GRAPEVINE RED BLOTCH DISEASE: CAN CULTURAL PRACTICES MITIGATE NEGATIVE EFFECTS?

2023 OWRI Grape Day
April 3, 2023
Corvallis, OR

Oregon State University
Southern Oregon Research and Extension Center

Physiological effects and **SYMPTOM CASCADE**

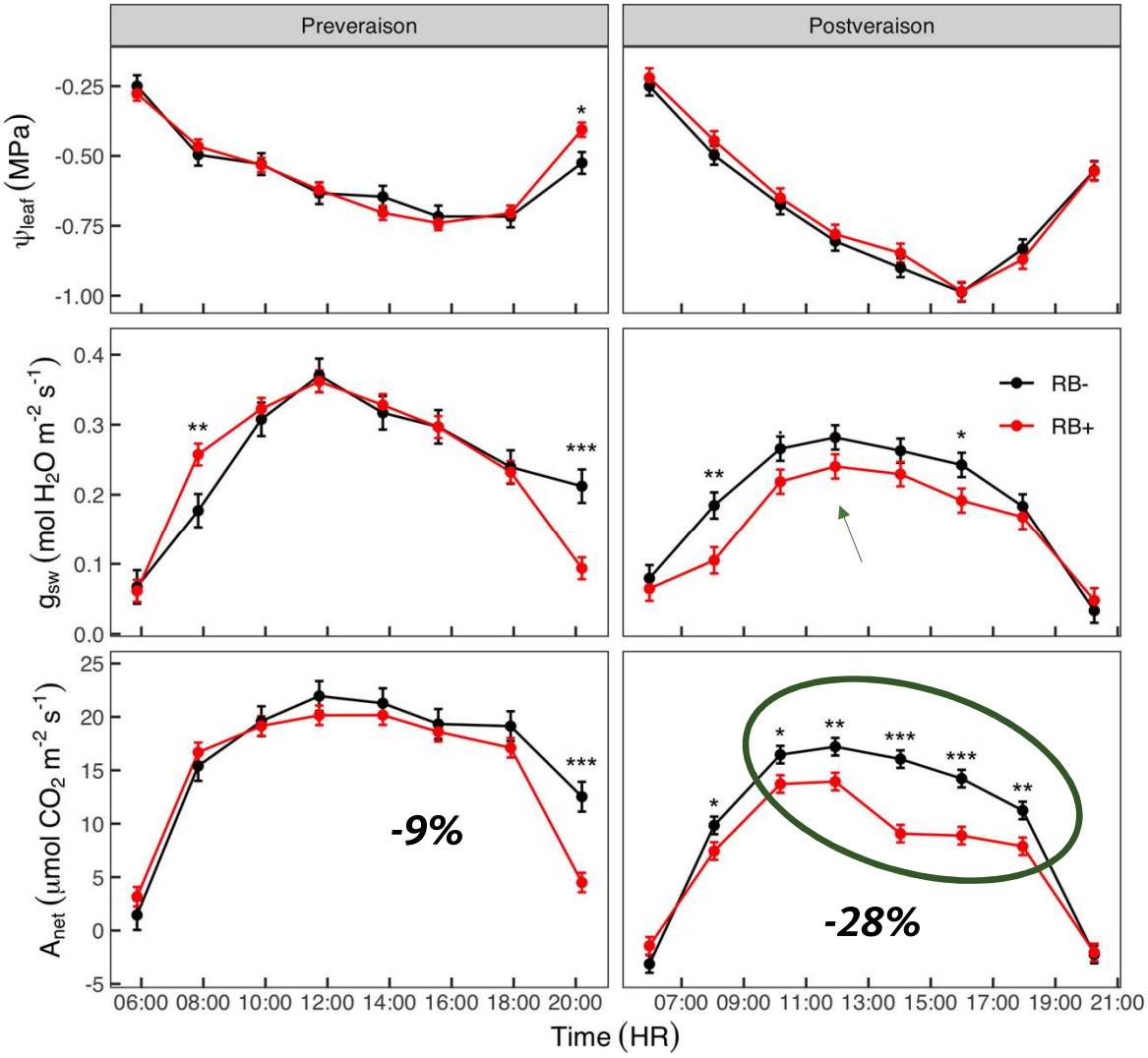
Lower gas exchange in the afternoon

No effect of virus on ψ_{leaf}.

Little to no effect of virus on g_s but trending lower postveraison.

Strong, significant main effect of virus on A_{net} at both phenological stages.

Strong, significant interaction between virus and time postveraison.

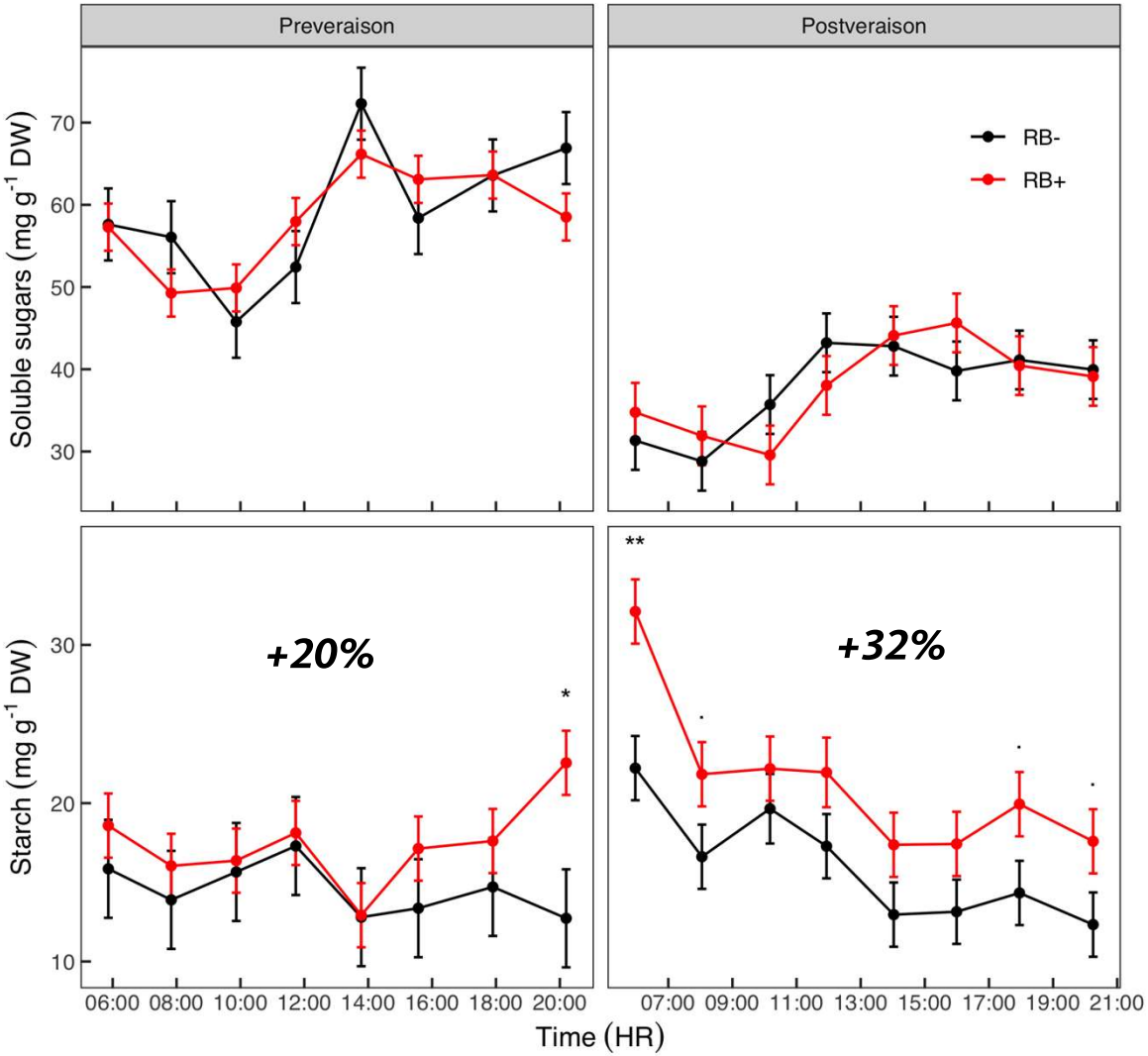


Copp et al. (In prep)

