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SUPPLEMENTARY DATA

Table S1. Standard vineyard information - Information about the vineyards under study.

Location	Tag	Trellis system	Prune length	Establishment year	Rootstock
San Vicente*	SV	Overhead trellis system	4 buds	2019	Freedom
Los Andes	LA	Open gable	2 buds	2018	1103 Paulsen
Rancagua	RA	Open gable	2 buds	2019	Harmony
Lampa	Lam	Overhead trellis system	2 buds	2019	Ramsey

**The tag column gives the abbreviation for vineyards in this article.*

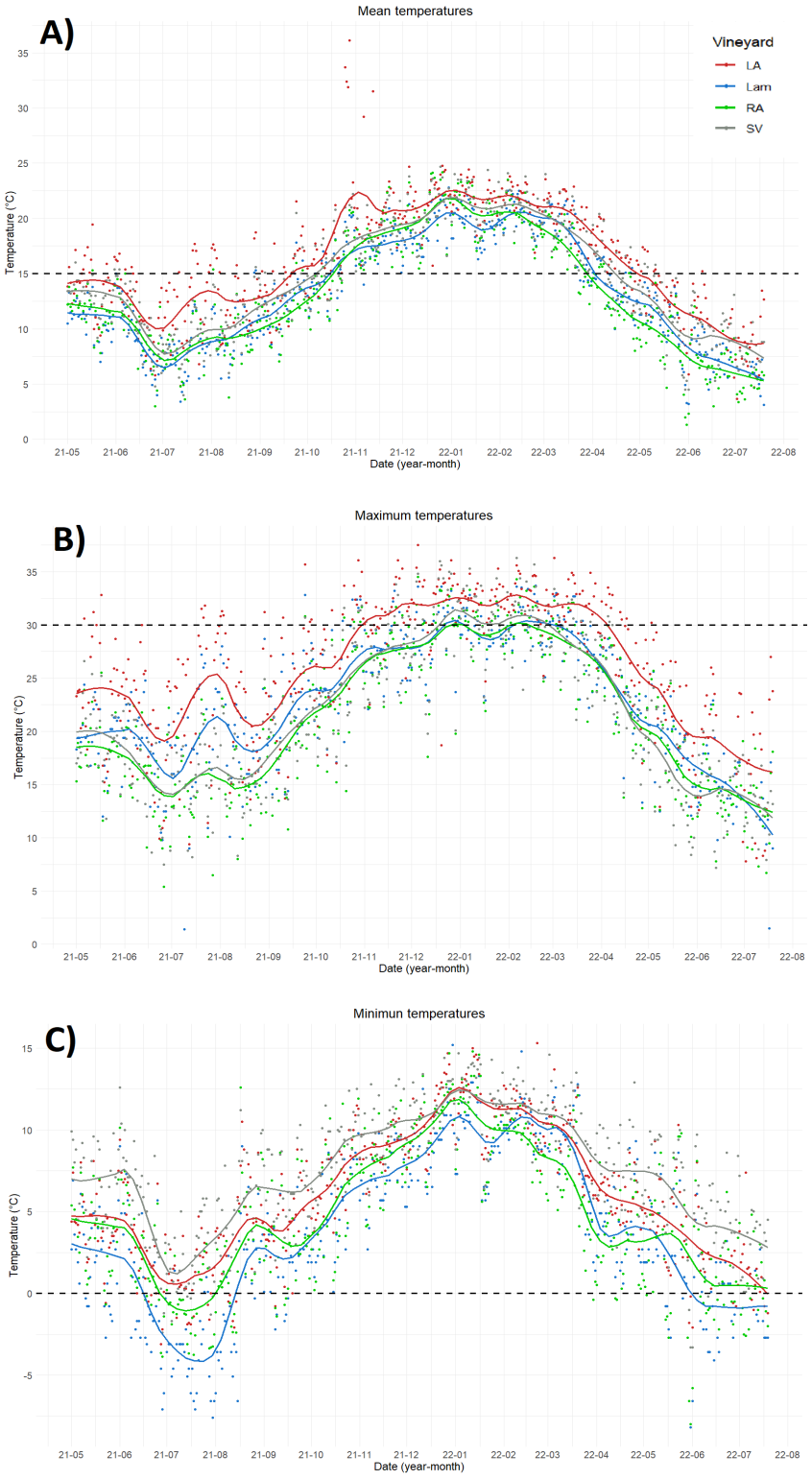
**San Vicente (SV) is the absolute control.*

Figure S1. Additional images of RSG symptoms.



