

Drought stress compromises vine growth and yield regardless of fruit removal

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Background

- During extreme drought events irrigation water supply to vineyards may be shut off and growers often remove fruit to ensure vine survival.
- We tested the idea that fruit removal during drought enhances vine survival in Cabernet Sauvignon and Riesling.

Field trials with Cabernet Sauvignon and Riesling

- In 2022 and 2023 we shut off irrigation either **after fruit set** or **at veraison** and removed **0%, 50%, or 100%** fruit at the start of each drought period. We compared outcomes with standard regulated deficit irrigation (RDI).

Measurements:

- Soil moisture (neutron probe)
- Vine water status (pressure chamber)
- Leaf wilting or yellowing (visual)
- Canopy temperature (infrared camera)
- Yield and its components
- Fruit composition (TSS, TA, pH)



Preliminary results

(a) Early drought onset results in up to 12°F warmer canopy and increased leaf abscission (Figs. 1 and 2)

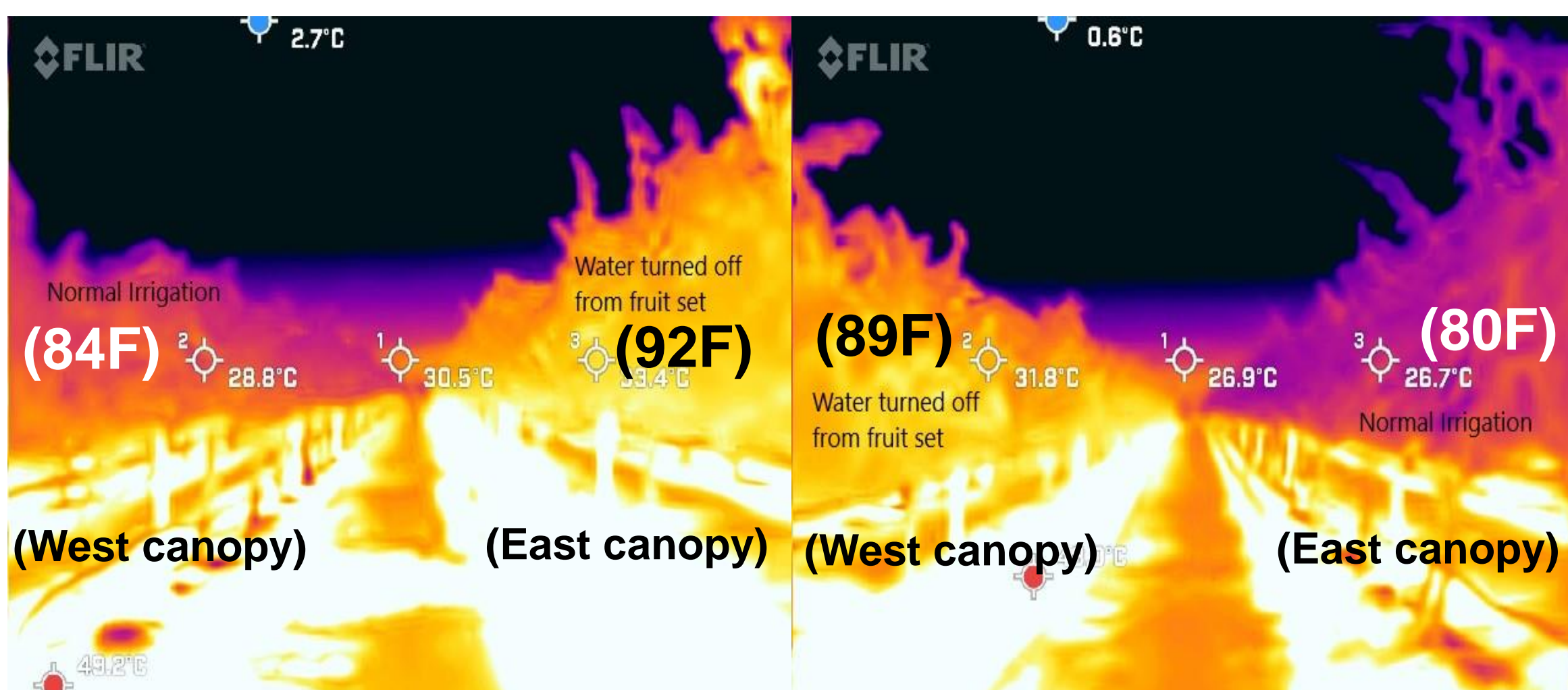


Figure 1. Thermal images of vine canopy exposed to drought stress from fruit set (warmer canopy) compared to the control (cooler canopy). Images show both the east and west side of each canopy.



Figure 2. Leaf death on Cabernet Sauvignon vines exposed to drought stress from fruit set (blue flag on end post) and at veraison (yellow flag) compared to the control (red flag).

(b) Vines with fruit experience greater water stress regardless of drought timing (Fig. 3)

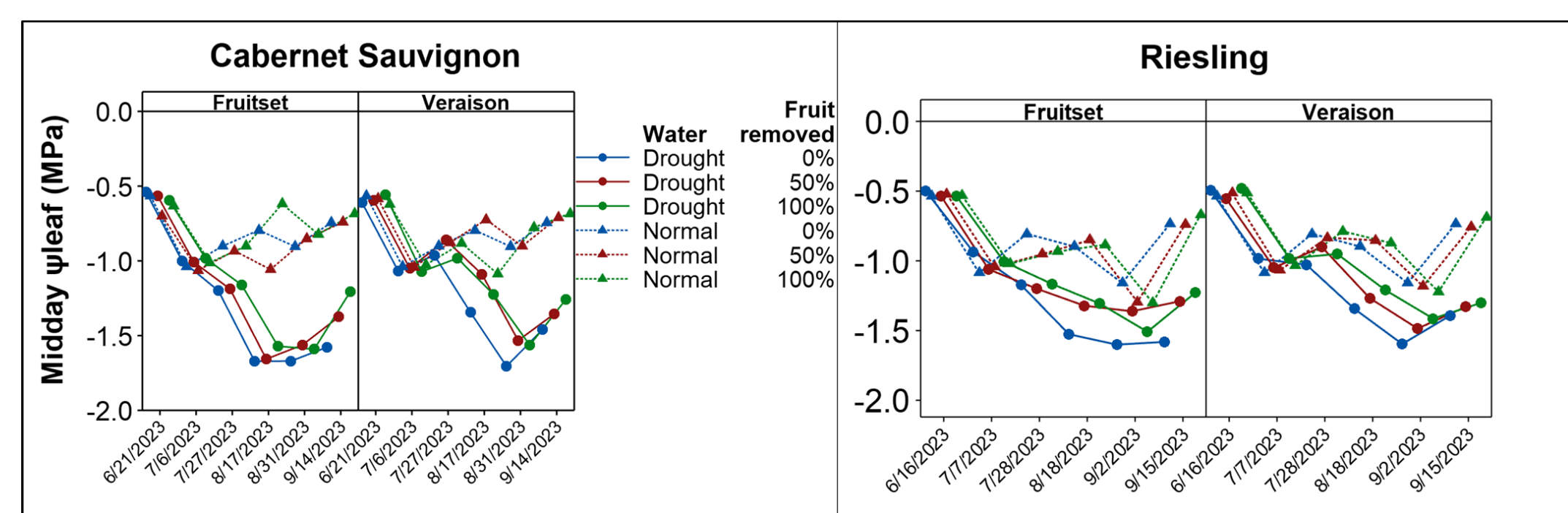


Figure 3. Impact of drought and fruit removal applied at different growth stage on vine water status of Cabernet Sauvignon and Riesling.

