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Supplementary Material

Mechanisms underlying photosynthetic acclimation to high temperature are different between *Vitis vinifera* cv. Syrah and Grenache

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Table S1. Meteorological conditions during the 2016/17 and 2017/18 experimental growing seasons

Historical data was taken from 1981 to 2010 from the National Meteorological Service

	Precipitations (mm)			**Mean air temperature (ºC)**		
	Historical	**2016/17**	**2017/18**	**Historical**	**2016/17**	**2017/18**
October	10.4	16.0	20.6	18.8	13.7	14.2
November	16.4	74.0	34.0	22.2	17.8	17.8
December	24.3	48.6	66.6	24.9	20.8	20.1
January	50.5	6.6	29.4	25.5	23.8	21.5
February	33.7	38.4	27.6	24	21.3	20.8
March	34.9	21.2	7.0	21.3	17.4	16.2
Total	170.2	204.8	185.2			

Table S2. Rubisco carboxylation rate (V_{cmax}) and maximum electron transport rate (J_{max}) in Grenache and Syrah leaves of heated and control plants determined from A_n/C_i curves at different temperatures, during two years of experiment (2016/17and 2017/18)

Values of V_{cmax} and J_{max} were obtained from A_n/C_i curves and represent the mean of 3 or 4 curves ± standard deviation. Mendoza, Argentina.

[1] LT leaf Temperature of the A_n/C_i curve, set by the IRGA.

Grenache								
	2016/17				2017/18			
LT[1] (°C)	V_{cmax} (µmol m^{-2} s^{-1})		J_{max} (µmol m^{-2} s^{-1})		V_{cmax} (µmol m^{-2} s^{-1})		J_{max} (µmol m^{-2} s^{-1})	
	Control	Heated	Control	Heated	Control	Heated	Control	Heated
20	---	---	---	---	44.3 ± 5.2	51.2 ± 6.1	100.1 ± 9.4	116.1 ± 10.5
25	76.6 ± 5.5	69.5 ± 4.3	135.7 ± 5.2	115.4 ± 1.4	52.8 ± 1.8	56.8 ± 5.3	106.6 ± 4.0	119.2 ± 7.4
30	89.5 ± 7.8	99.9 ± 13.5	136.1 ± 10.2	134.2 ± 10.8	88.1 ± 7.5	90.8 ± 10.1	147.5 ± 9.1	155.5 ± 30.4
35	138.8 ± 8.2	144.8 ± 10.9	153.4 ± 4.3	150.8 ± 0.6	134.9 ± 2.6	133.7 ± 12.2	203.3 ± 9.3	204.1 ± 14.1
40	90.7 ± 13.3	148 ± 3.1	86.5 ± 0.7	152.1 ± 2.5	114.8 ± 3.3	140.0 ± 10.4	100.1 ±	160.3 ± 10.7

Syrah								
	2016/17				2017/18			
LT[1] (°C)	V_{cmax} (µmol m^{-2} s^{-1})		J_{max} (µmol m^{-2} s^{-1})		V_{cmax} (µmol m^{-2} s^{-1})		J_{max} (µmol m^{-2} s^{-1})	
	Control	Heated	Control	Heated	Control	Heated	Control	Heated
20	50.9 ± 7.3	55.6 ± 5.2	111.2 ± 18.2	130.4 ± 10.5	44.8 ± 1.1	46.6 ± 2.5	113.1 ± 4.2	106.1 ± 8.8
25	70.6 ± 4.3	80.2 ± 5.3	136.9 ± 5.1	143.5 ± 14.5	51.9 ± 3.2	64.6 ± 0.1	134.6 ±	139.9 ± 0.2
30	90.3 ± 6.7	97.5 ± 2.6	167.8 ± 15.9	165.3 ± 2.8	82.9 ± 3.4	81.3 ± 2.4	226.8 ± 3.8	197.9 ± 2.2
35	128.3 ± 10.8	144.7 ± 11.7	203.5 ± 9.3	198.3 ± 29.1	116 ± 4.3	111.9 ± 3.6	181.2 ± 0.1	181.2 ± 7.7
40	147.7 ± 9.7	162.1 ± 11.9	163.9 ± 12.3	198.9 ± 9.5	107.6 ± 7.8	116.7 ± 6.2	152.9 ± 8.4	169.9 ± 10.9

Fig. S1. Heating system consisting of an open-top chamber installed under 5 consecutive vines along the row to increase air temperature during 2016/17 and 2017/18 seasons. Heating systems were installed in five replicates of each variety (Grenache and Syrah). Mendoza.