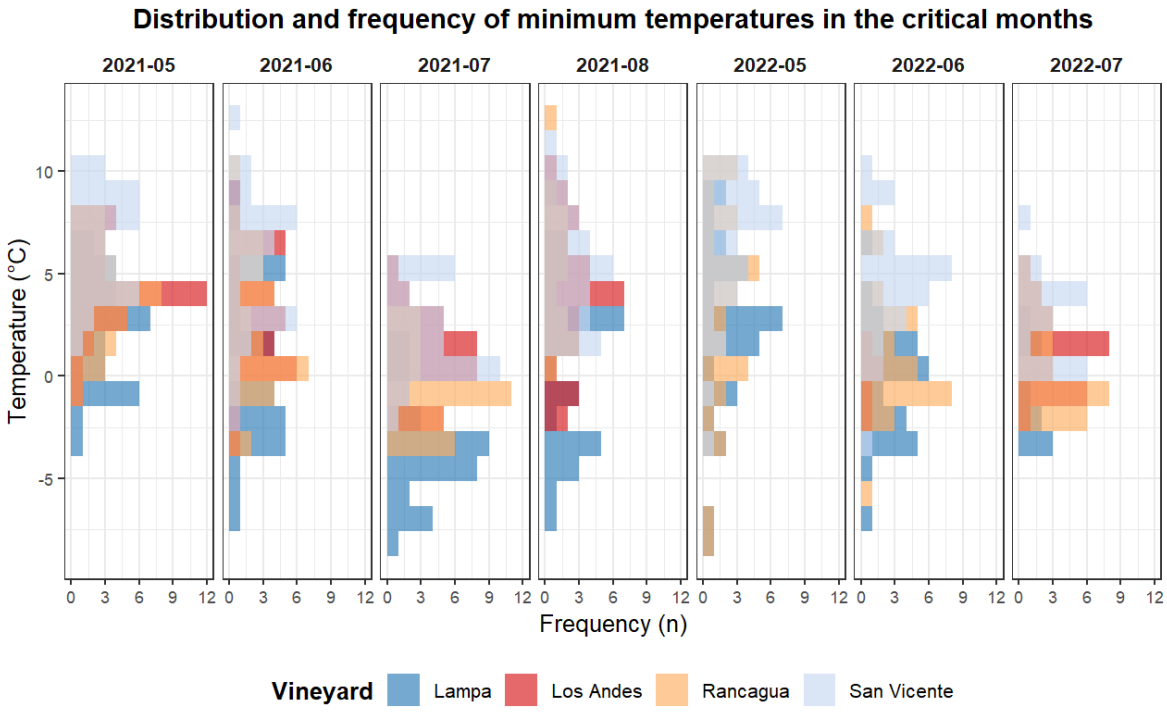
The representative images illustrate the syndrome from various viewpoints, including whole-plant morphology and close-ups of the shoots. The most striking characteristic is the reduced vigour, driven by shortened internodes and irregular budburst. Plants frequently display multiple phenological stages simultaneously, and fruit is typically limited.

Figure S2. Climatic data on all vineyards.



Climatic conditions on all vineyards from May 2021 to July 2022. A) Mean temperatures, B) Maximum temperatures, C) Minimum temperatures. LA: red, Lam: blue, RA: green, SV: grey. The dotted line at 15 °C (A), at 30 °C (B) and at 0 °C (C).