Higher leaf [starch] preveraison

- Leaf soluble CHOs increase significantly from morning to afternoon plateau, but **no significant virus effect at either stage.**

- **Significant main effect of virus on leaf [starch] at both phenological stages.**

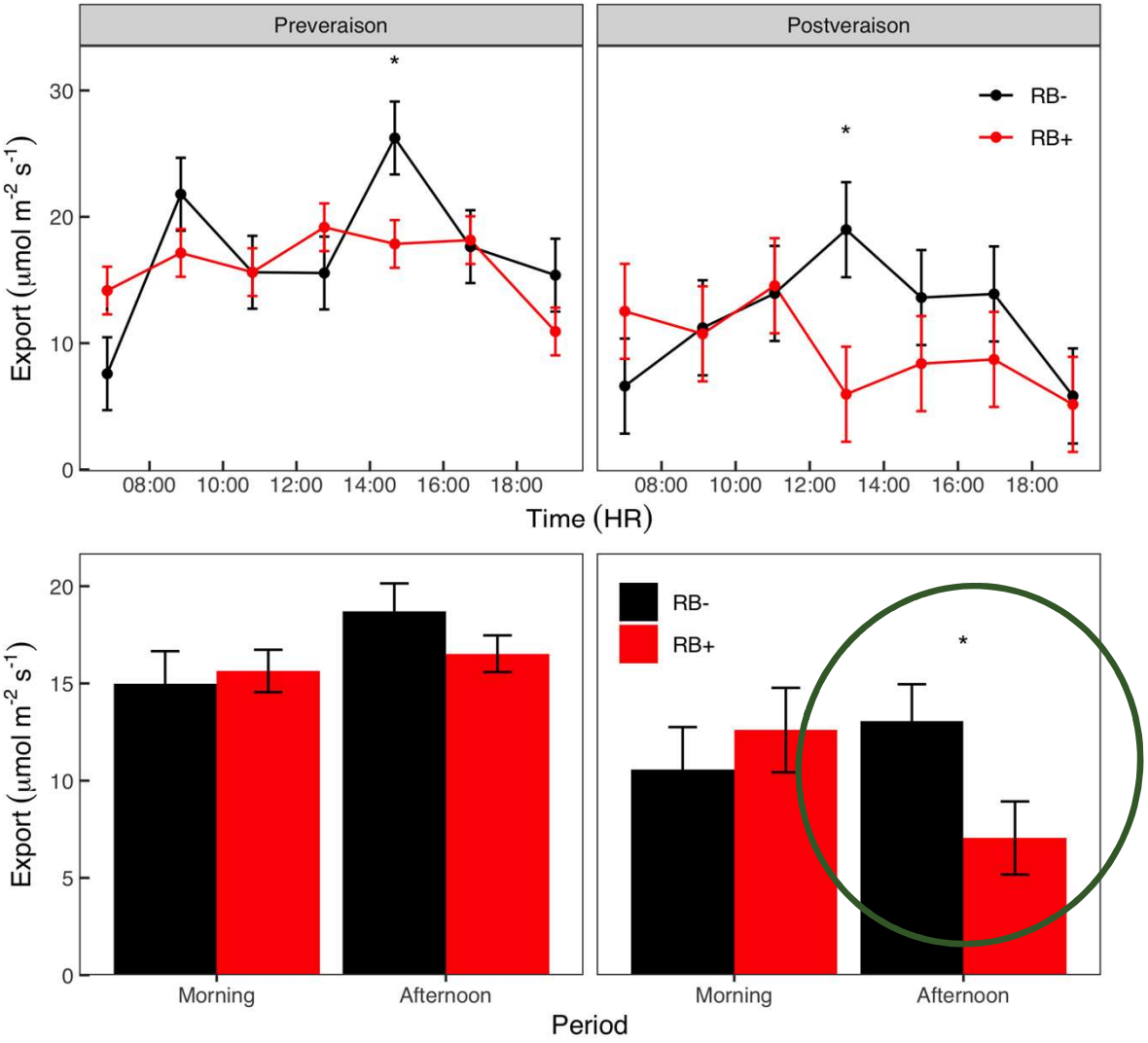


Copp et al. (In prep)

Lower C export

Healthy leaf C export more dynamic, but in general C export tracks with A_{net} at both stages.

When data were pooled into *morning* and *afternoon* groups, **significant virus effects found postveraison in afternoon.**



Copp et al. (In prep)

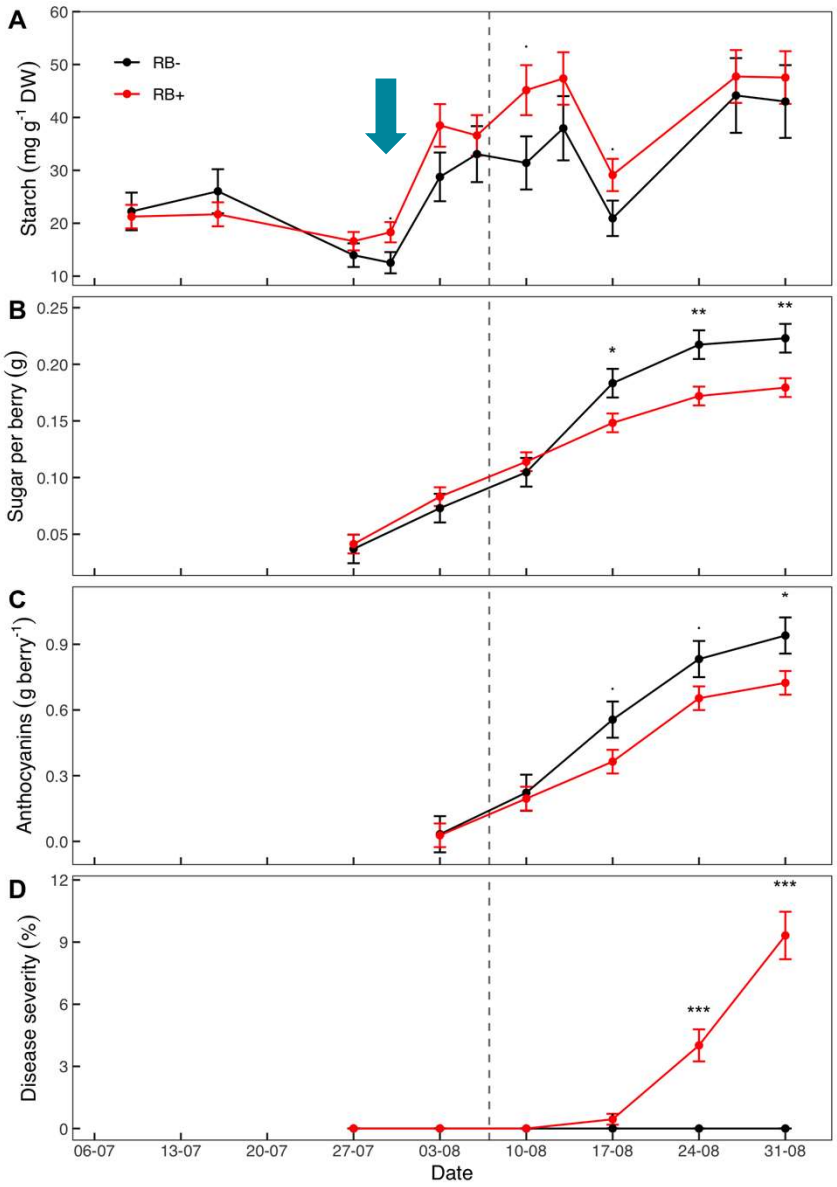
Leaf starch accumulation and berry ripening

Differences in leaf [starch] separate ~2 weeks before veraison.