System description.

The heating system is passive, that is, it helps increasing air temperature without an active heating system. It has been previously described in detail by Sadras and Soar (2009). The sun heats the air enclosed inside the chamber and under the vine, when it rises and it heats up the whole canopy. Even if the system depends on daily weather conditions, as the weather in our region is sunny (2871 hours of effective heliophany per year), the open-top chamber is a good system to heat plants in realistic vineyard conditions. It has been employed in several works in different countries (Sadras and Soar 2009, Sadras *et al.* 2012, 2013, de Rosas *et al.* 2017) Additionally benefits of this system are*:

- it does not modify the light interception by the canopy;
- it does not modify the relative humidity or the wind around the canopy;
- it reproduces daily cycles of temperature;
- it allows to heat an adequate number of experimental vines for statistical resolution.

*(Sadras, Moran and Petrie 2012, A window into hotter and drier future: phenological shifts and adaptive practices, Chapter 1).

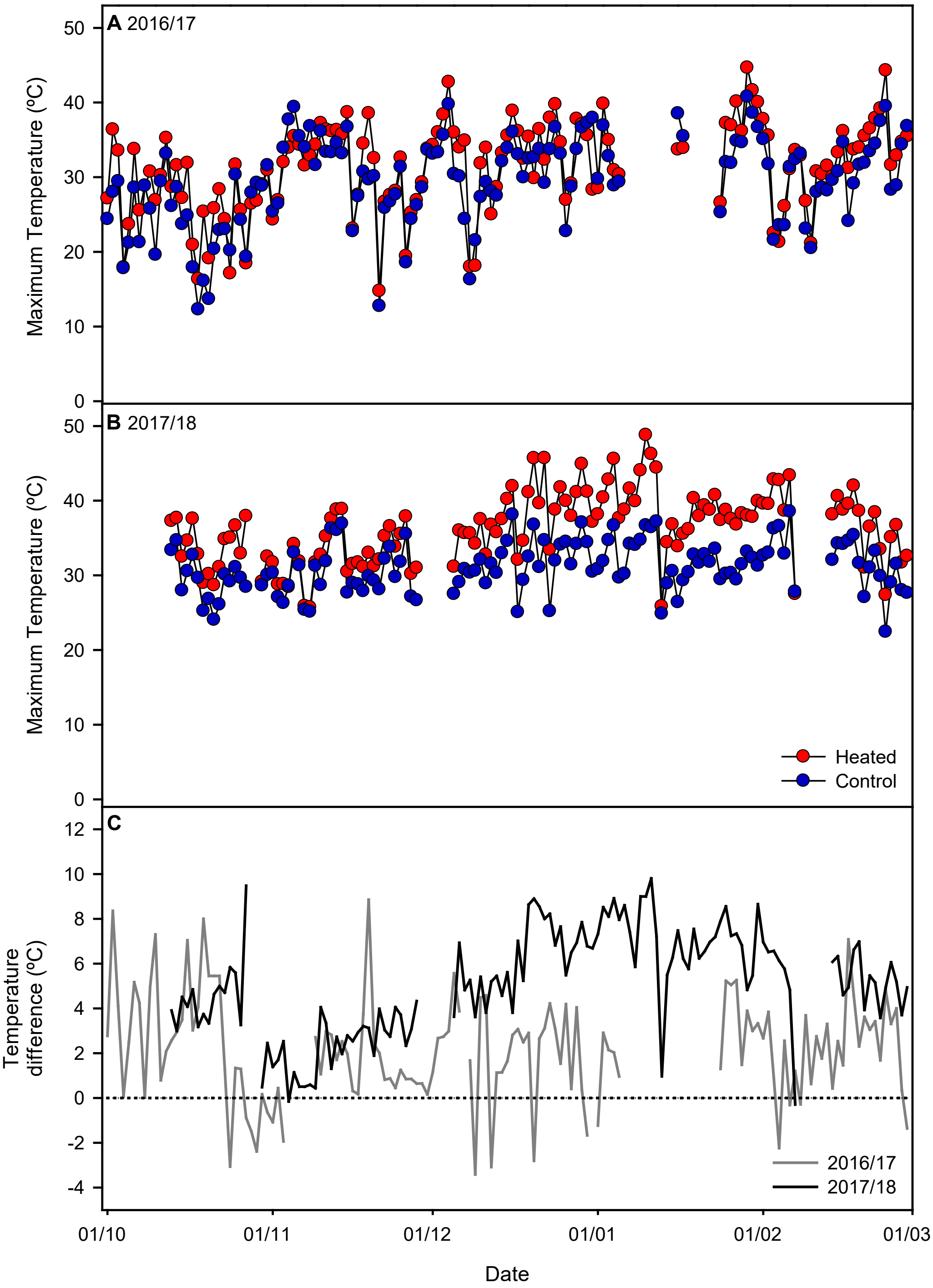

Fig. S2. Seasonal evolution of maximum daily air temperature for the heating (red) and control (blue) treatments during (A) 2016/17, (B) 2017/18 season, and, (C) difference between heated and control treatment for 2016/07 season (gray line) and 2017/18 (black line). Values represent the mean of 4 replicates, two placed at Grenache and two at Syrah sub plots. Temperature was measured daily every 30 minutes at cluster zone with thermocouples. Mendoza.