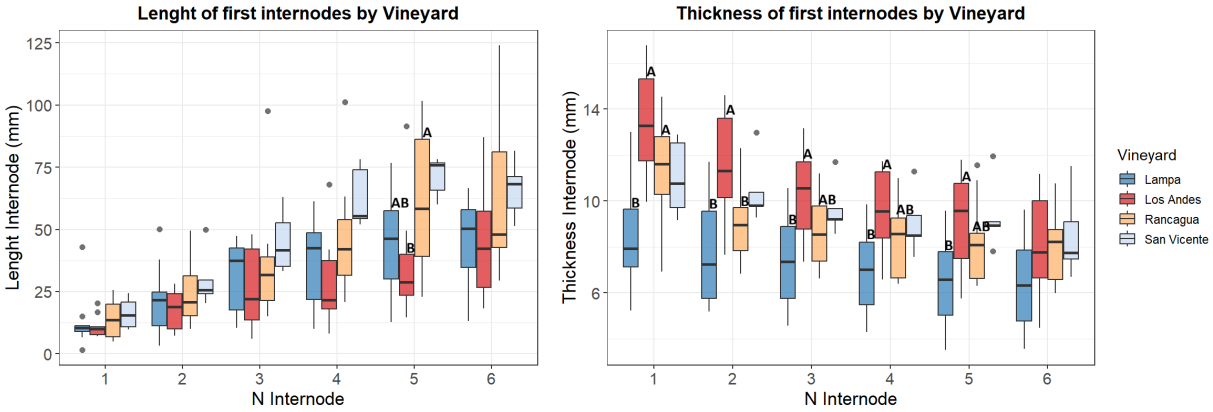
Figure S3. Histograms showing the frequency distribution of minimum temperatures for each vineyard.



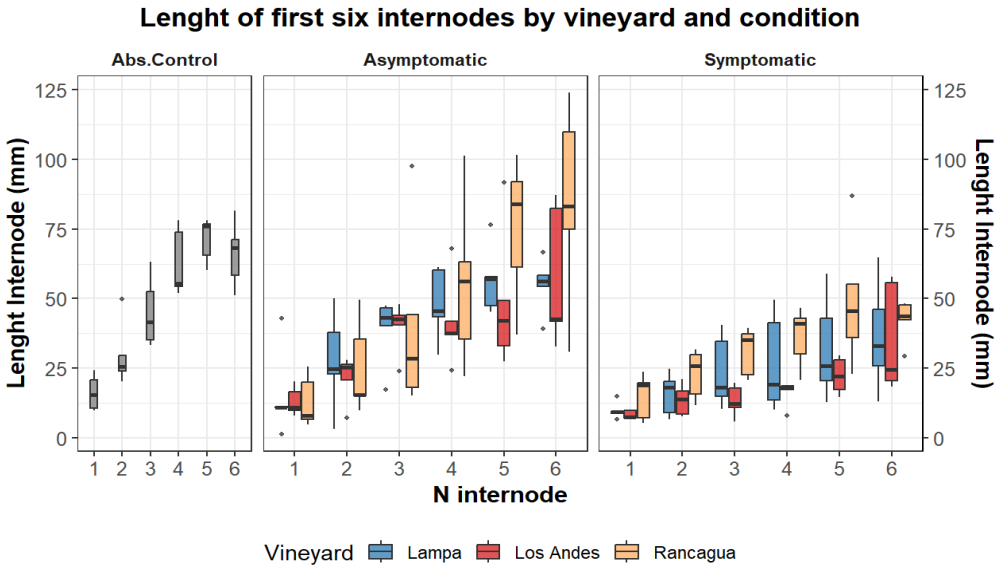
The graph shows that Lampa experiences the lowest temperatures, followed by Rancagua and Los Andes. This pattern is consistent with the data presented in Table 1, which summarises the frequency of frost events at each site.