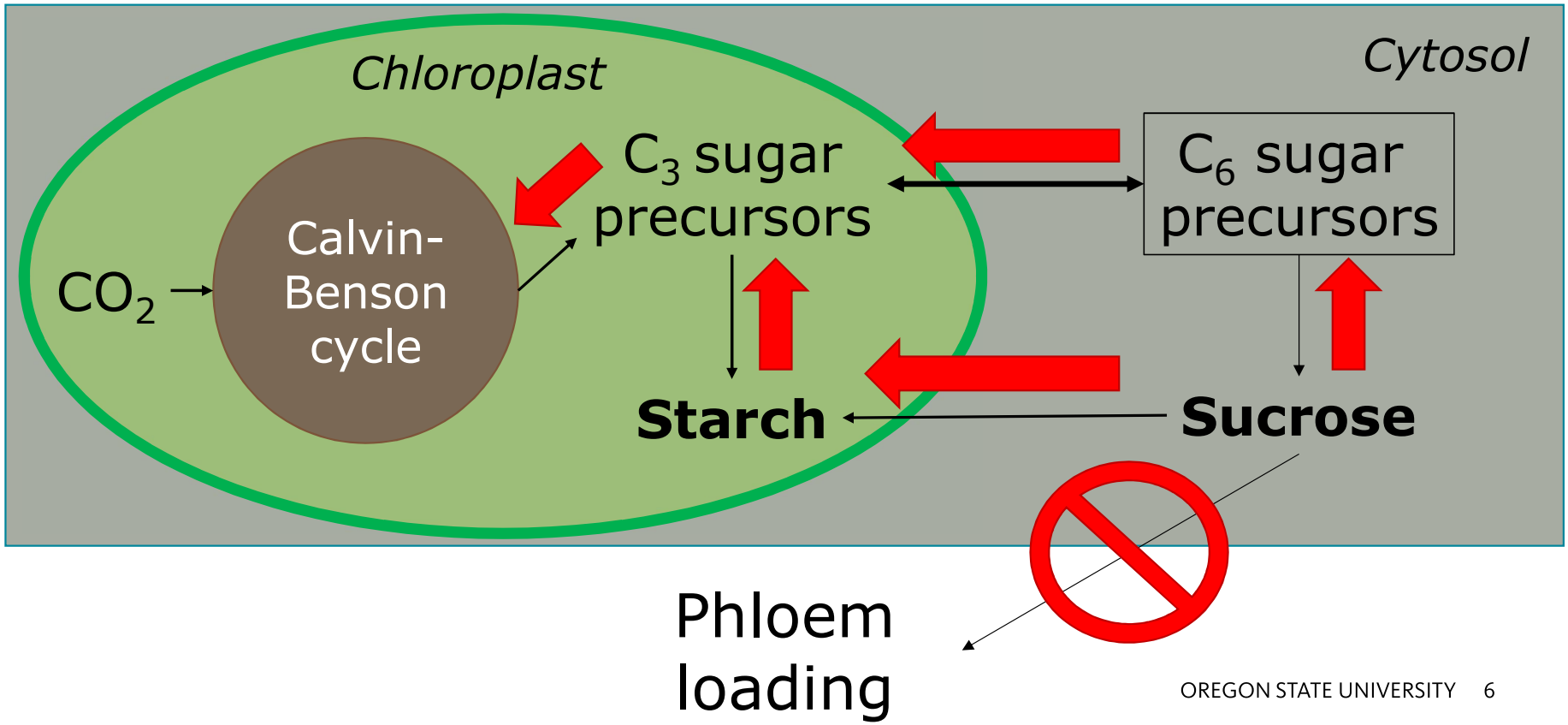
Differences in berry sugar and anthocyanin content follow.

Foliar symptoms appear last.

Copp et al. (In prep)



Feedback inhibition from GRBV



Cultural practice

MANAGEMENT TRIALS

Testing cultural management practices

Deficit irrigation trial

- Well-watered (100% ETc) vs. deficit (50-66% ETc)
- Healthy (GRBV-) vs. infected (GRBV-)
- Pinot noir on Schwarzmann (planted 2009, trial 2017-18)

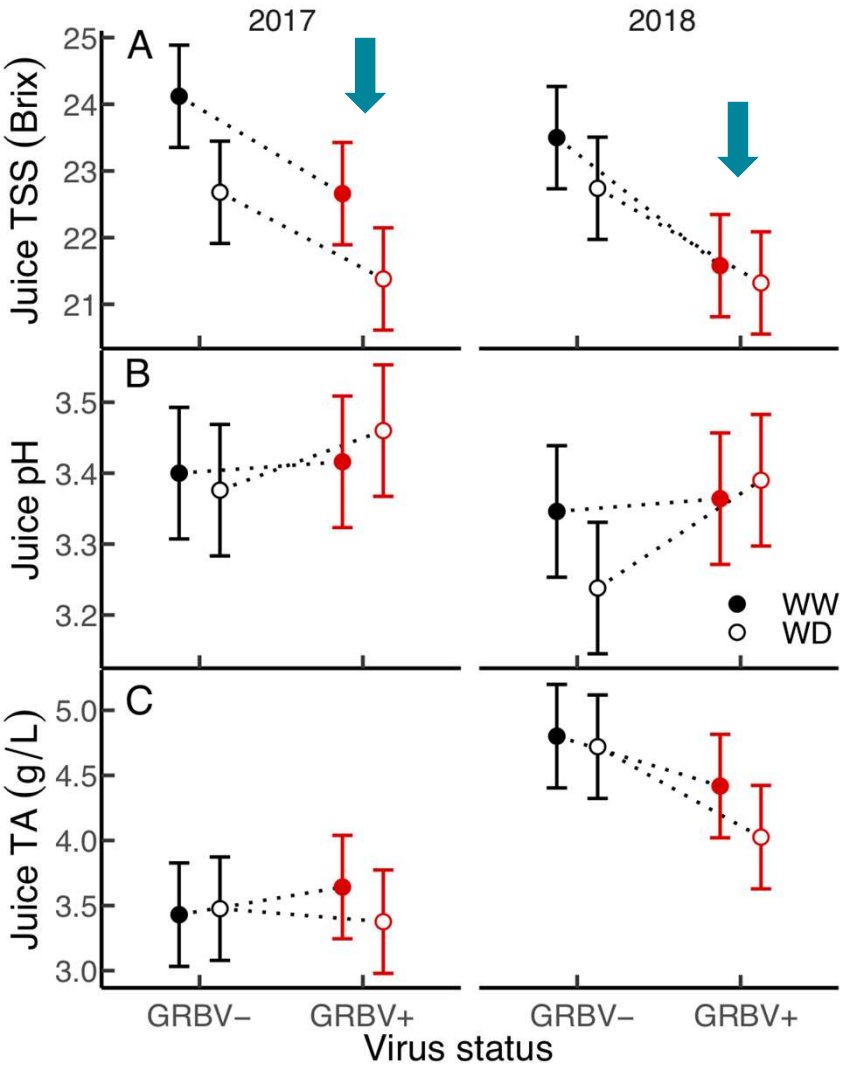
Supplemental inputs trials

- Grower standard vs. 2x grower standard
- Irrigation * fertilizer AND irrigation * thinning
- All infected (GRBV+)
- Pinot noir on 3309C and RG (planted 2015, trial 2018-2020)

Less water = less sugar

Although keeping GRBV+ vines well-watered may mitigate some of the negative effects of GRBD, results suggested that **water deficits will not improve overall fruit quality in GRBV+ vines.**

