealing with labor shortage and lack of quality labor is difficult
- ▶ Timing of practices is critical
- ▶ Need to optimize intercepted light
 - ▶ Most balance over-exposure and under-exposure
- ▶ Drive down berry size, but avoid shrivel and raisining
- ▶ In my opinion the two greatest ways we can impact fruit quality is through decreased berry size and optimized *PAR transmittance*.

Background Red Hills – Terroir and soils

- ▶ Diurnal shifts help develop and retain key secondary metabolites
 - ▶ Warm summer days, followed by cool nights
- ▶ High altitude and air quality feature greater levels of intercepted light
 - ▶ Must balance shade and over-exposure
- ▶ Volcanic soils attribute to quality – well drained soils
 - ▶ Abundance of obsidian, gravel, stones and cobbles limits the amount of plant available water

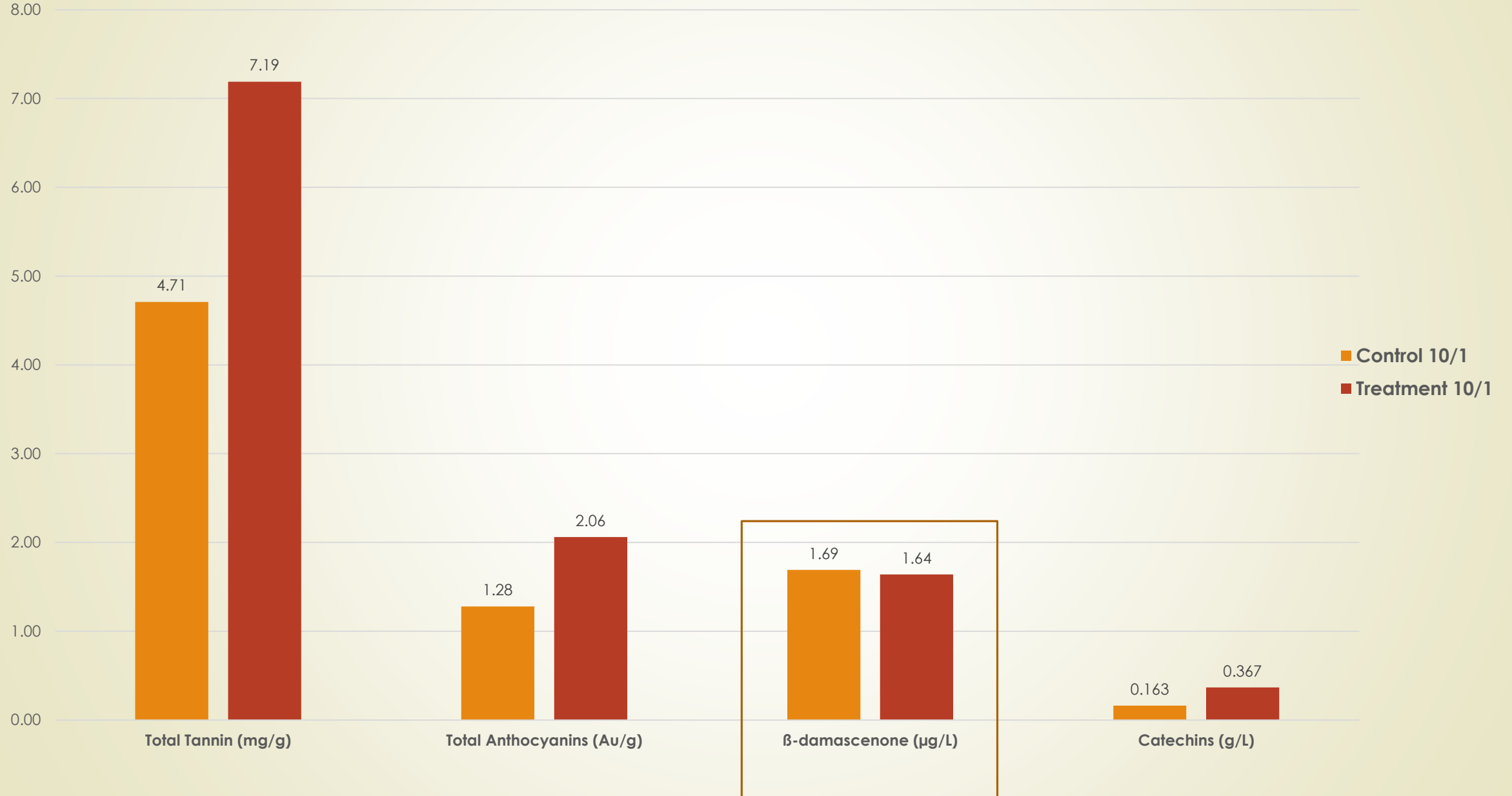
Amber Knolls



Amber Knolls Malbec

- ▶ Malbec 04/1103P est. 2009
- ▶ Training systems – quadrilateral cordon
- ▶ Cultural practices:
 - ▶ Minimal irrigation (regulated deficit) 50% ETc ~15 bars stress through veraison
 - ▶ Tunnel leaf removal
 - ▶ Laterals pulled on the shade side
 - ▶ Machine box-hedged
 - ▶ Fruit thinned aggressively, ~ 4 TPA down to 1.5 TPA

Amber Knolls - Malbec



Amber Knolls Malbec - summary

- Chemistry

- Little impact on aromatic potential

- Control and Treatment both had relatively high β -damascenone content

- Yield Components

- Control picked at 24.5 Brix and Treatment at 25.0 Brix.

- Approximately ~60% decrease in yield... again ~4 TPA down to 1.5 TPA.

