Linking crop-load, storage potential and sensory quality of Crimson Seedless

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Background

Why? Storage are key to preserving postharvest grape quality

What is the effect of bud- and crop-load allocation on storage ability and sensory quality?

Decay → deterioration

Crop-load → ripeness → storage ability

Extended storage ↓ berry firmness ↑ decay

Objective

Identify yield balances to enable sustainable production and optimal grape quality at harvest and after storage

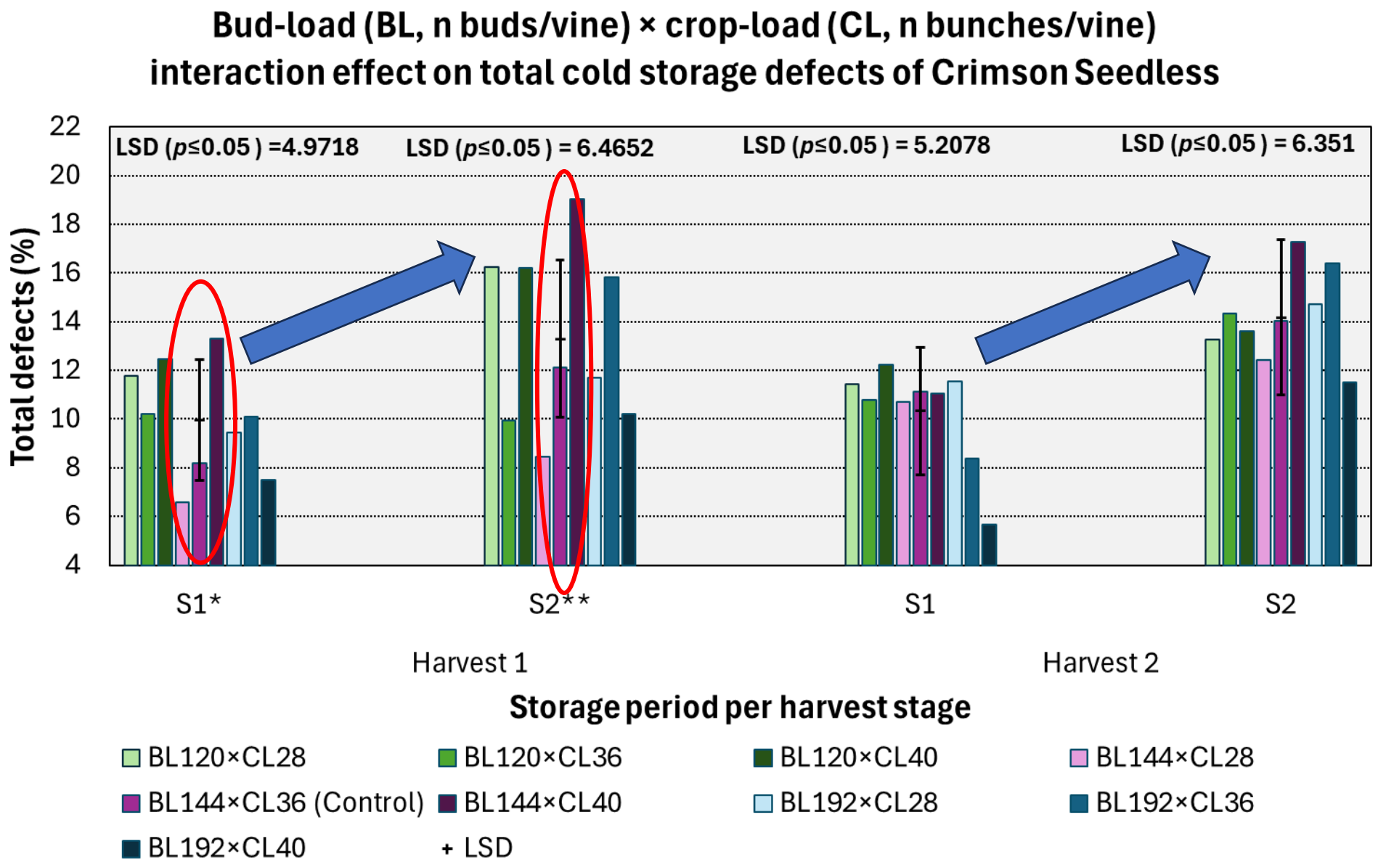
Approach

Vineyard: Crimson Seedless/Ramsey
Design: RCBD
Factorial: 3 × 3 × 2
- **BL:** 120, 144 (control), 192 buds/vine
- **CL:** 28, 36 (control), 40 bunches/vine
- **Allocation timing:** 9-10 mm (control -early) or 13-14 mm (late)

Harvests (H, Ripeness levels): H1 (19 °Brix) and H2 (18 °Brix)
Sampling: 3 × 4.5 kg cartons per treatment replicate
Storage (S):
- S1: 4 weeks at -0.1 °C + 1 week at 7.5 °C
- S2: 8 weeks at -0.1 °C + 1 week at 7.5 °C