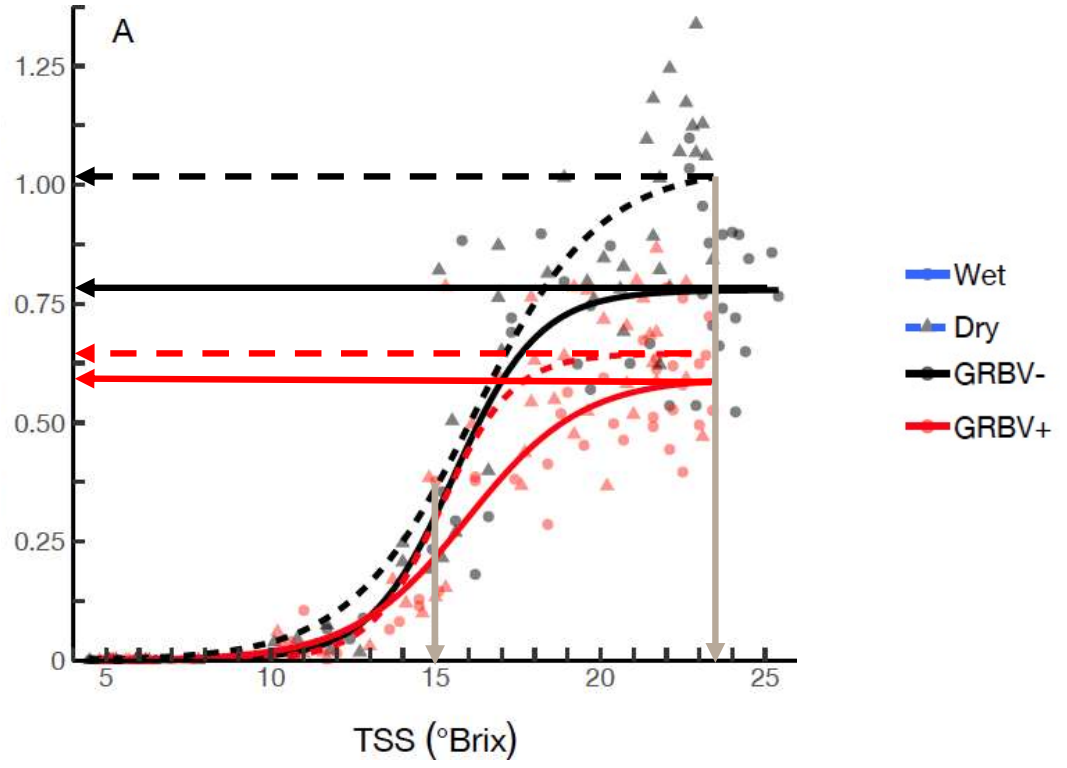
Control of fruit ripening imparted by GRBV infection seems to be stronger than abiotic control imparted by water deficits.



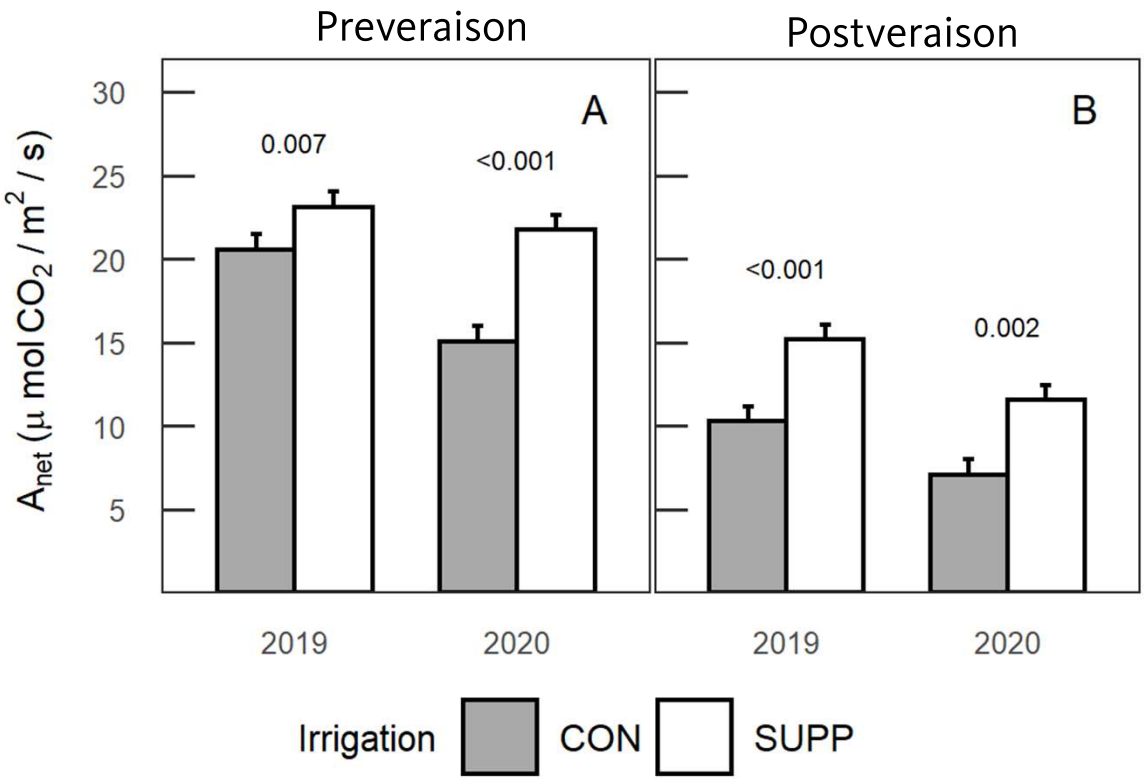
Levin, AD, and KC AN. 2020. Water deficits do not improve fruit quality in Grapevine Red Blotch Virus-infected grapevines (*Vitis vinifera* L.). Front Plant Sci 11:1292. DOI: https://www.doi.org/10.3389/fpls.2020.01292

GRBV limits color development at same sugar

Anthocyanins (mg/g FW)