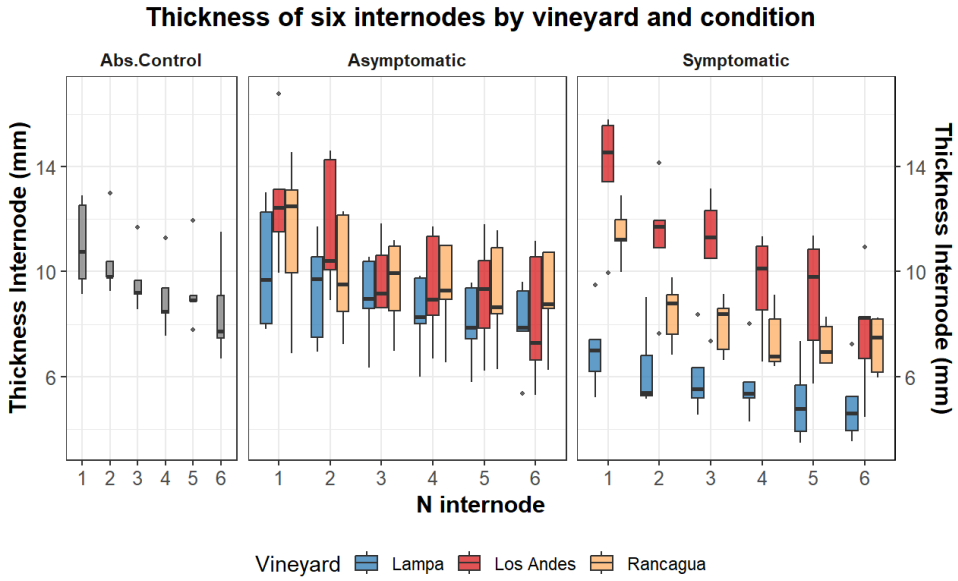
SUPPLEMENTARY DATA
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Figure S4. Length and thickness of internodes by field and condition.



Length and thickness of internodes by field, different letters indicate statistically significant differences, according to Student's t-test for mean comparison (α: 0.05).





SUPPLEMENTARY DATA
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Means and standard errors of internode length and thickness for each field, condition, and their interaction, with the corresponding p-values reported.