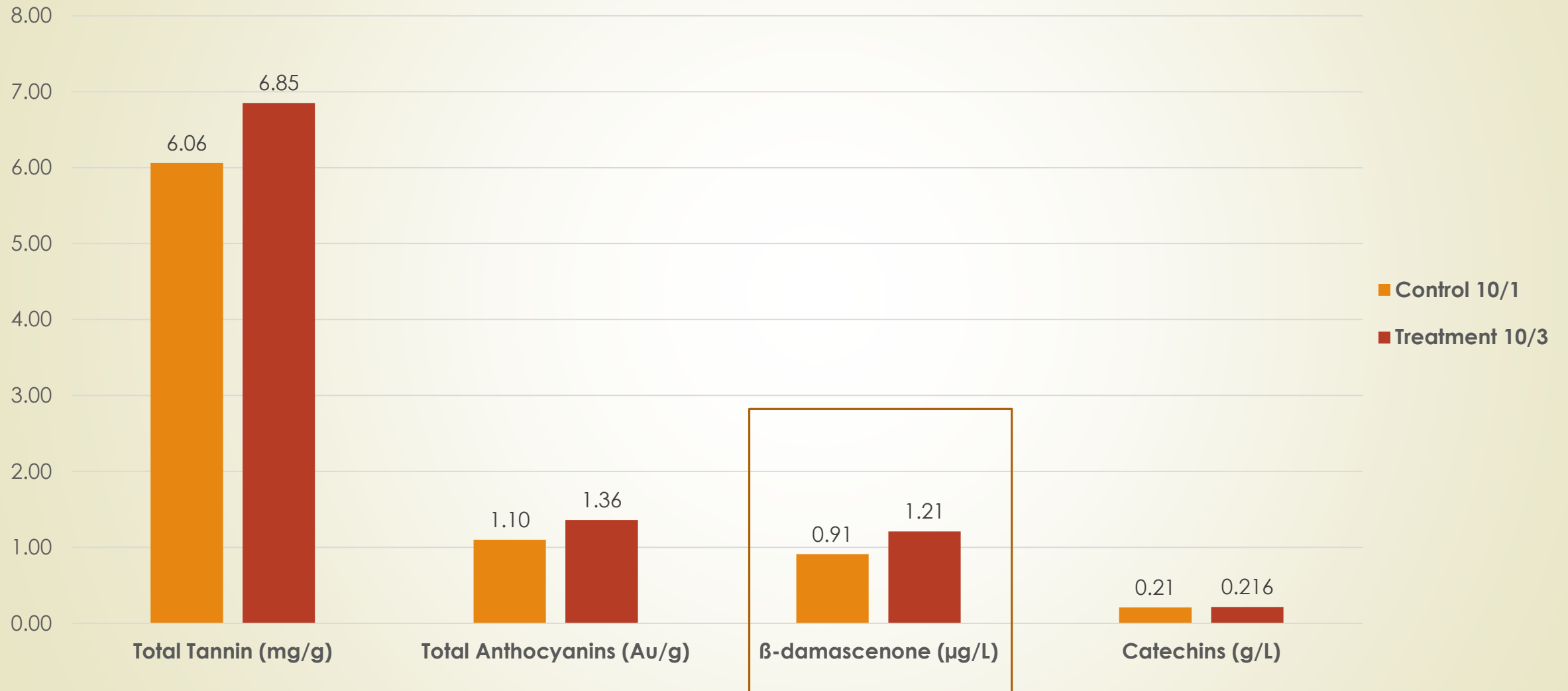
Crimson Ridge



Crimson Ridge #1

- ▶ Cabernet Sauvignon 338/101-14 planted in 2013
- ▶ Training system – VSP
- ▶ Cultural practices implemented:
- ▶ Aggressive deficit irrigation from fruit-set through veraison, maintain slightly lower stress levels post-veraison
 - ▶ 14-15 bars stress level up to veraison, 13-14 post-veraison
- ▶ Tunnel leaf removal
 - ▶ 1 leaf layer to protect against over-exposure