(c) Drought stress depresses yield (Fig. 4) without improving fruit composition (Table 1)

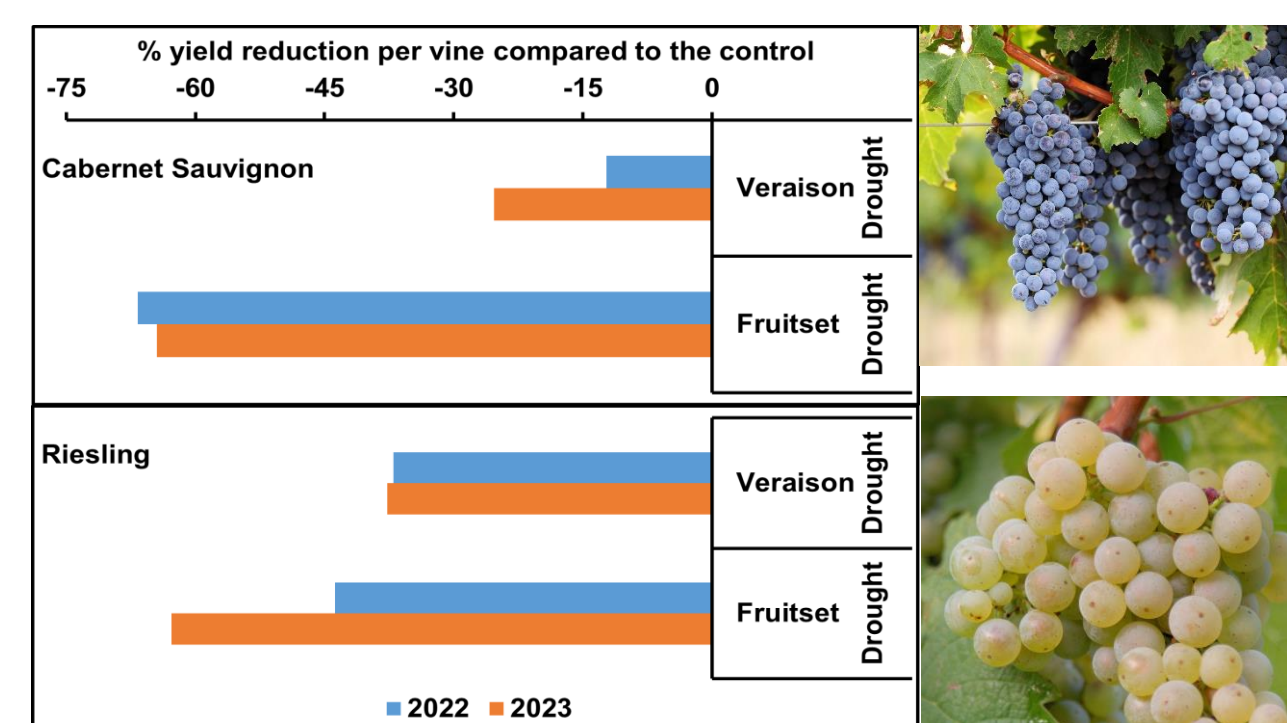


Figure 4. Percent yield reduction relative to the control in Cabernet Sauvignon and Riesling exposed to drought stress starting at fruit set or veraison.

Table 1. Impact of drought starting at fruit set and fruit removal on fruit composition of Cabernet Sauvignon and Riesling. Data are from the 2022 season.

Fruit composition	Cabernet Sauvignon				Riesling			
	Drought		Irrigation		Drought		Irrigation	
	0%	50%	0%	50%	0%	50%	0%	50%
TSS (°Brix)	23.3	23.8	22.5	23.8	17.1	19.6	19.9	20.6
TA (g/L)	4.3	4.0	4.3	4.4	6.7	5.9	6.7	6.4
pH	3.7	3.9	3.5	3.6	3.3	3.4	3.2	3.3

(d) Early drought onset impairs next year's vine growth and productivity (Fig. 5)