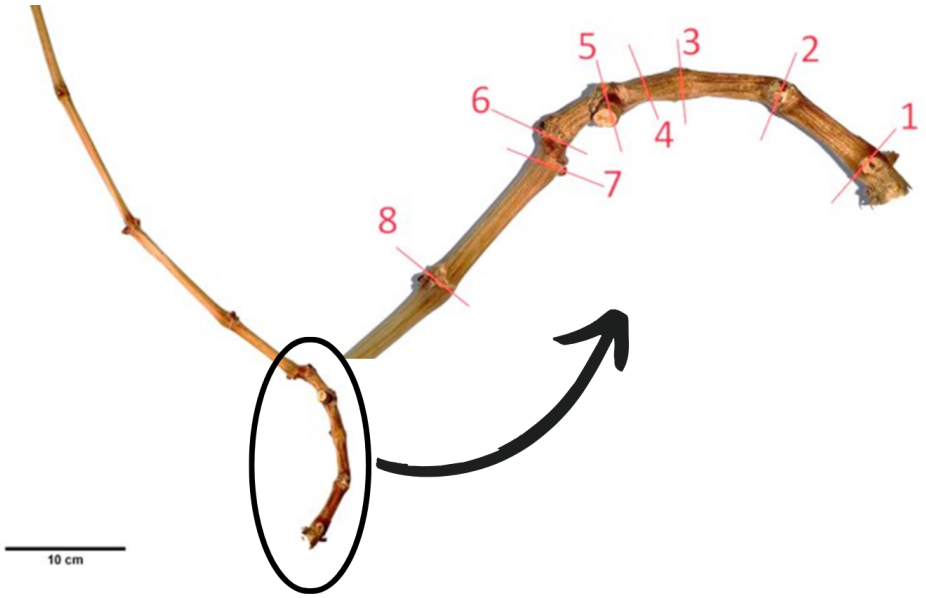
			N Internode					
Parameter	**Factor**		**1**	**2**	**3**	**4**	**5**	**6**
Length of internodes	Vineyard	Lampa (L)	12.7±3.52	21.8±4.49	31.3±4.57	37.4±5.84	44.5±6.24 ab	45.8±5.57
		Los Andes (LA)	10.7±1.38	17.5±2.51	26.6±4.95	28.9±5.52	35.5±7.05 b	46.3±7.68
		Rancagua (RA)	14.0±2.60	24.1±4.00	35.9±7.51	45.9±7.48	62.2±8.62 a	63.4±10.4
		San Vicente (SV)	16.2±2.80	29.9±5.22	45.1±5.60	62.7±5.47	71.3±3.57	66.1±5.22
		p-value	0.695	0.462	0.469	0.109	0.021	0.144
	Condition	Asymptomatic (As)	13.9±2.63	24.8±3.61	39.8±5.12 a	48.5±5.28 a	60.2±6.05 a	65.6±7.17 a
		Symptomatic (Sy)	11.1±1.44	17.4±2.08	22.7±3.00 b	26.4±3.65 b	34.6±5.22 b	38.1±4.06 b
		Abs. Control	16.2±2.80	29.9±5.22	45.1±5.60	62.7±5.47	71.3±3.57	66.1±5.22
		p-value	0.372	0.099	0.009	0.001	0.001	0.002
	Interaction	L x As	15.5±7.08	27.7±7.85	38.9±5.54	48.1±5.86	56.8±5.53	55.0±4.44
		L x Sy	9.93±1.37	15.8±3.39	23.7±5.86	26.8±7.89	32.2±8.31	36.5±8.81
		LA x As	13.1±2.30	21.5±3.77	39.8±4.12	41.7±7.17	48.7±11.3	57.3±11.3
		LA x Sy	8.38±0.71	13.5±2.49	13.4±2.50	16.1±2.03	22.3±2.90	35.4±8.79
		Ra x As	13.1±4.07	25.1±7.48	40.7±15.0	55.6±13.5	75.1±11.6	84.5±16.0
		Ra x Sy	14.9±3.67	23.0±3.94	31.0±3.87	36.3±4.75	49.2±10.7	42.3±3.39
		Abs. Control	16.2±2.80	29.9±5.22	45.1±5.60	62.7±5.47	71.3±3.57	66.1±5.22
		p-value	0.567	0.645	0.525	0.917	0.994	0.434
Thickness of internodes	Vineyard	Lampa (L)	8.61±0.79 b	7.81±0.73 b	7.48±0.68 b	7.05±0.62 b	6.53±0.67 b	6.44±0.69
		Los Andes (LA)	13.3±0.75 a	11.4±0.74 a	10.3±0.58 a	9.46±0.60 a	9.08±0.68 a	7.96±0.73
		Rancagua (RA)	11.4±0.67 a	9.18±0.58 b	8.74±0.50 b	8.38±0.56 ab	8.19±0.57 ab	8.12±0.54
		San Vicente (SV)	11.0±0.74	10.4±0.65	9.65±0.53	9.03±0.63	9.32±0.69	8.50±0.84

		p-value	0.004	0.002	0.002	0.015	0.015	0.116
	Condition	Asymptomatic (As)	11.4±0.69	10.2±0.61 a	9.42±0.40	9.04±0.46 a	8.76±0.49 a	8.40±0.50 a
		Symptomatic (Sy)	10.7±0.86	8.68±0.68 b	8.29±0.67	7.55±0.55 b	7.10±0.59 b	6.62±0.52 b
		Abs. Control	11.0±0.74	10.4±0.65	9.65±0.53	9.03±0.63	9.32±0.69	8.50±0.84
		p-value	0.440	0.042	0.072	0.024	0.020	0.017
	Interaction	L x As	10.1±1.06	9.29±0.90	8.97±0.75 ab	8.38±0.69	8.01±0.69	7.97±0.74
		L x Sy	7.07±0.71	6.33±0.73	6.00±0.65 c	5.73±0.62	5.05±0.68	4.92±0.65
		LA x As	12.7±1.13	11.6±1.16	9.77±0.63 a	9.40±0.94	9.12±0.96	8.19±1.14
		LA x Sy	13.8±1.05	11.2±1.04	10.9±1.00 ab	9.51±0.87	9.03±1.07	7.72±1.06
		Ra x As	11.3±1.34	9.93±0.99	9.52±0.79 ab	9.35±0.82	9.16±0.94	9.03±0.83
		Ra x Sy	11.4±0.47	8.43±0.53	7.96±0.48 b	7.41±0.52	7.22±0.36	7.21±0.48
		Abs. Control	11.0±0.74	10.4±0.65	9.65±0.53	9.03±0.63	9.32±0.69	8.50±0.84
		p-value	0.118	0.388	0.030	0.194	0.230	0.332