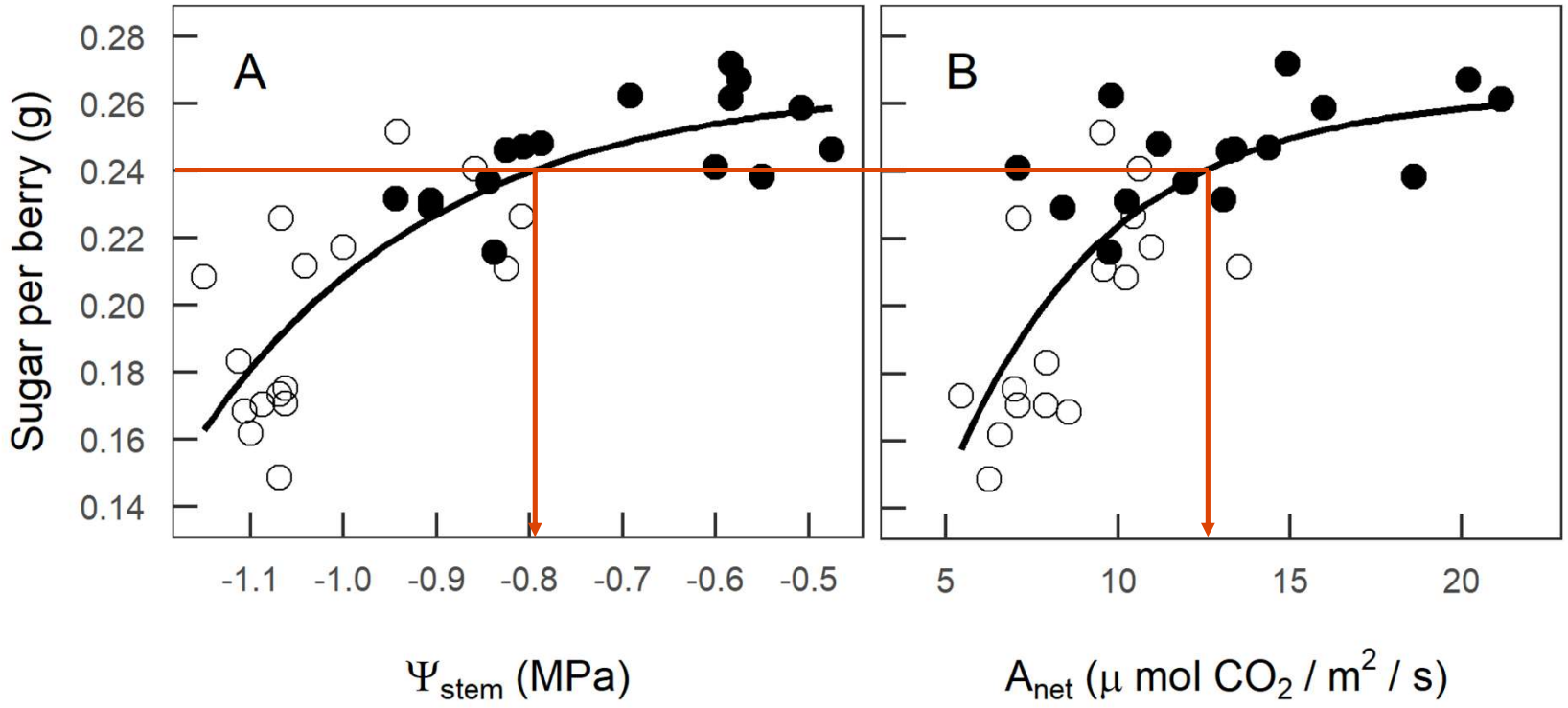


More water = less stress = more Photo



Copp, CR, and Levin AD. 2021. Irrigation Improves Vine Physiology and Fruit Composition in Grapevine Red Blotch Virus-Infected *Vitis vinifera* L. American Journal of Enology and Viticulture 72:307-317. DOI: https://www.doi.org/10.5344/ajev.2021.21007

More water = more sugar per berry



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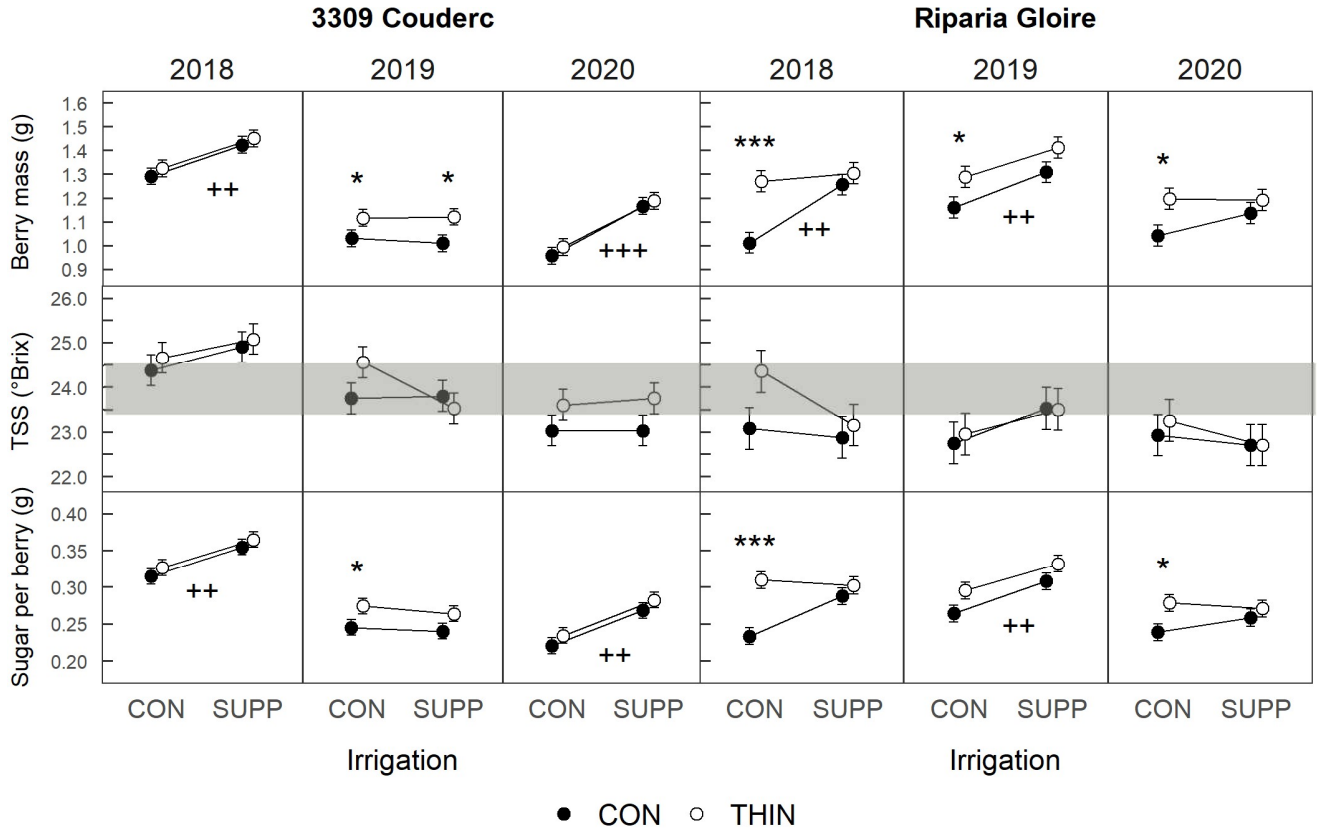
Thinning reduced photosynthesis!

Irrigation[a]	Thinning[b]	A_{net} (µmol $CO_2/m^2/sec$)	
		3309C	RG
CON	CON	11.5 ± 1.7 a[c]	5.8 ± 0.9 a
	THIN	11.1 ± 1.7 a	5.8 ± 0.9 a
SUPP	CON	16.2 ± 1.7 b	13.0 ± 0.9 b
	THIN	14.9 ± 1.7 b	10.4 ± 0.9 a

Copp, CR, KC AN, and Levin AD. 2021. Cluster Thinning Does Not Improve Fruit Composition in Grapevine Red Blotch Virus-infected *Vitis vinifera*. Am J Enol Vitic. DOI: https://www.doi.org/10.5344/ajev.2021.21016

Thinning doesn't do much to fruit quality



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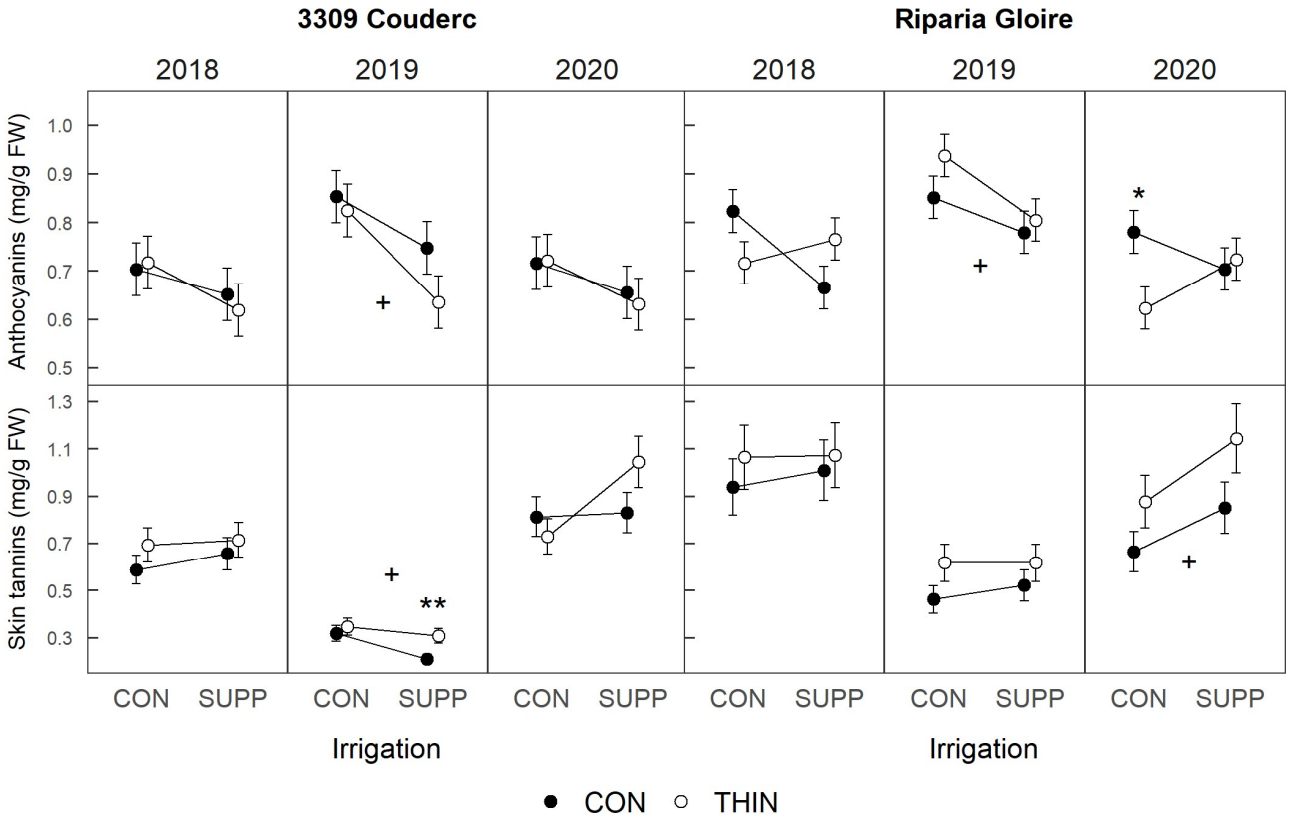
Thinning doesn't do much (con't)