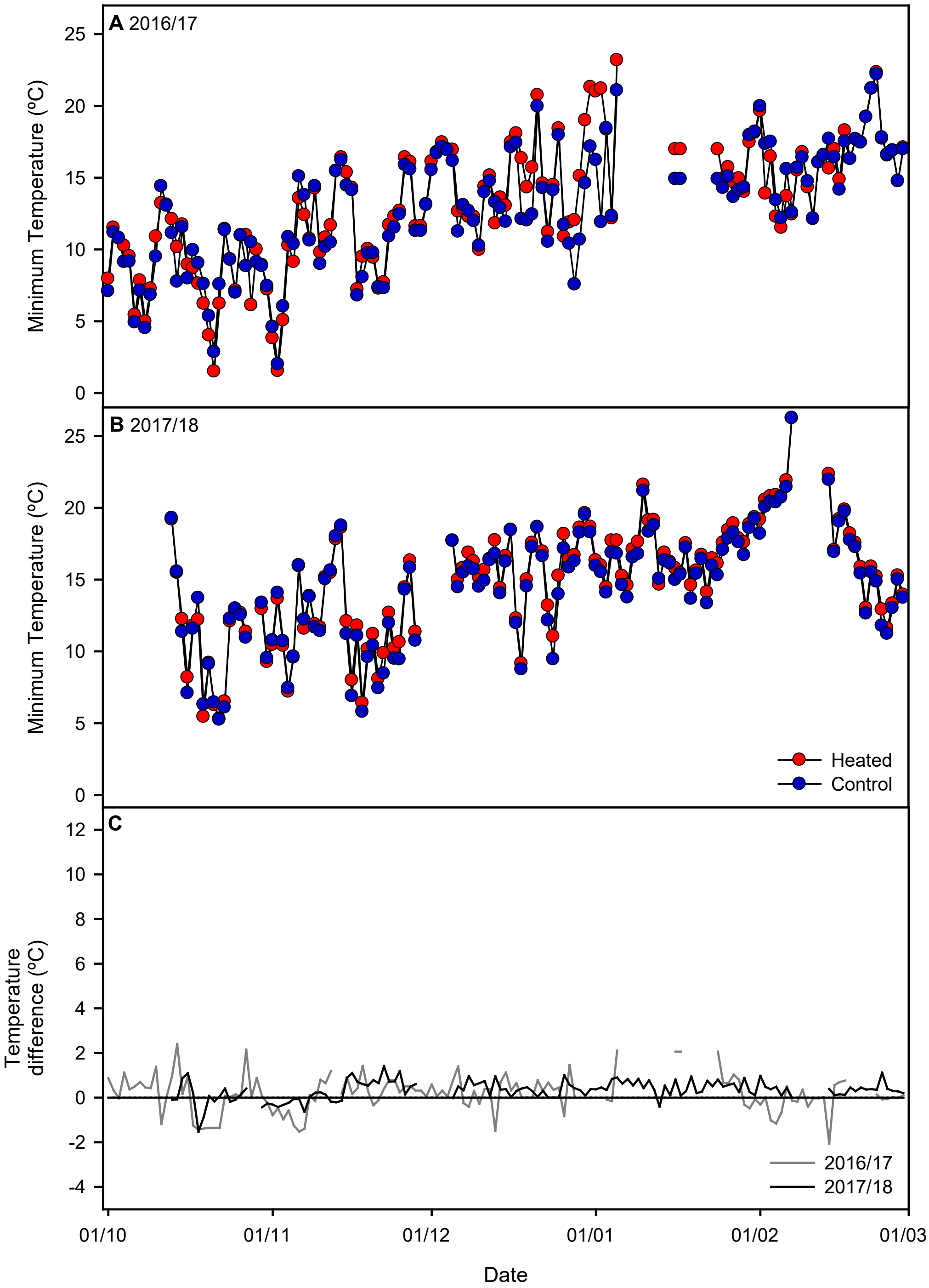

Fig. S3. Seasonal evolution of minimum daily air temperature for the heating (red) and control (blue) treatments during (A) 2016/17, (B) 2017/18 season, and, (C) difference between heated and control treatment for 2016/07 season (gray line) and 2017/18 (black line). Values represent the mean of 4 replicates, two placed at Grenache and