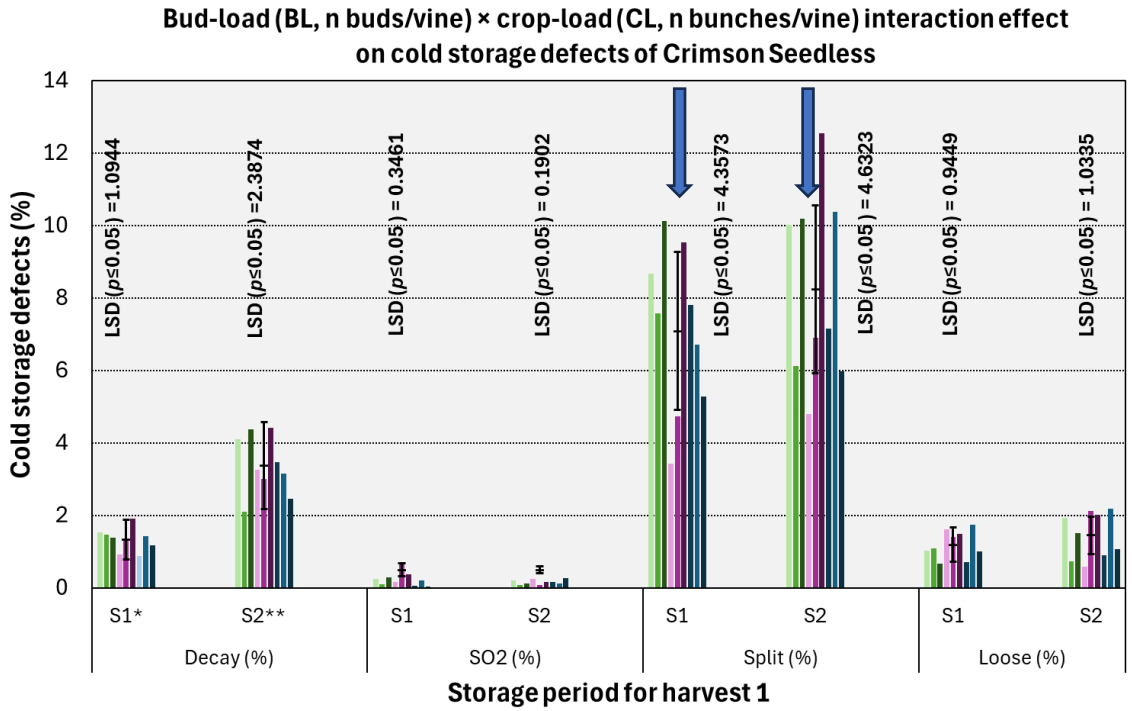
Assessments
Berry size, mass
Total soluble solids
Chroma, hue angle, lightness
Whole berry and skin firmness
Sensory evaluation: Line scale - visual, taste, flavour and texture attributes
Cold storage defects
Statistical analyses

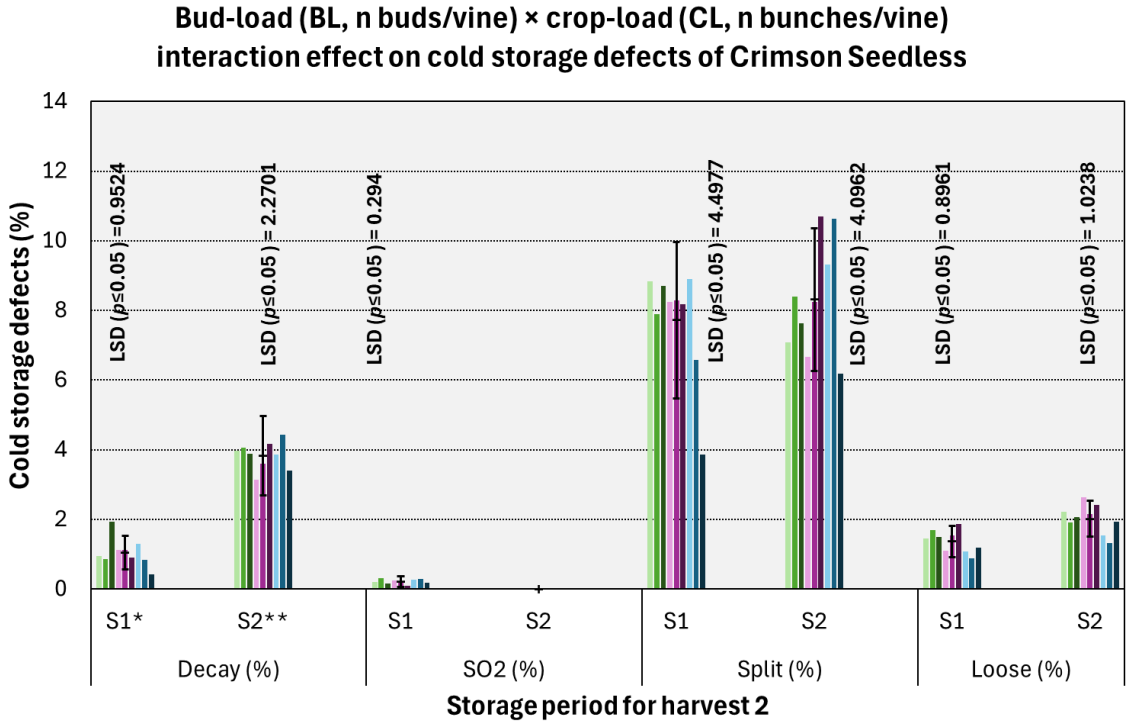
Key findings



*4 weeks storage at -0.5°C plus 1 week at 7.5°C; **8 weeks storage at -0.5°C plus 1 week at 7.5°C