- ▶ Fruit thin – 2 clusters / strong shoot, 1 cluster small shoot, remove weak shoots
- ▶ Cluster de-clumping and green drop at 75% veraison
- ▶ Target increased skin:pulp ratio
 - ▶ Berry size <1.0 grams

Crimson Ridge #1





Crimson Ridge #1 summary

Results:

- Chemistry

- **Aroma – β -damascenone content increased by ~30%**

- Yield Components

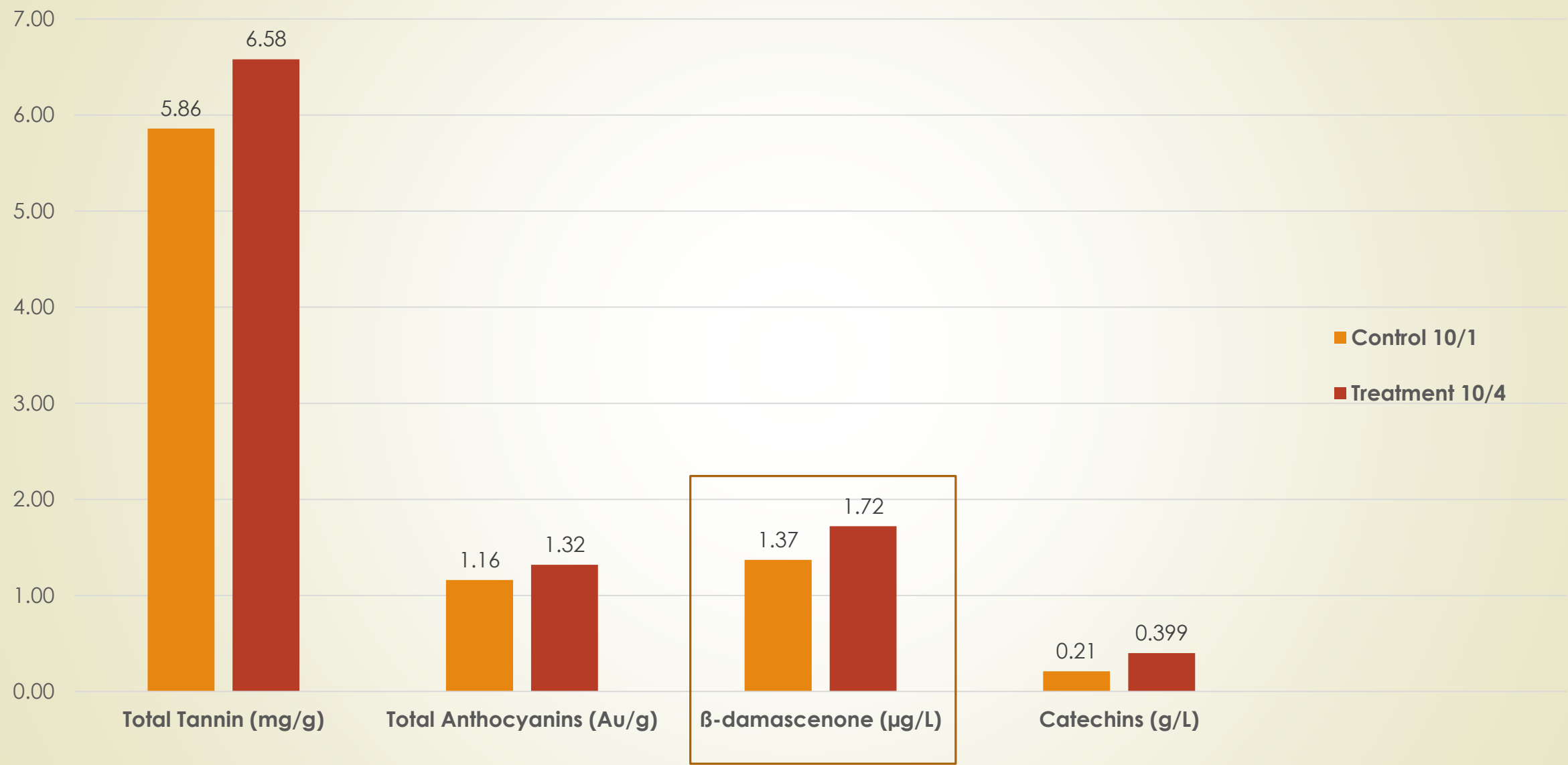
- **Both control and treatment pick at ~ 27 Brix**