two at Syrah sub plots. Temperature was measured daily every 30 minutes at cluster zone with thermocouples, Mendoza.

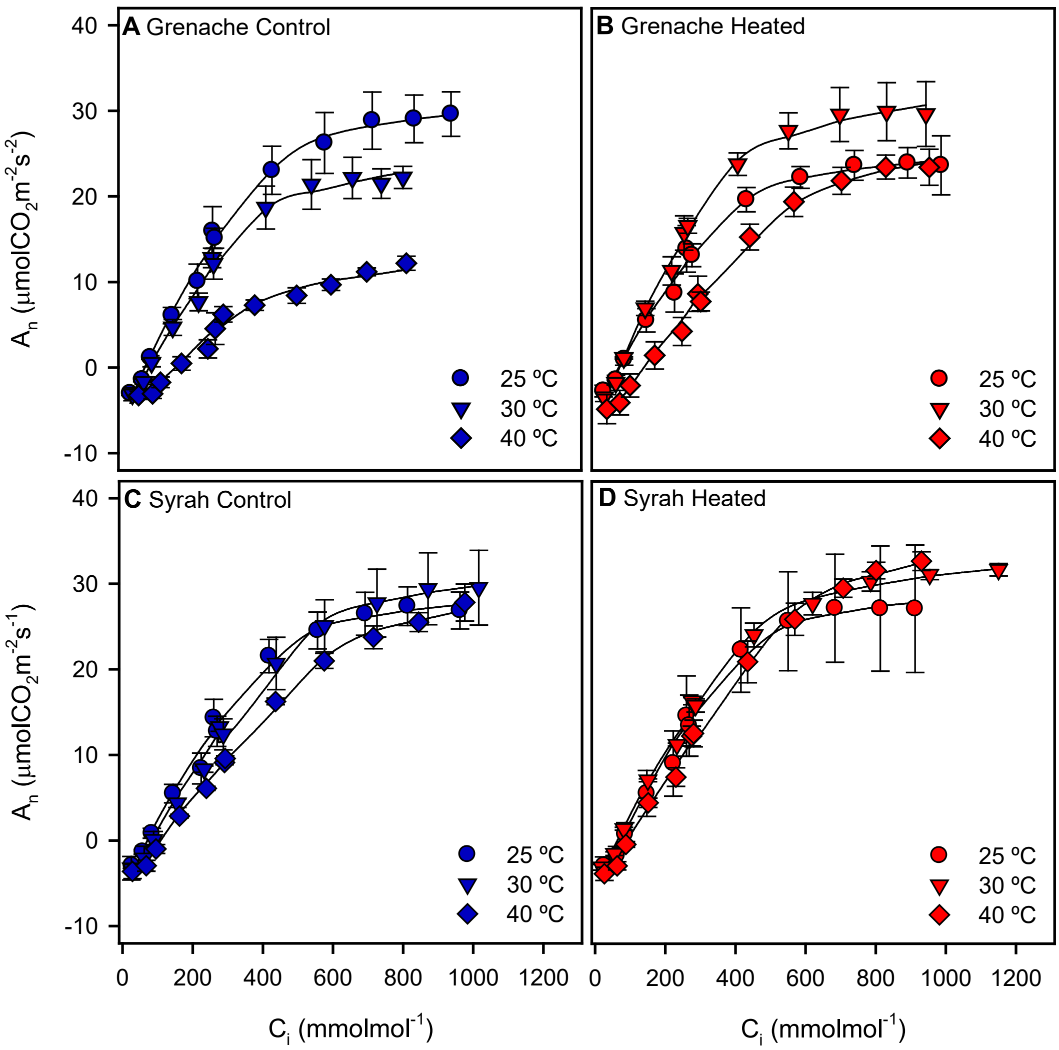

Fig. S4. A_n/C_i curves at 25, 30 and 40°C (20 and 35°C are not present for clarity) in (A) Grenache control, (B) Grenache heated, (C) Syrah control and (D) Syrah heated field-grown plants, during 2016/17. Mendoza.