Key findings



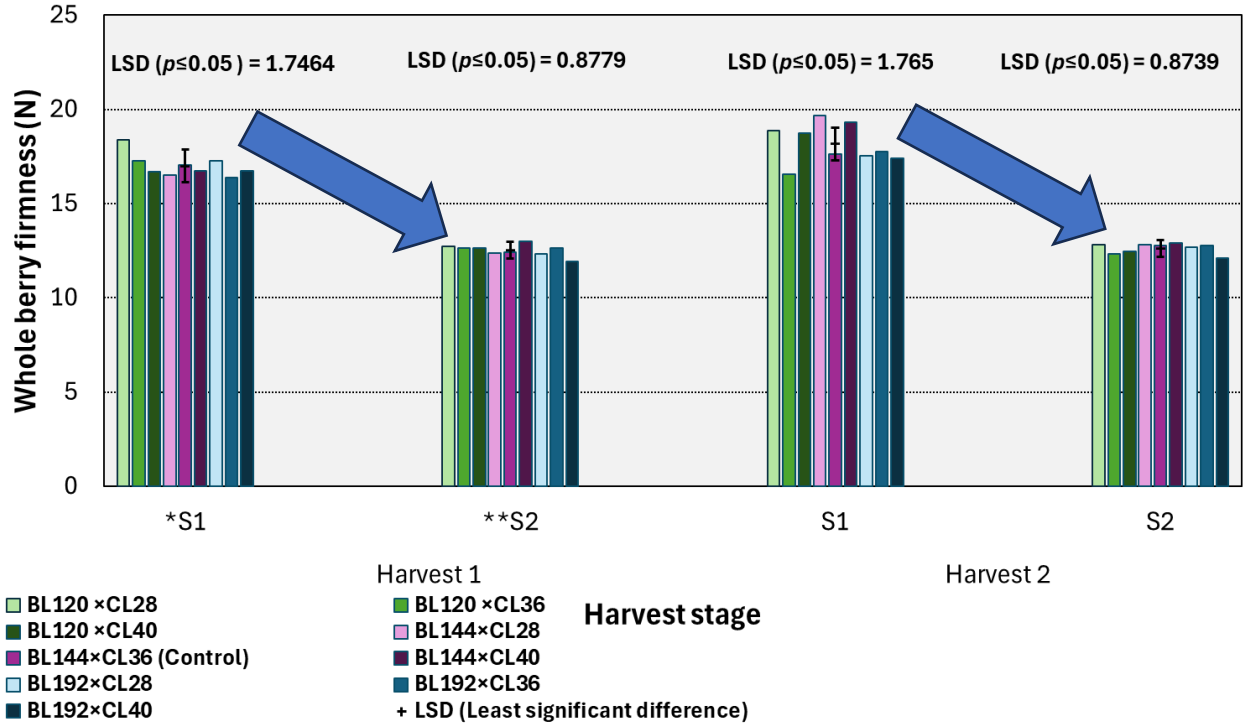


- BL120×CL28
- BL120×CL36
- BL120×CL40
- BL144×CL28
- BL144×CL36 (Control)
- BL144×CL40
- BL192×CL28
- BL192×CL36
- BL192×CL40
- \+ LSD (Least significant difference)

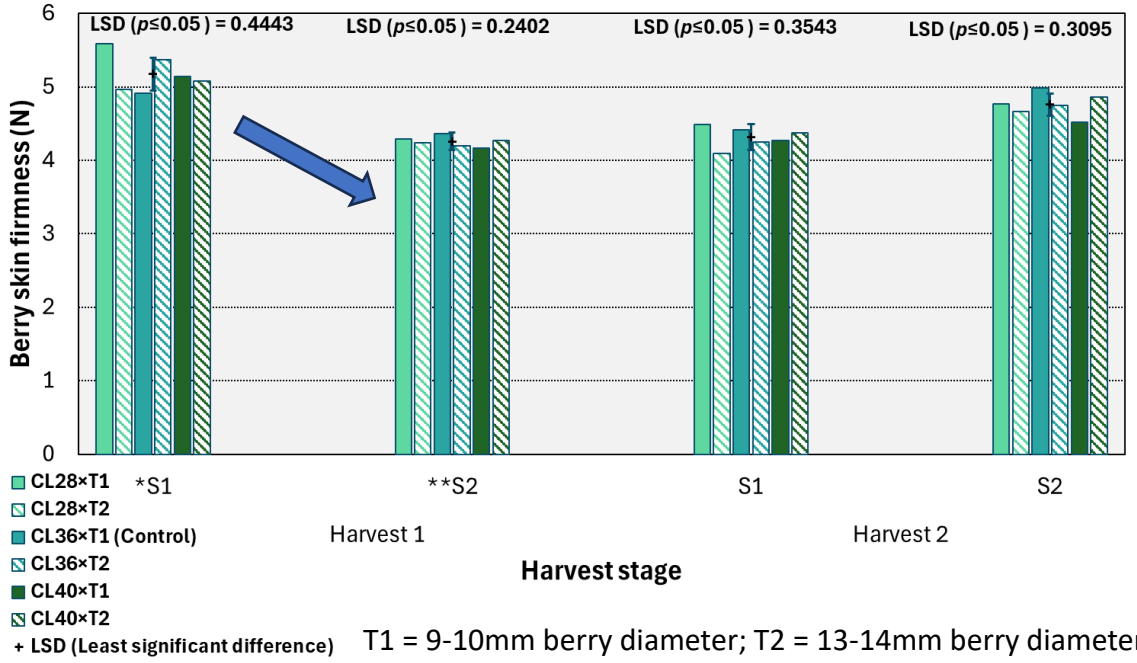
***S1 = 4 weeks storage at -0.5°C plus 1 week at 7.5°C; **S2 = 8 weeks storage at -0.5°C plus 1 week at 7.5°C**