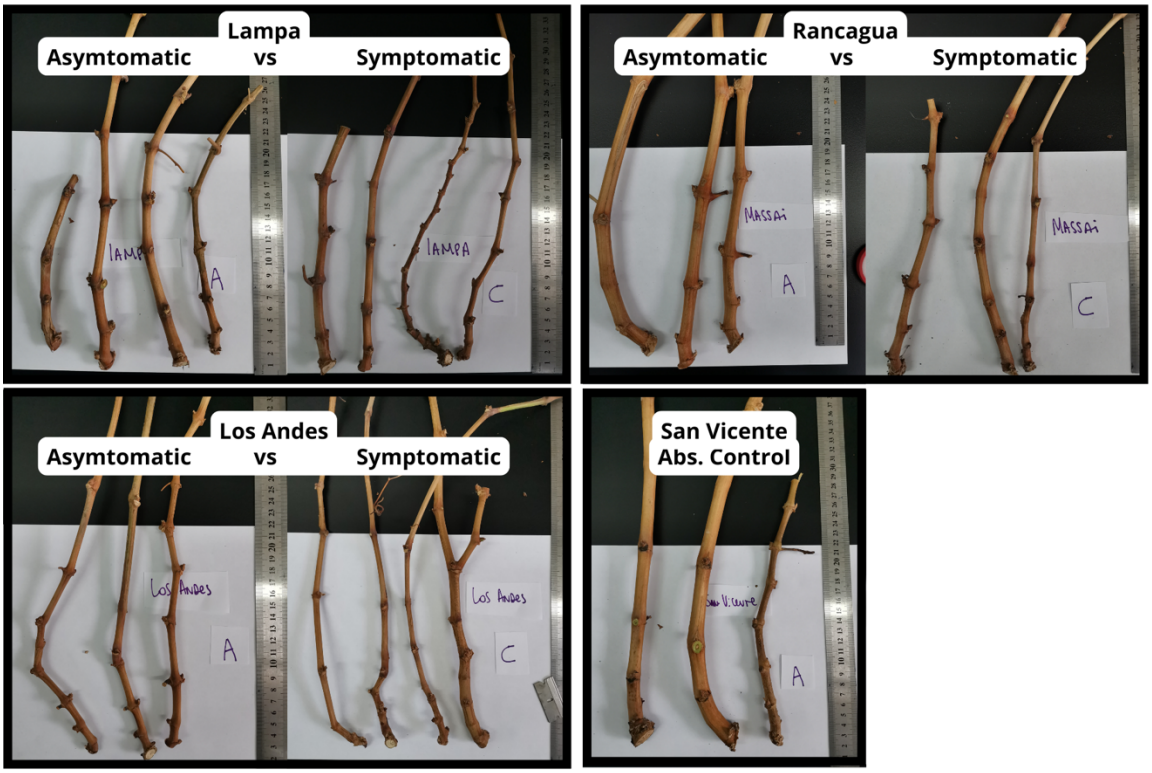
**Different letters indicate differences according to Student's t-test.*

** The experimental design of this study was structured with the syndrome condition treated as a fixed factor, whereas the different vineyards were treated as random factors. Consequently, the analysis presented to illustrate differences among vineyards–and the interaction between factors, treating both as fixed–was performed solely to depict site-level variability. This analysis is not intended to apply to, nor does it replace, the statistical approach used in the main manuscript, in which vineyards were incorporated as random factors within the experimental design.*

Figure S5. A representative shoot exhibiting the syndrome (RSG), along with representative shoots from each vineyard and condition.



The first nodes are shorter than the middle nodes, and in some cases, all the canes present shorter nodes.



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Figure S6. Additional images illustrating anatomical deformations.