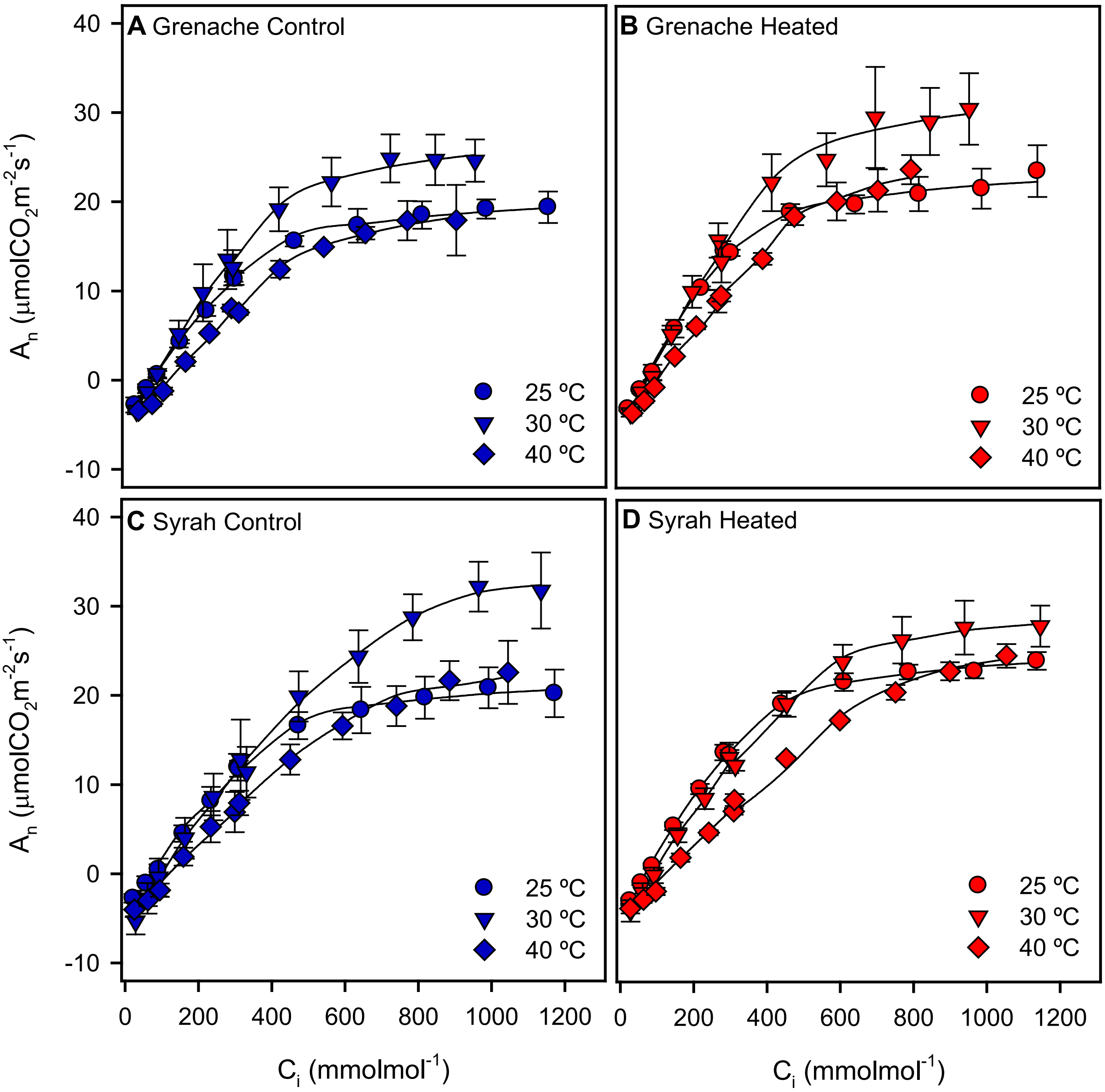

Fig. S5. A_n/C_i curves at 25, 30 and 40°C (20 and 35°C are not present for clarity) in (A) Grenache control, (B) Grenache heated, (C) Syrah control and (D) Syrah heated field-grown plants, during 2017/18. Mendoza.