Key findings

Bud-load (BL, n buds/vine) × crop-load (CL, n bunches/vine) interaction effect on whole berry firmness



Crop-load (CL, n bunches/vine) × time of crop-load allocation (T) interaction effect on berry skin firmness



T1 = 9-10mm berry diameter; T2 = 13-14mm berry diameter

Timing effect of crop-load allocation on whole berry firmness (N)

Crop-load allocation stage	Whole berry firmness (N)			
	Harvest 1		Harvest 2	
	S1*	S2**	S1	S2
9-10mm berry diameter	16.99 a	12.53 a	18.38 a	12.51 a
13-14mm berry diameter	17.03 a	12.52 a	17.91 a	12.76 a
LSD (P≤0.05)	***1.01***	***0.49***	***1.03***	***0.46***

LSD = Least significant difference

Bud-load effect on berry skin firmness (N)

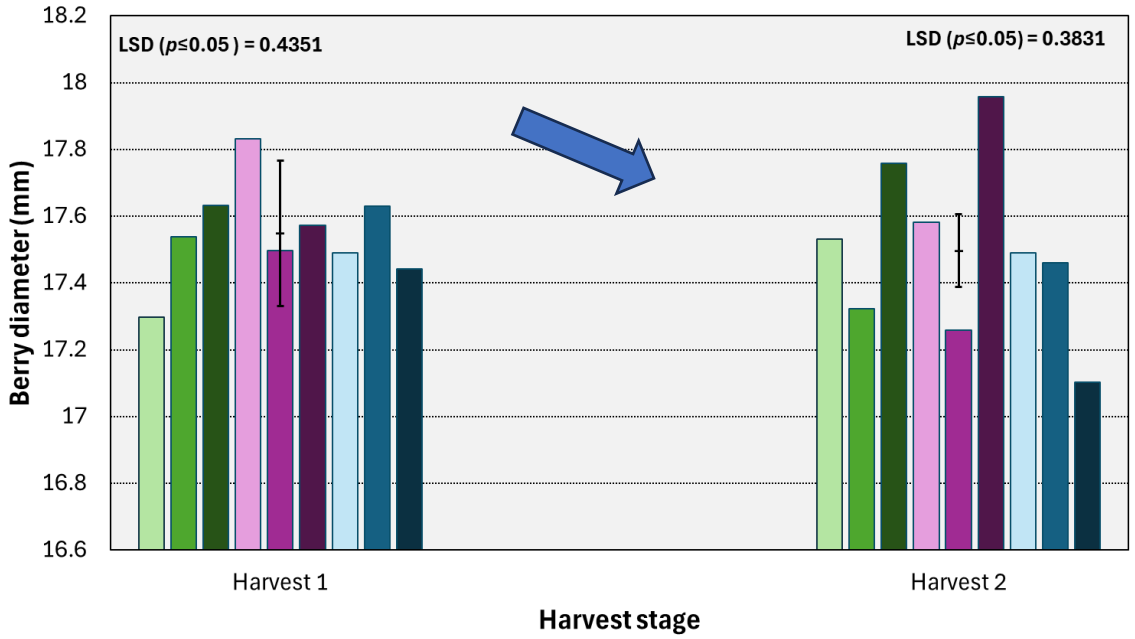
Bud-load per vine	Berry skin firmness (N)			
	Harvest 1		Harvest 2	
	S1*	S2**	S1	S2
120	5.26 a	4.31 a	4.34 a	4.67 a
144	5.02 a	4.20 a	4.34 a	4.81 a
192	5.22 a	4.25 a	4.25 a	4.80 a
LSD (p≤0.05)	***0.33***	***0.21***	***0.24***	***0.37***

LSD = Least significant difference

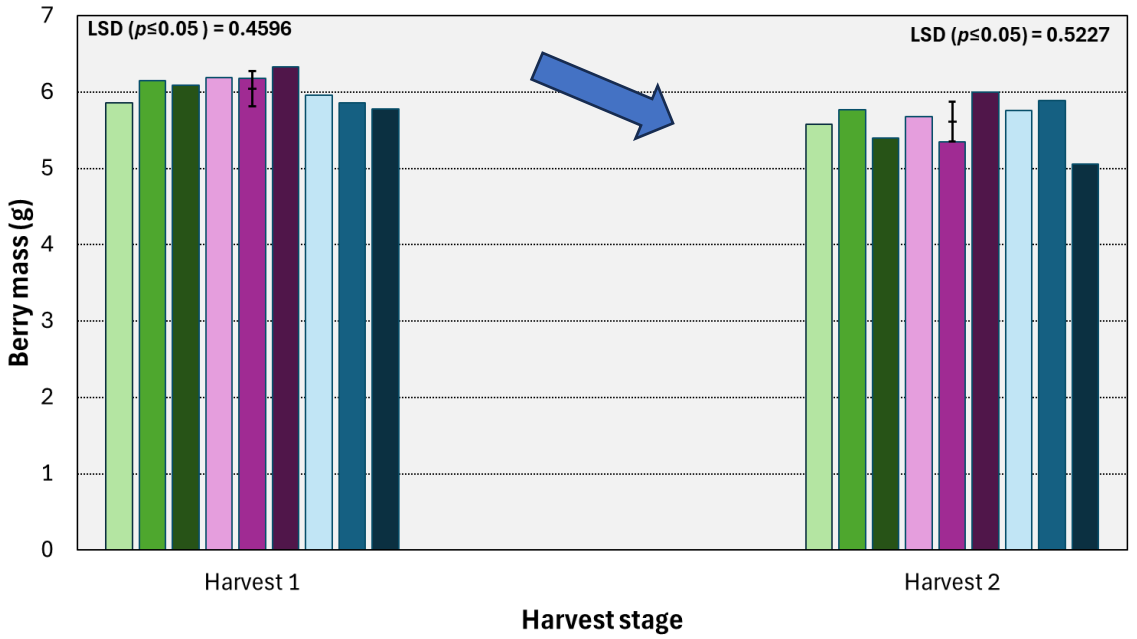
***S1 = 4 weeks storage at -0.5°C plus 1 week at 7.5°C; **S2 = 8 weeks storage at -0.5°C plus 1 week at 7.5°C**

