

Yield and growth responses to different pruning strategies in high-density irrigated avocado orchards under subtropical growing conditions



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Canopy avocado management in Brazil

- For many years, **wide planting spacings (80-125 trees ha⁻¹)** discouraged the implementation of canopy management practices in commercial avocado orchards in Brazil.
- High-density (> 300 trees/hectare) irrigated avocado orchards are uncommon in Brazil**, because of the difficulties in controlling plant growth onto very invigorating seedling rootstocks grown under warm and rainy weather conditions.
- Since 2012, **pruning and high-density** plantings are being applied in commercial production, but **no empiric information on best pruning times and modalities** is yet available.



3.5x2.0 m Breda avocado, Bonella Group
Southern Minas Gerais state



6x3 m Hass avocado, Tsuge Group
Minas Gerais state, Cerrado region

MATERIAL AND METHODS

🥑 Field trials were conducted over a 4-year period at **Fazenda Santa Cecilia farm (Carlini Avocado Group)** in the Southwestern region of the state of São Paulo, for studying the effect on **different pruning modalities and times** on tree growth and yield of 'Hass' and 'Quintal' high-density irrigated orchards.

🥑 Local climate is subtropical with dry winter (Cwa Köppen), with 1,500 mm mean annual rainfall.

🥑 The soil is classified as a very clayey, deep Oxisol (>50% clay).

🥑 The trees were irrigated by one 30 L h⁻¹ pressure-regulated micro-sprinkler per tree.

<https://carliniavocado.com/>



MATERIAL AND METHODS

- ✓ Two commercial 'Hass' and 'Quintal' irrigated avocado orchards were planted in 2010 on 0.40-height mounds, in a 4.5 x 4.5-m spacing (493 trees ha⁻¹).
- ✓ In both varieties, different pruning modalities were applied over a 4-year period (2014-2017):
 - * In 2014/2015: Mechanical hedging + Topping pruning, versus Mechanical hedging + Hand pruning.
 - * In 2016/17: Mechanical hedging + Hand pruning performed at different times from April through August.
- 🔗 Effects on tree size, regrowth shoot length, leaf area index, leaf chlorophyll content, fruit yield and fruit size were studied.



**4.5 x 4.5 m Hass avocado
Fazenda Santa Cecilia, Carlini Avocado**

MATERIAL AND METHODS

Fazenda Santa Cecília, Carlini Avocado Group



Hass avocado (4.5 x 4.5 m, 493 trees ha⁻¹)



Quintal avocado (4.5 x 4.5 m, 493 trees ha⁻¹)



MATERIAL AND METHODS



**Mechanical hedging + topping pruning
with a coffee pruning machine**

**Mechanical hedging +
hand pruning**



RESULTS

Effects of different pruning modalities on Hass fruit yield. Fazenda Santa Cecilia, April 2015.

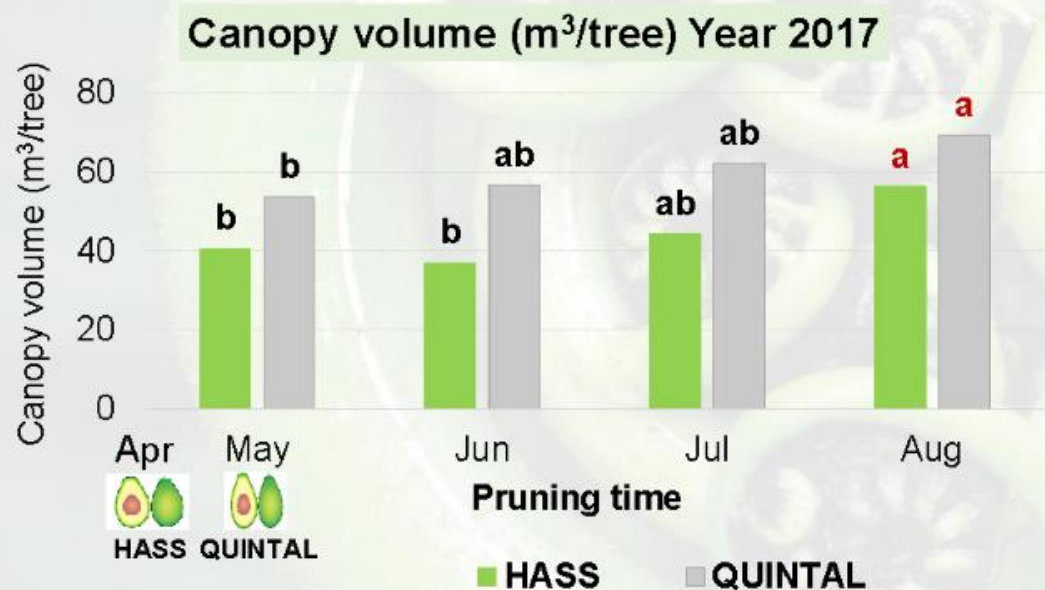
Pruning modalities	Fruits tree ⁻¹	Kg tree ⁻¹	Fruit weight, g
Only mechanical pruning	118.0 b	29.88 b	237.81 a
Combined pruning	247.4 a	57.46 a	215.34 b
P value	0.0002	0.0003	<0.0001
CV (%)	34.46	32.00	17.23

- As previously reported by Snidjer et al. (2000) and Leonardi (2008) under similar climatic and edaphic growing conditions, the mechanical pruning increased shading inside the canopy and reduced fruit yield.
- Based on these results, in **the 2016-2017 biennium a combined strategy of mechanical and hand pruning was applied at different time periods**, from April (early autumn) through August (late winter).