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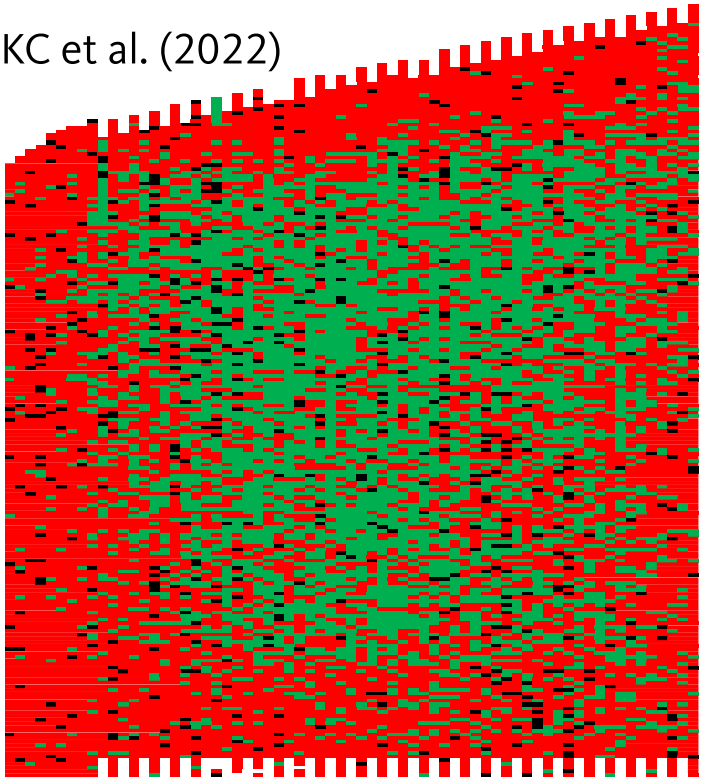
Testing cultural management practices

Foliar K+ trial

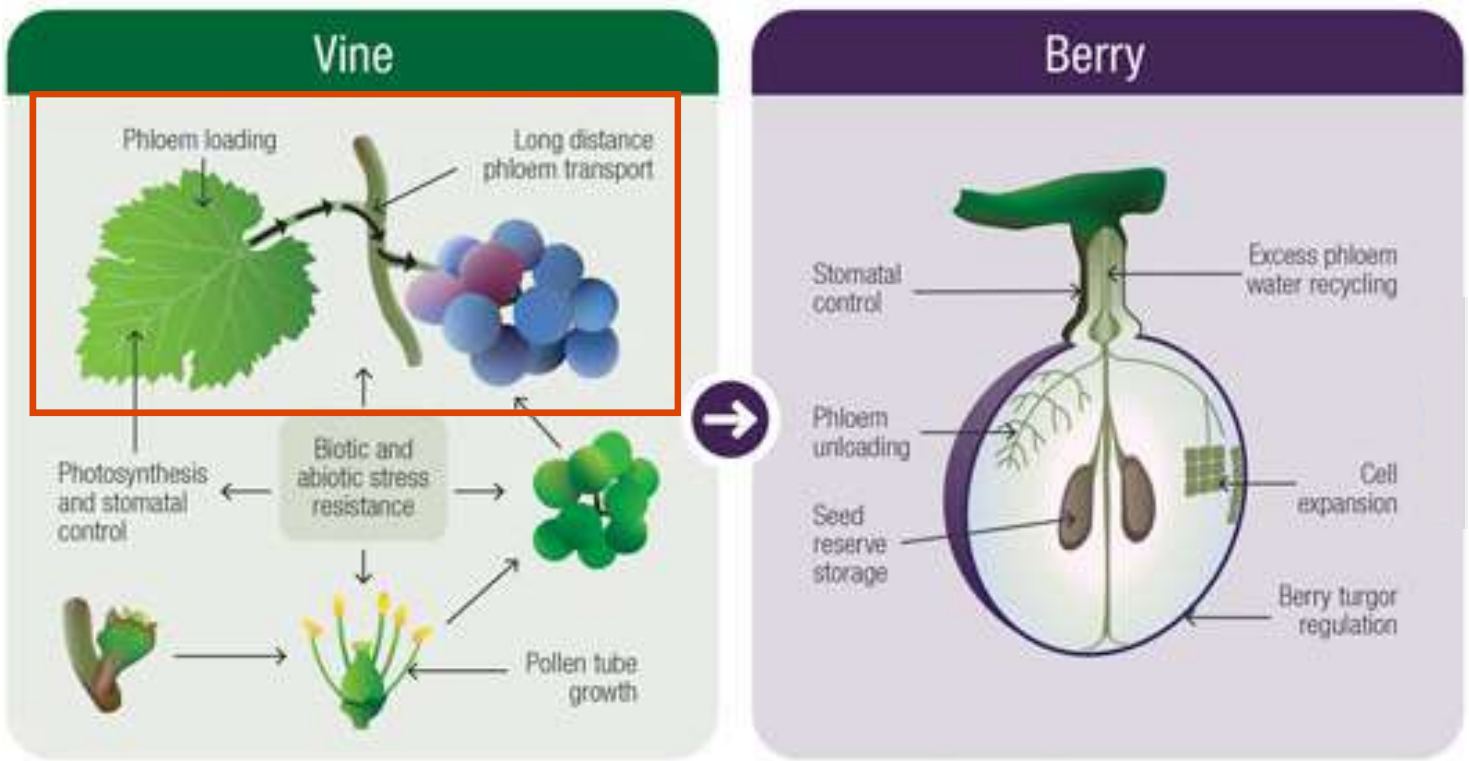
- Water vs. KDL vs. Metalosate-K
- 4 post-veraison apps (3 qt/A/app)
- Healthy (GRBV-) vs. infected (GRBV-)
- Pinot noir on 101-14 (planted 2010, trial 2020-2021)

KC et al. (2022)