Key findings

Bud-load (BL, n buds/vine) × crop-load (CL, n bunches/vine) interaction effect on on berry diameter



Bud-load (BL, n buds/vine) × crop-load (CL, n bunches/vine) interaction effect on berry mass

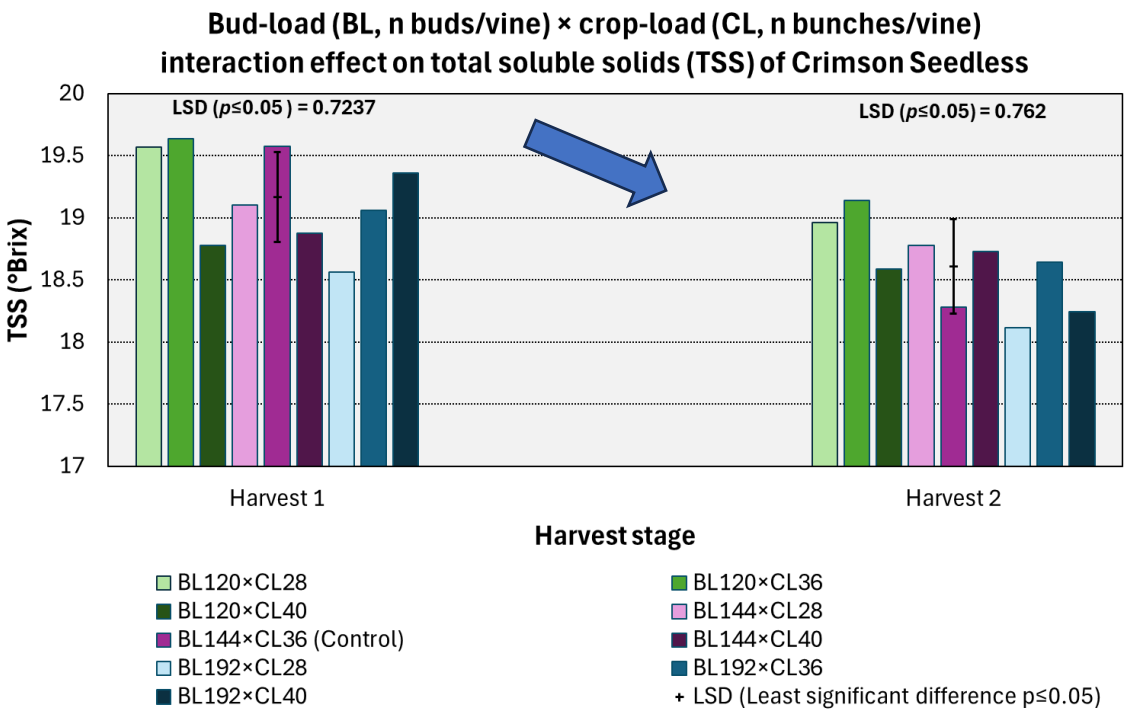


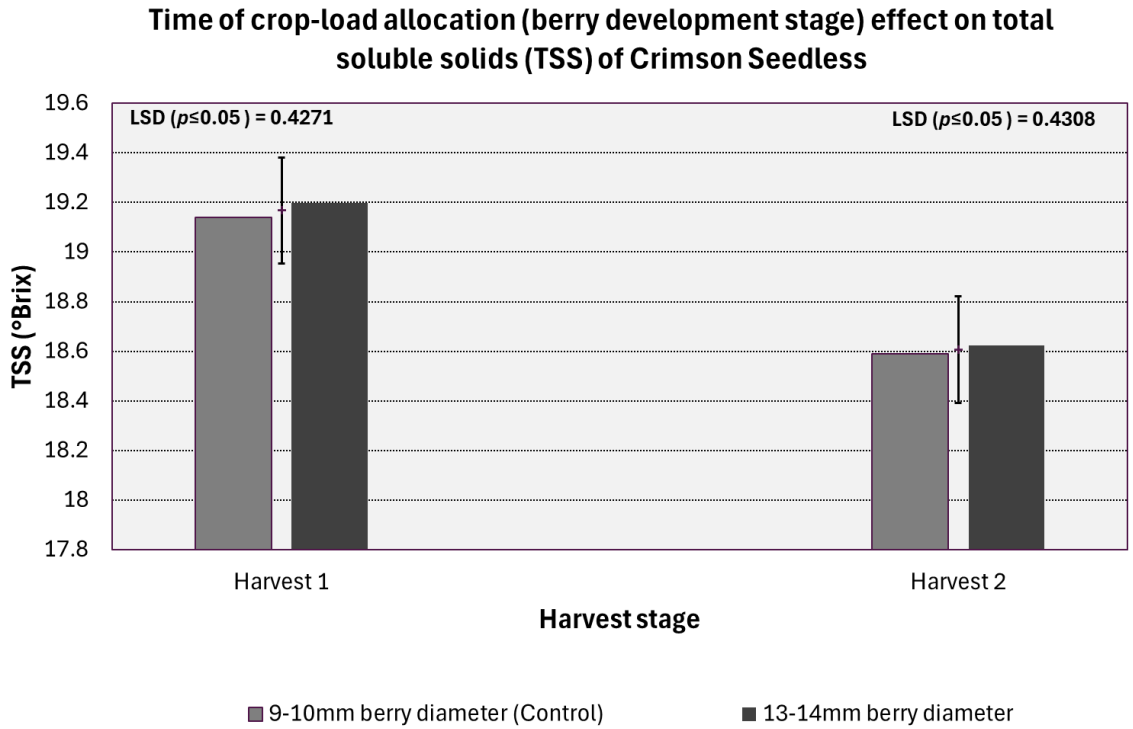
- BL120 ×CL28
- BL120 ×CL36
- BL120 ×CL40
- BL144×CL28
- BL144×CL36 (Control)
- BL144×CL40
- BL192×CL28
- BL192×CL36
- BL192×CL40
- LSD