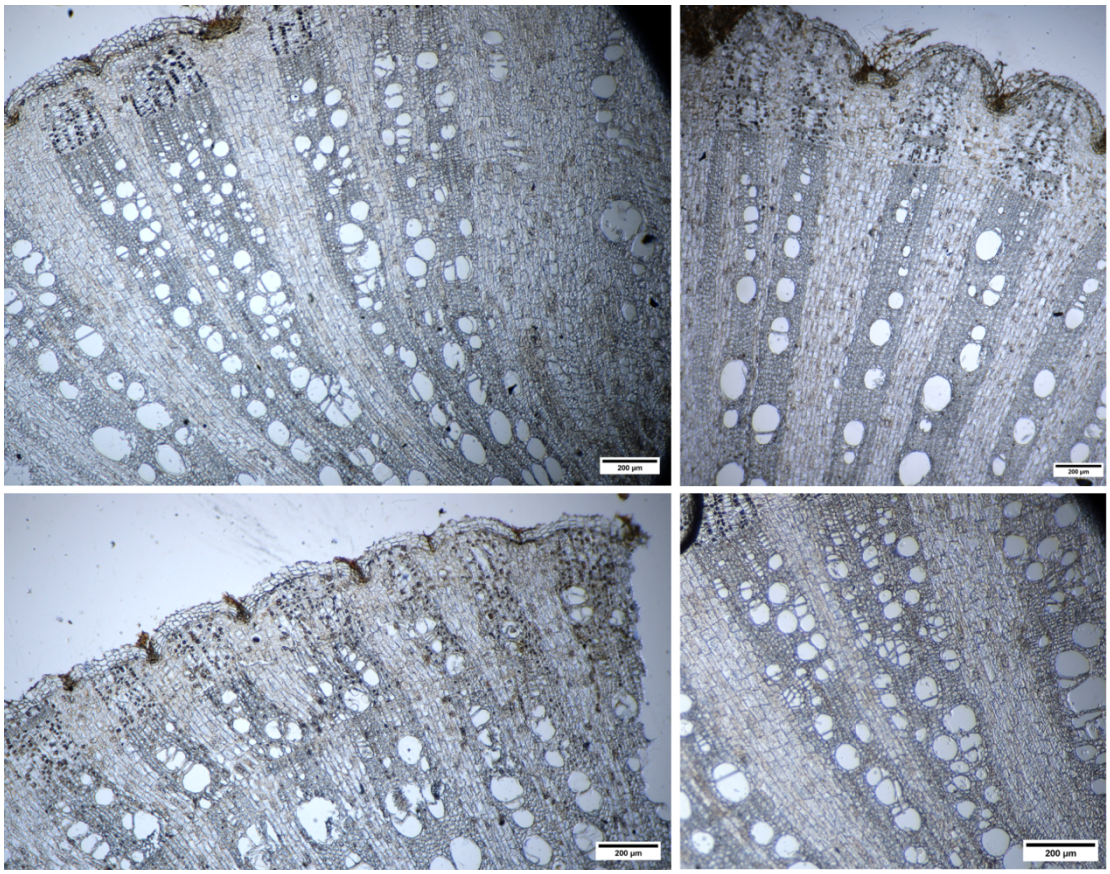


Table S2. Presence of grapevine viruses in four vineyards.