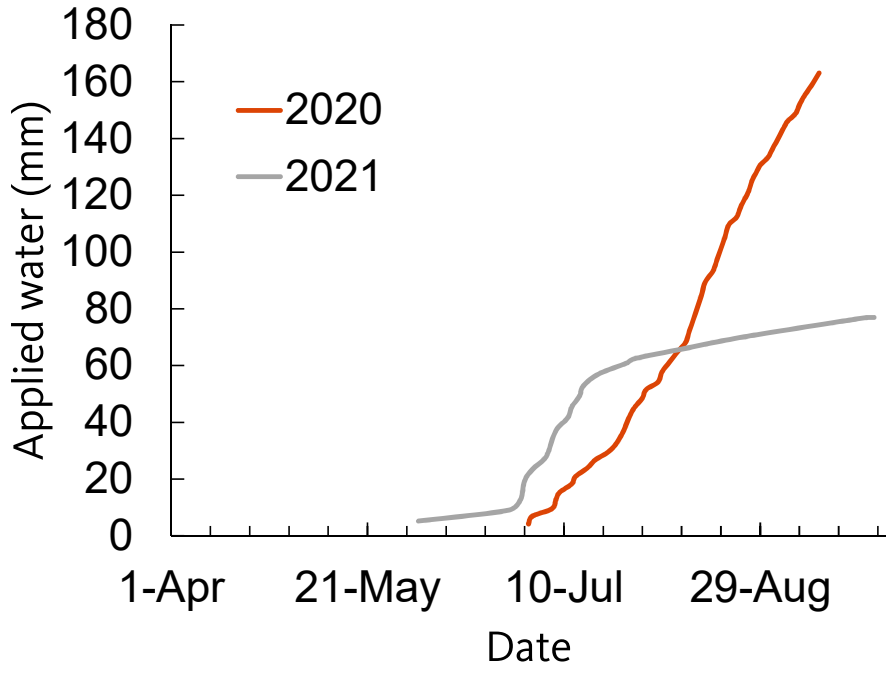
KC, A, DeShields JB, Levin AD, Hilton RJ, and Rijal J. 2022. Epidemiology of Grapevine Red Blotch Disease Progression in Southern Oregon Vineyards. American Journal of Enology and Viticulture 73:116-124. DOI: https://www.doi.org/10.5344/ajev.2022.21031

Sugar translocation tightly correlated with K nutrition



Rogiers et al. 2017

Much less applied water in 2021 due to curtailments

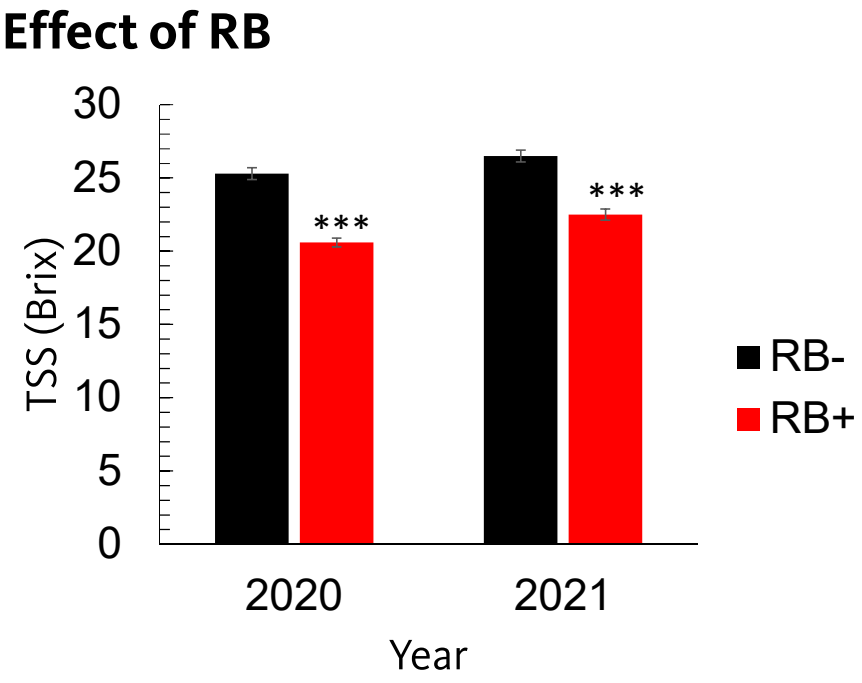


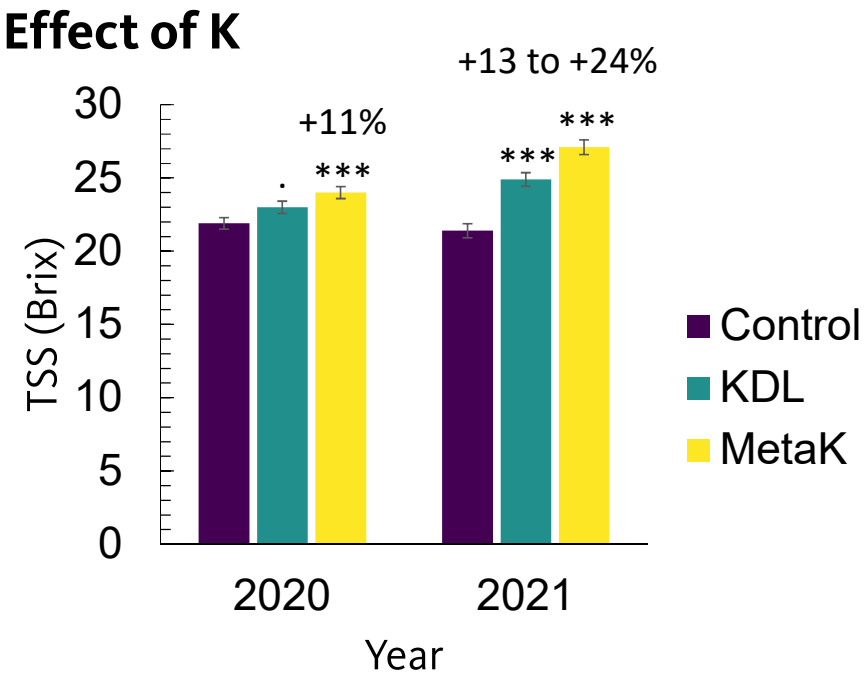
TID will shut off irrigation water Monday

By Vickie Aldous | | Updated: Jul 15, 2021 04:20 PM

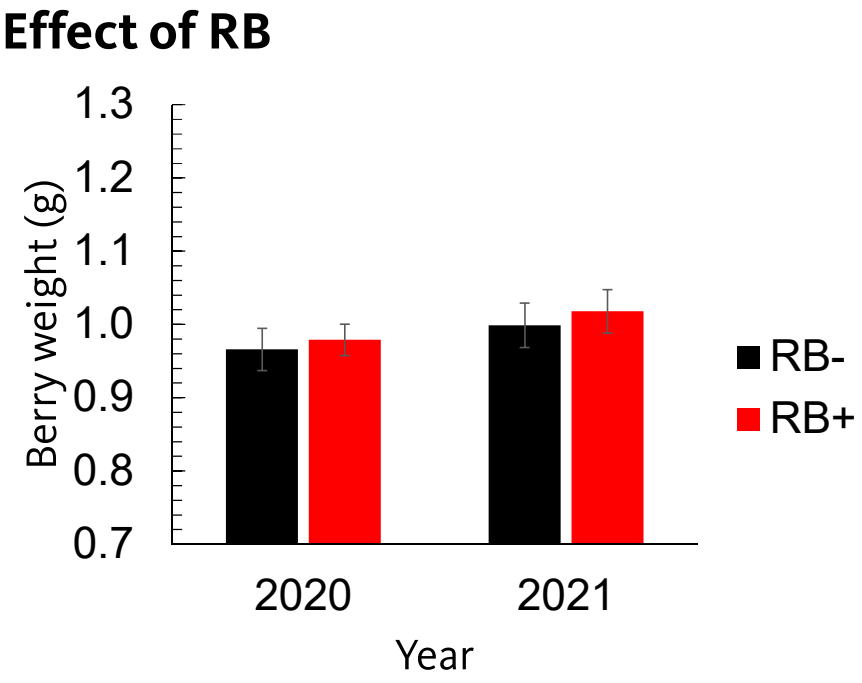
The Rogue Valley irrigation season will end early do to dwindling water supplies in local reservoirs like Emigrant Lake. Andy Atkinson/Mail Tribune