Crop-load allocation stage	Harvest 1		Harvest 2	
	Berry mass (g)	Berry diameter (mm)	Berry mass (g)	Berry diameter (mm)
9-10mm berry diameter (Control)	5.95 a*	17.46 a	5.70 a	17.50 a
13-14mm berry diameter	6.14 a	17.64 a	5.55 a	17.49 a
LSD (P≤0.05)	***0.2***	***0.29***	***0.22***	***0.25***

*Values with the same letter per column do not differ significantly from each other at the 5 % significance level. LSD = Least significant difference.

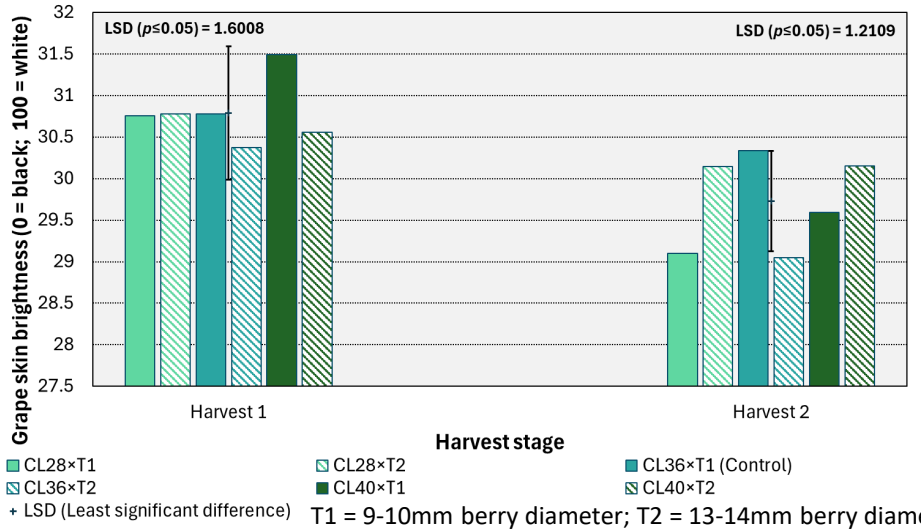
Key findings





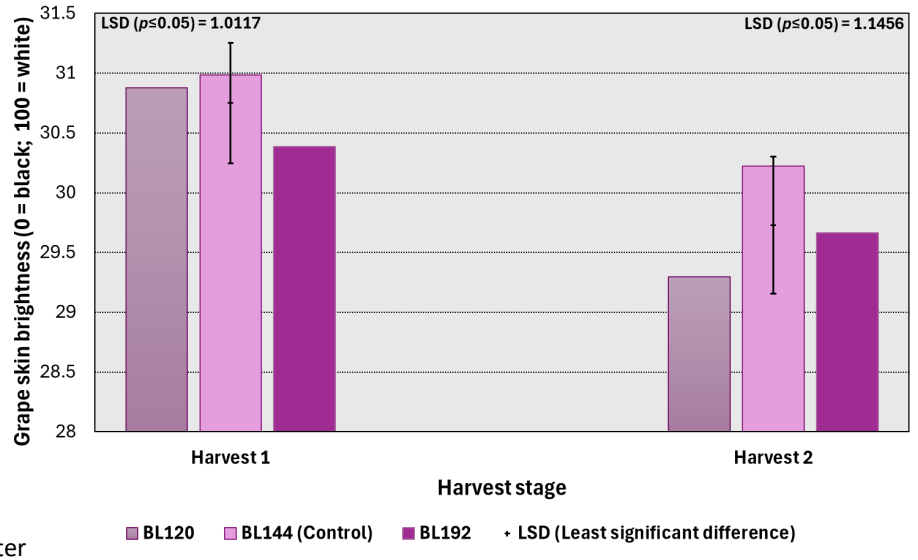
Key findings

Crop-load (CL, n bunches/vine) × time of crop-load allocation (T) interaction effect on grape skin brightness