- **Decrease in yield ~35% (6.5 TPA down to 4.4)**

Crimson Ridge #2

- ▶ Cabernet Sauvignon 7/110R planted in 2013
- ▶ Trellis system - VSP
- ▶ Cultural practices implemented
- ▶ Moderate deficit irrigation from fruit-set through veraison, maintain slightly lower stress levels post-veraison
 - ▶ 13-14 bars stress level up to veraison, 11-13 post-veraison
- ▶ Tunnel leaf removal
 - ▶ 1 leaf layer to protect against over-exposure
- ▶ Green drop at 75% veraison

Crimson Ridge #2



Crimson Ridge #2 Summary

- Chemistry

- **Aroma marker – β -damascenone content increased by ~ 20%**

- Yield Components

- **Control picked at 25.0 Brix, treatment picked at 26.0 Brix.**

- **Decrease in yield ~16% (7.0 TPA to 5.9)**

Crimson Ridge #3

- ▶ Cabernet Sauvignon 337/101-14 planted in 2013
- ▶ Trellis system - VSP
- ▶ Cultural practices implemented

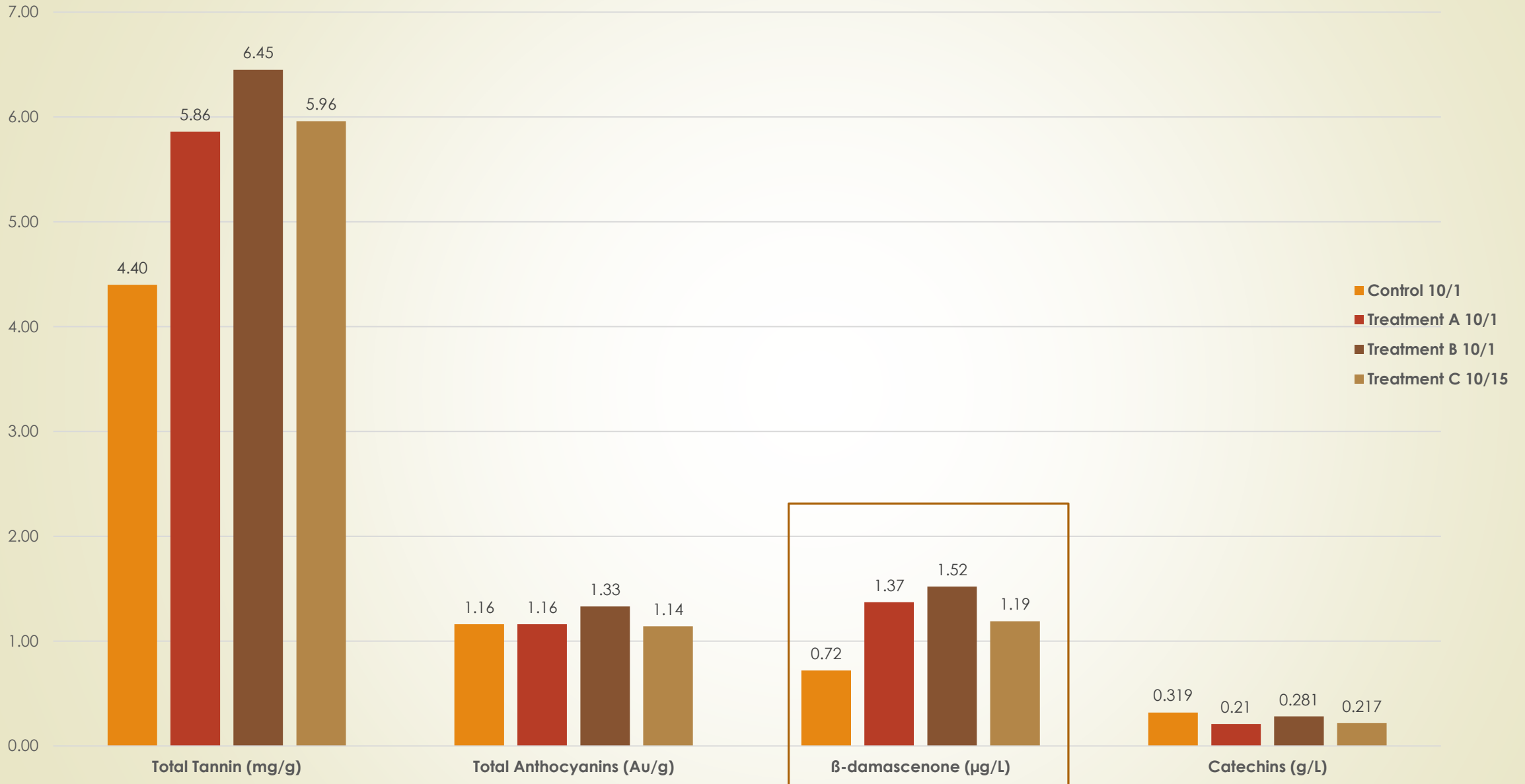
Winemakers A, B and C

- ▶ Aggressive deficit irrigation from fruit-set through veraison, maintain slightly lower stress levels post-veraison
 - ▶ 14-16 bars stress level up to veraison, 12-14 post-veraison
- ▶ More aggressive pruning
- ▶ Tunnel leaf removal
 - ▶ 1 leaf layer to protect against over-exposure
- ▶ Green drop at 50% veraison

Winemakers B and C

- ▶ Top-wire un-tucked, increased dappled sunlight in fruiting zone, protect against over-exposure ~Lazy VSP, no leaf removal
- ▶ Drop over-exposed fruit