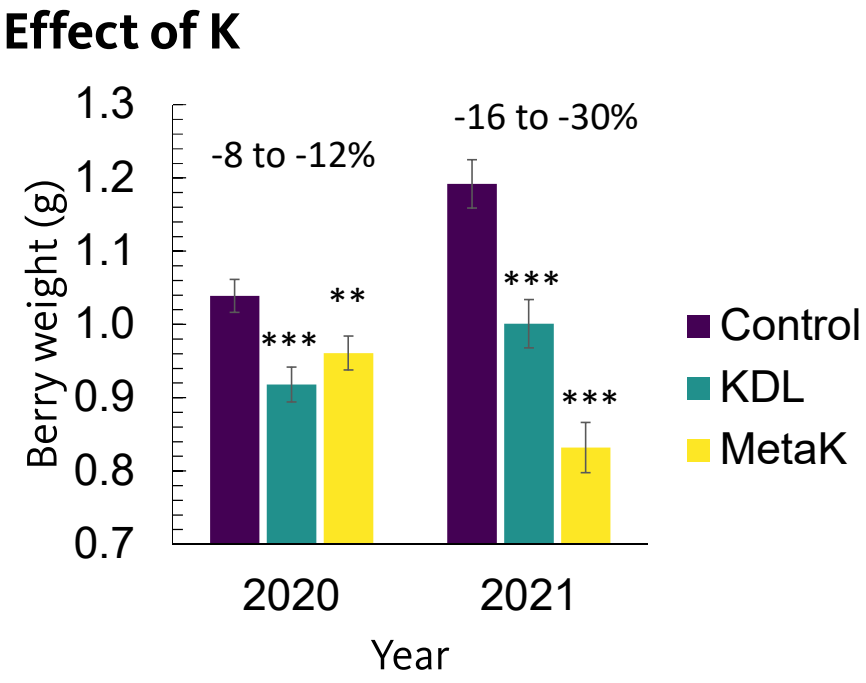
TSS decreased by RB, increased by K



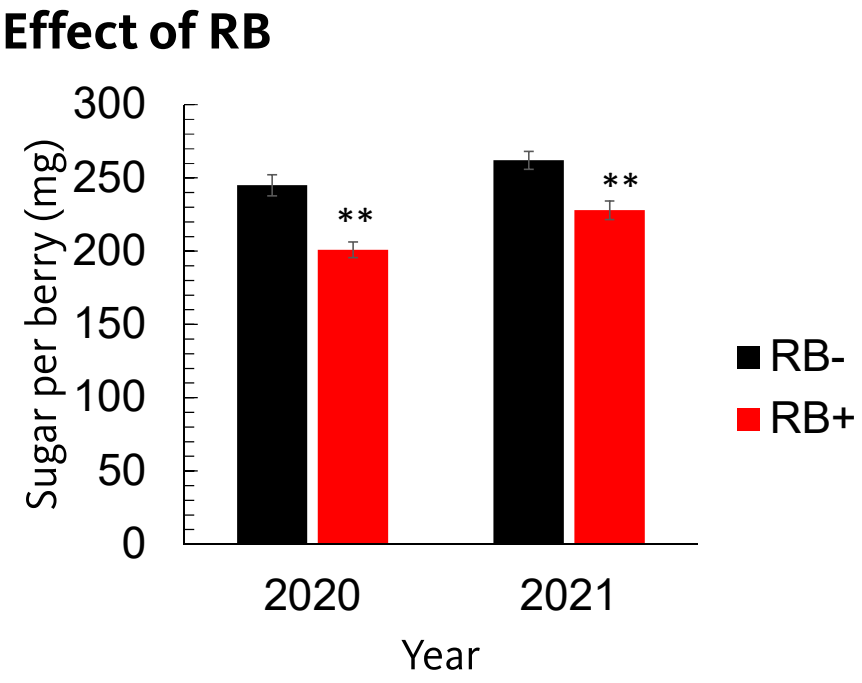


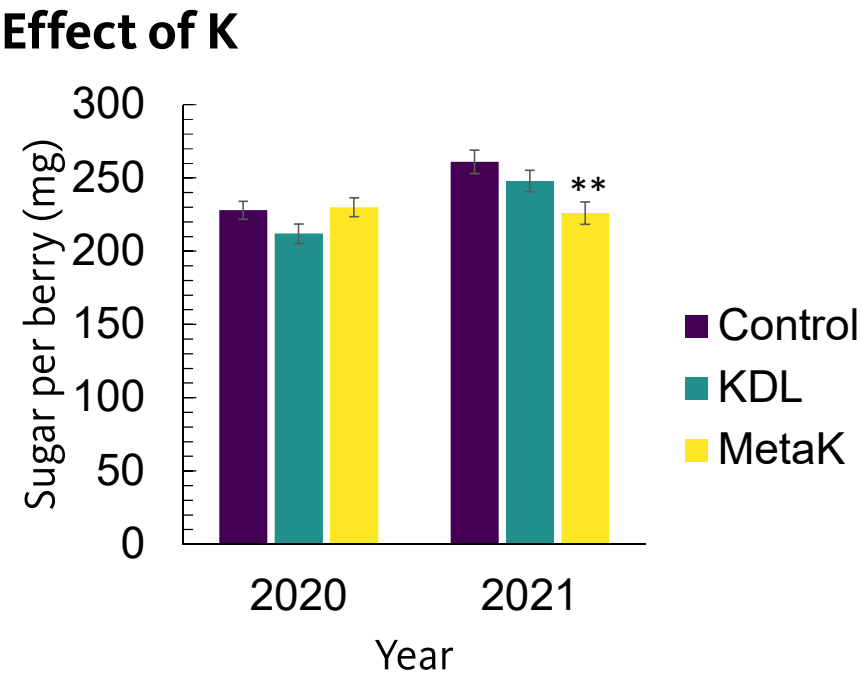
Significant reduction in berry weight from K in both years





Sugar per berry decreased by RB, little effect of K





Severe berry shriveling in sprayed vines

GRBV- control (i.e., not sprayed)

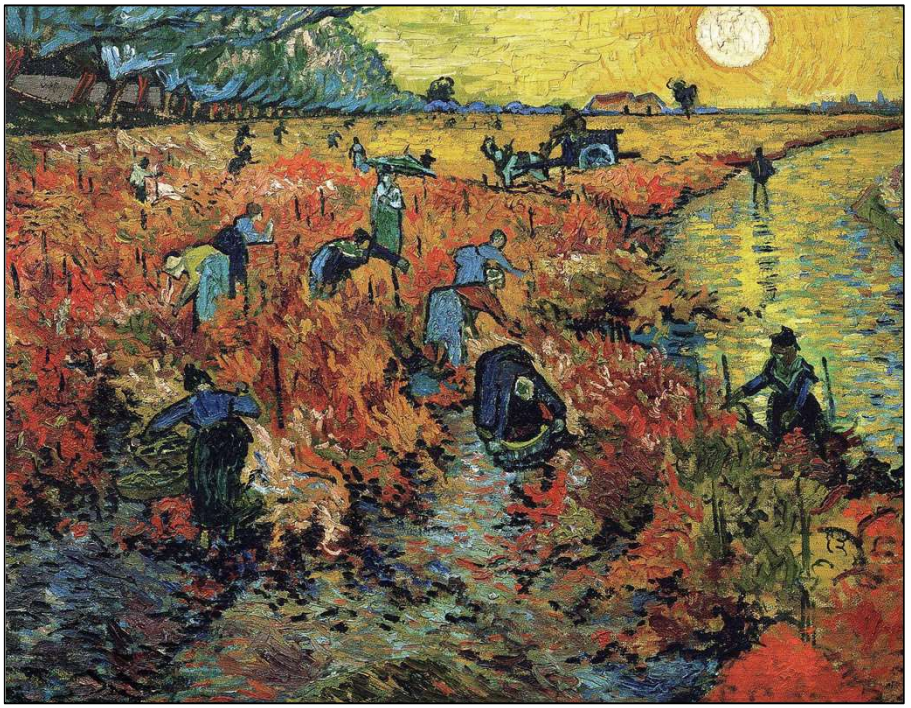
GRBV- sprayed with Metalosate-K

How can we manage

INFECTED VINES?

How can we manage infected vines?

- Monitor, rogue, and replant if low incidence
- Avoid water stress
- Monitor nutrient budgets, and fertilize to maintain healthy tissue test levels
- Thinning effect is psychological
- Post veraison K application can increase Brix



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American Vineyard Foundation

Oregon Wine Board

USDA NIFA

United States Department of Agriculture
National Institute of Food and Agriculture

Oregon Department of Agriculture
Protect. Promote. Prosper.

Oregon State University
Oregon Wine Research Institute

Rogue Valley Winegrowers Association

THANK YOU!

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