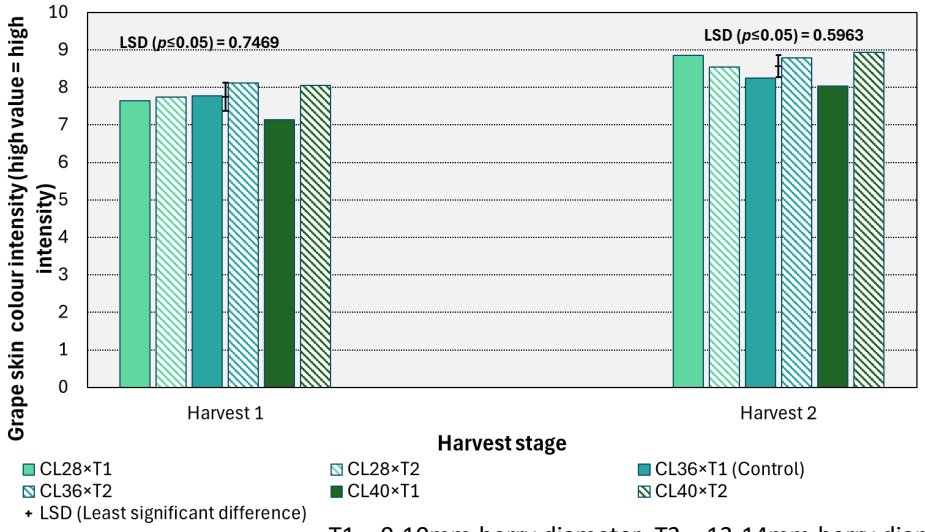


T1 = 9-10mm berry diameter; T2 = 13-14mm berry diameter

Bud-load (BL, n buds/vine) effect on grape skin brightness

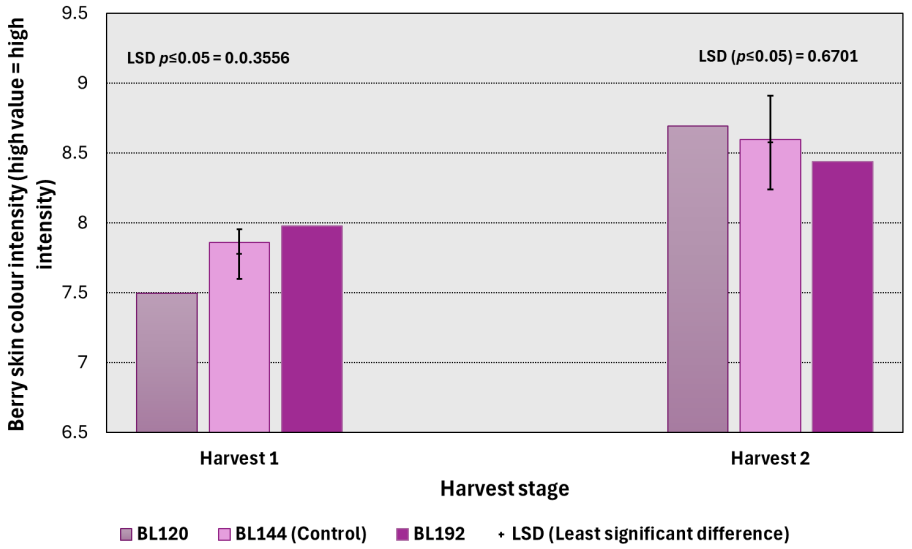


Crop-load (CL, n bunches/vine) × time of crop-load allocation (T) interaction effect on grape skin colour intensity



T1 = 9-10mm berry diameter; T2 = 13-14mm berry diameter

Bud-load (BL, n buds/vine) effect on berry skin colour intensity



Treatment factor	Hue angle (h°)*	
Bud-load (n buds/vine)	**Harvest 1**	**Harvest 2**
120	313.53 a*	281.50 a
144 (Control)	317.72 a	263.90 a
192	299.55 a	261.69 a
LSD (p≤0.05)	***29.4***	***40.1***
Crop-load (bunches/vine)	**Harvest 1**	**Harvest 2**
28	305.26 ab	271.86 a
36 (Control)	323.9 a	268.39 a
40	301.43 b	266.83 a
LSD (p≤0.05)	***22.06***	***25.9***
Time of crop-load allocation	**Harvest 1**	**Harvest 2**
9-10mm berry size (Control)	312.85 a	268.78 a
13-14mm berry size	308.62 a	269.28 a
LSD (p≤0.05)	***24.09***	***40.1***