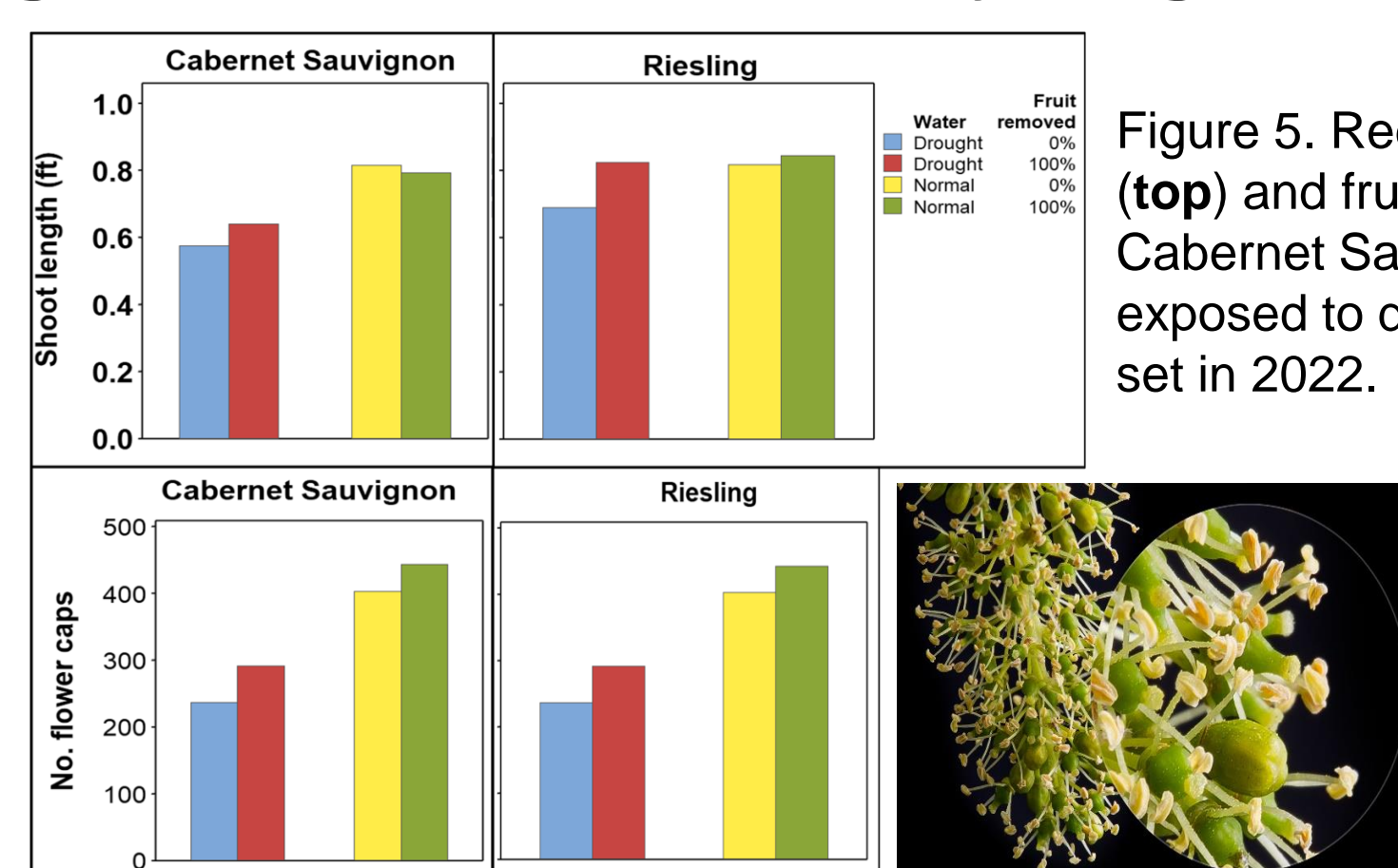


Figure 5. Reduced 2023 shoot growth (top) and fruitfulness (bottom) in Cabernet Sauvignon and Riesling exposed to drought stress starting at fruit set in 2022.

Conclusion

- Extreme drought will have a long-lasting effect on vine growth and productivity even if fruit is removed from vines.
- The field trials will be repeated in 2024.

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