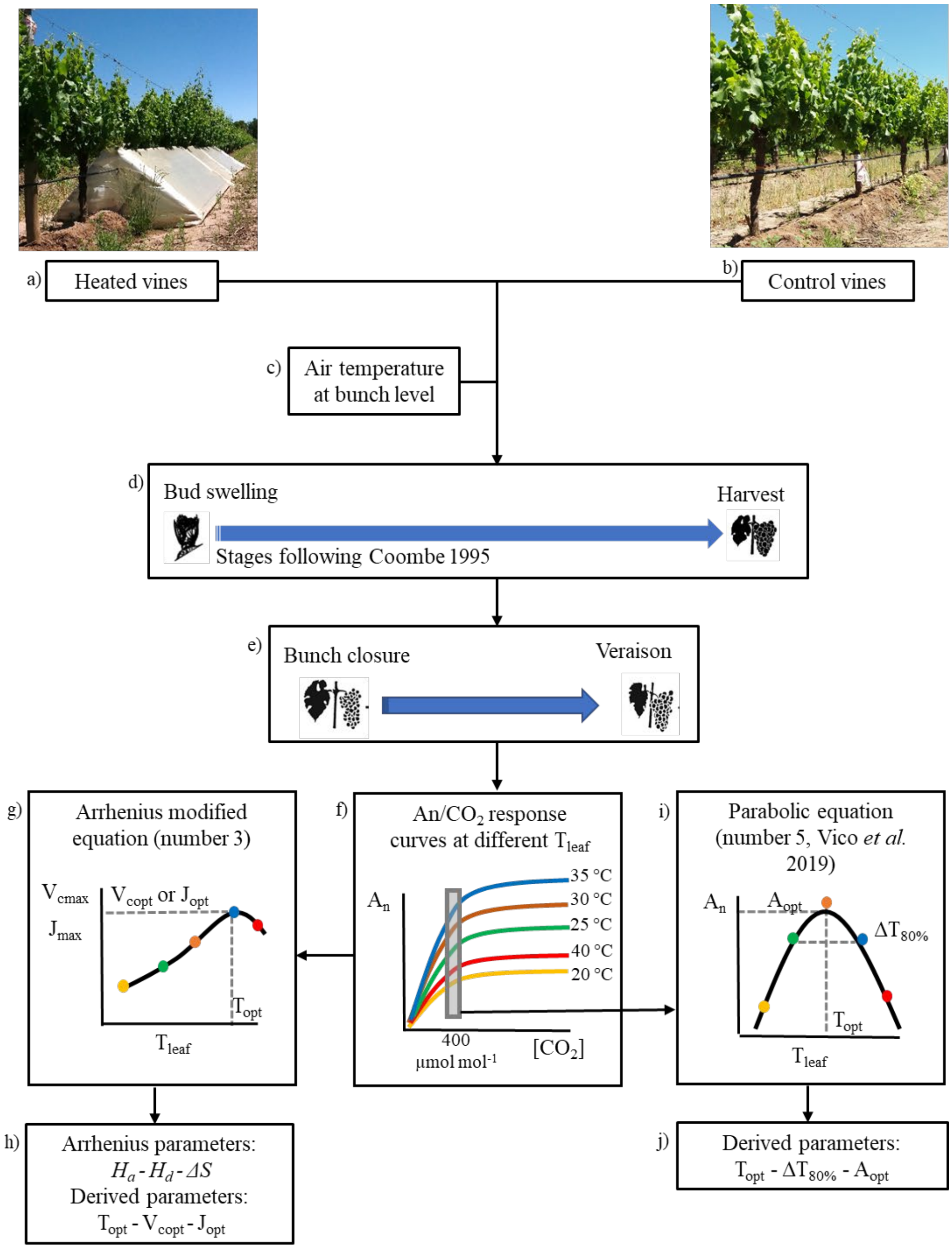

Fig. S6. General scheme of the experiment indicating temperature treatments in the field (a and b), their microclimate characterization by measuring air temperature(c), duration of heating (d) and period for gas exchange measurements (e). From A_n/CO_2 response curves at different leaf temperatures (f) we obtained Rubisco carboxylation rate (V_{cmax}) and electron transport rate (J_{max}) and their responses to leaf temperature (g) that were characterized by Arrhenius equation and derived parameters were calculated (h). From A_n/CO_2 response curves, we extracted net assimilation (A_n) values at 400 µmol mol^{-1} CO_2 to build A_n response to leaf temperature (i), characterized by parabolic equation and derived parameters (j). Color and response curves in figures f, g, and i are only for illustrative purposes but they don't reflect the real values obtained in our experiment.