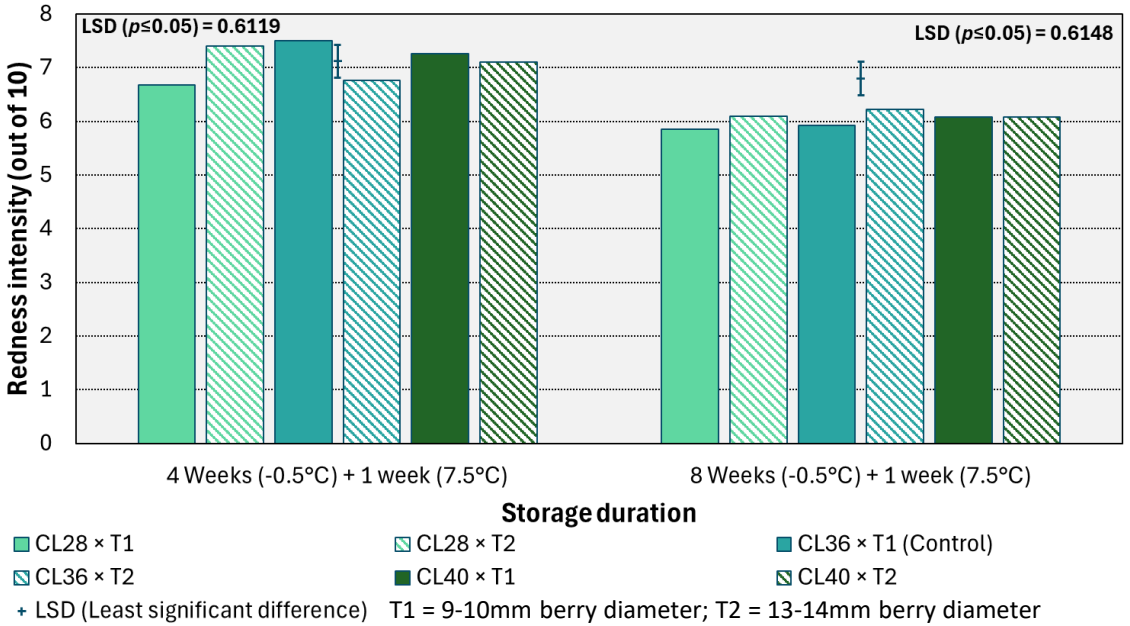
*h° = red (0°/360°), yellow (90°), green (180°) and blue (270°)

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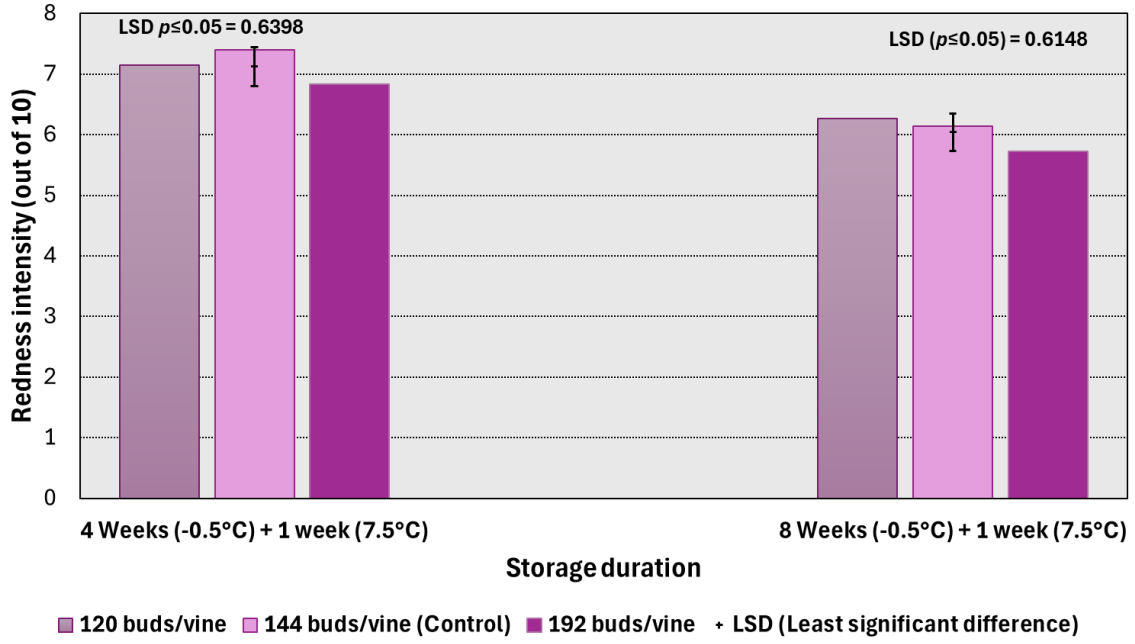
Key findings



Crop-load (CL, n bunches/vine) × time of crop-load allocation (T) interaction effect on redness intensity of grapes from harvest 1



Bud-load (BL, n buds/vine) effect on redness intensity of grapes from harvest 1



Practical implications

Heavy rainfall effect on postharvest defects

- Planning / timing of harvest (Harvest was too late)
- Protected cultivation (overhead plastics*)
- Canopy management to improve aeration

Storage duration

Impact on source:sink ratio

- Affect TSS
  - Impact on sensory perception
  - Affect time of ripening
- Allocate bud-load for sufficient leaf area to provide assimilates

- *Strydom, J., Volschenk, C.G., van der Rijst, M., de Palma, L., Novello, V., di Lorenzo, R., Pisciotta, A., Raath, P.J. & Hunter, J.J., 2025. Physiological response of Crimson Seedless table grape vines to controlled irrigation conditions in different micro-climatic environments. Plants, 14, 3579. https://doi.org/10.3390/plants14233579
- Strydom, J., Volschenk, C.G., van der Rijst, M., de Palma, L., Novello, V., di Lorenzo, R., Pisciotta, A., Raath, P.J. & Hunter, J.J., 2026. Effect of controlled irrigation treatments on the vegetative and reproductive response of Crimson Seedless table grape vines under different micro-climatic conditions. Manuscript submitted for publication. S. Afr. J. Enol. Vitic.
- Strydom, J, Volschenk, N & Hunter, JJ., 2026. Using Overhead Plastics to Balance Crimson Seedless Water Use and Yield – submitted for Aug / Sept edition of SAFJ

Take-home

Value to the table grape industry

- Improved vineyard management decisions to balance yield and quality
- Grape quality control to achieve market specifications
- Provide decision support for table grape producers

Acknowledgements

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