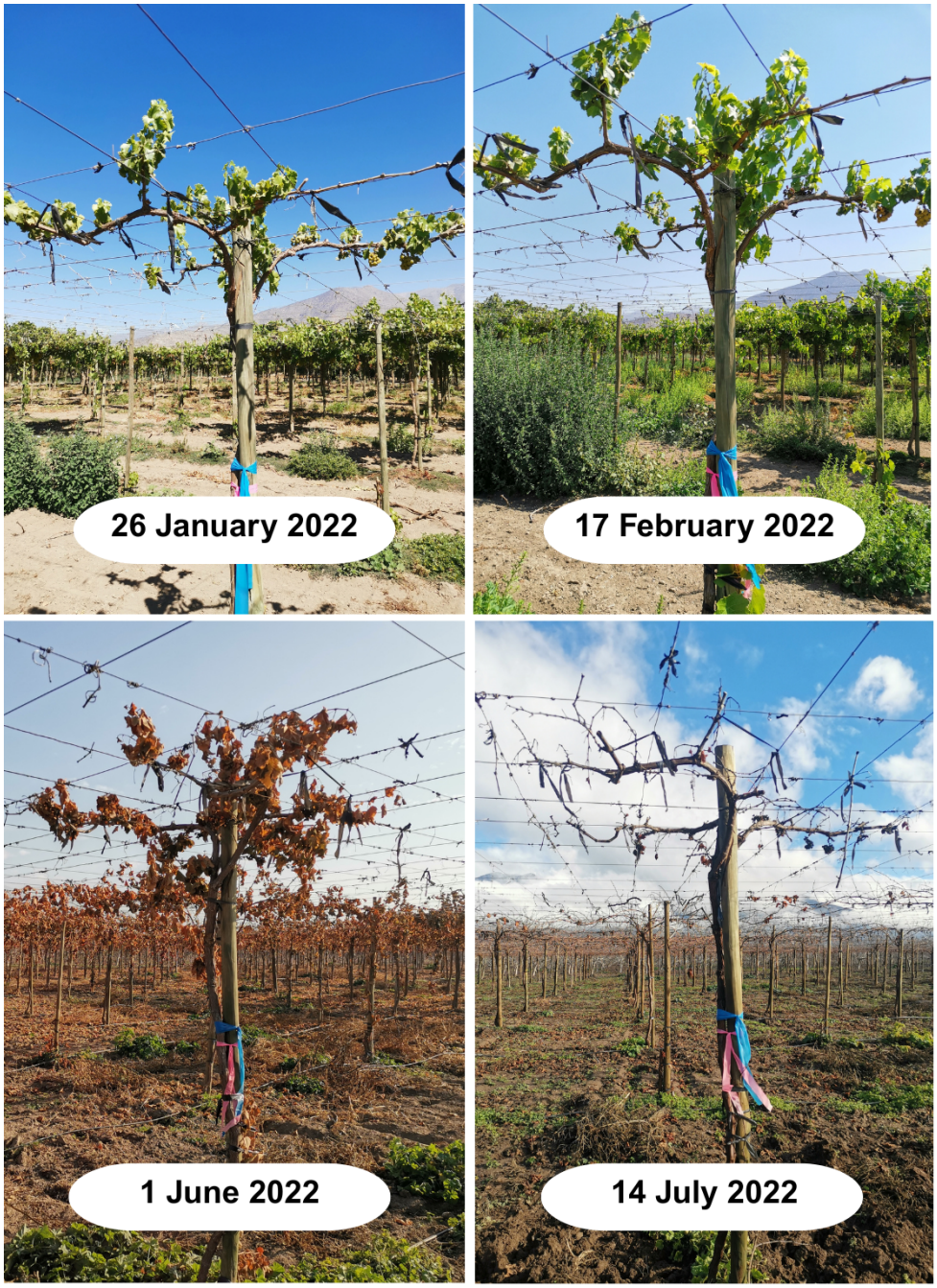
Virus detection is indicated for Grapevine leafroll-associated virus-3 (GLRaV-3), Grapevine fleck virus (GFkV), Grapevine virus A (GVA), Grapevine rupestris stem pitting-associated virus (GRSPaV), and Grapevine fanleaf virus (GFLV).

Vineyards	Condition	GLRaV-3	GFkV	GVA	GRSPV	GFLV
San Vicente*	Absolute control	Neg	Neg	Neg	Pos	Pos
Los Andes	Asymptomatic	Neg	Neg	Pos	Pos	Neg
	Symptomatic	Neg	Neg	Pos	Neg	Neg
Rancagua	Asymptomatic	Neg	Neg	Pos	Neg	Pos
	Symptomatic	Neg	Neg	Pos	Neg	Pos
Lampa	Asymptomatic	Neg	Neg	Neg	Pos	Pos
	Symptomatic	Neg	Neg	Neg	Pos	Pos

**San Vicente: absolute control.*

**Neg: negative. Pos: positive.*

Figure S7. Images of an extreme case of RSG, tracking the same plant from summer through to winter.



Extreme expression of restricted spring growth (RSG). The timeline shows that the plant failed to develop during its expected growth period. The first frost event in May caused visible damage. No samples were collected and no measurements were performed on this plant.