- ▶ Cluster de-clumping

Crimson Ridge #3





Crimson Ridge #3 Summary

- ▶ Chemistry
 - ▶ **Dramatic increase in β -damascenone up to nearly 100% increase, however extended hang-time decreased content.**
- ▶ Yield components
 - ▶ **Control- 25.5 Brix**
 - ▶ **Treatment A, B- 26.5 Brix**
 - ▶ **Treatment C- 28.0 Brix**
 - ▶ **Decrease in yield ~30% (6.0 TPA down to 4.0)**
 - ▶ **Treatment 3 – 3.75 TPA**

Key findings and summary

- ▶ Increased cultural practices generally increase aromatic potential.
 - ▶ β -damascenone content was positively influenced.
- ▶ Key factors to the success appear to be optimized light in the fruiting zone and decreased berry size.
- ▶ Counter to what many believe - extended hang time and overly aggressive fruit thinning did not positively influence β -damascenone content.
- ▶ Off the cuff observations – warm nights at the end of harvest can dramatically influence β -damascenone content. Potentially a result of cellular respiration?
 - ▶ Temporal project looking at weekly analyses of grape content across multiple vineyards.
 - ▶ Observed impacts of excessive heat event with warm nights in late September, β -damascenone content dropped significantly across all vineyards, later rebounded as diurnal cooling resumed.

Thank you!

- ▶ Eglantine Chauffour & Jose Santos
- ▶ Andy & David Beckstoffer
- ▶ Pedro Rubio, General Manager – Beckstoffer Red Hills
- ▶ Red Hills farming team