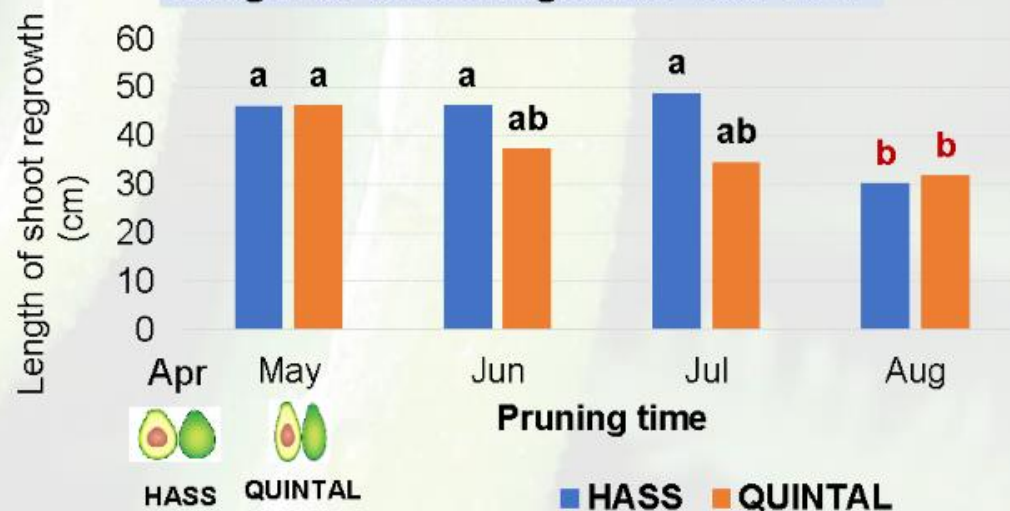


RESULTS

Tree size and regrowth length



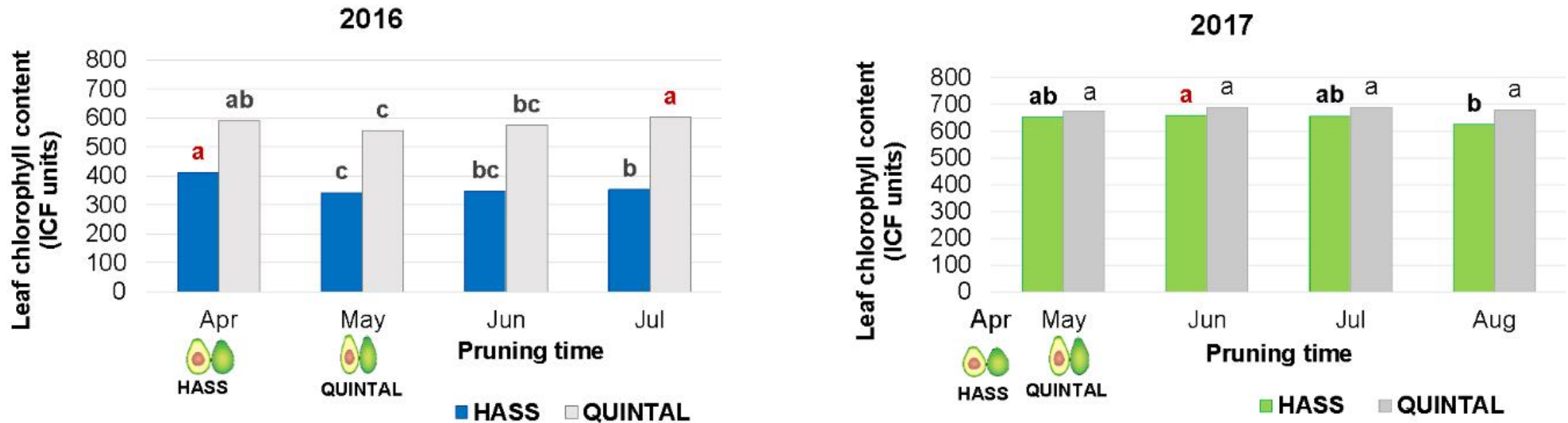
Length of shoot regrowth Year 2017



- ✓ In both cultivars, **late-winter (August) pruning induced shorter regrowth shoots**, but was not effective for controlling final tree size.

RESULTS

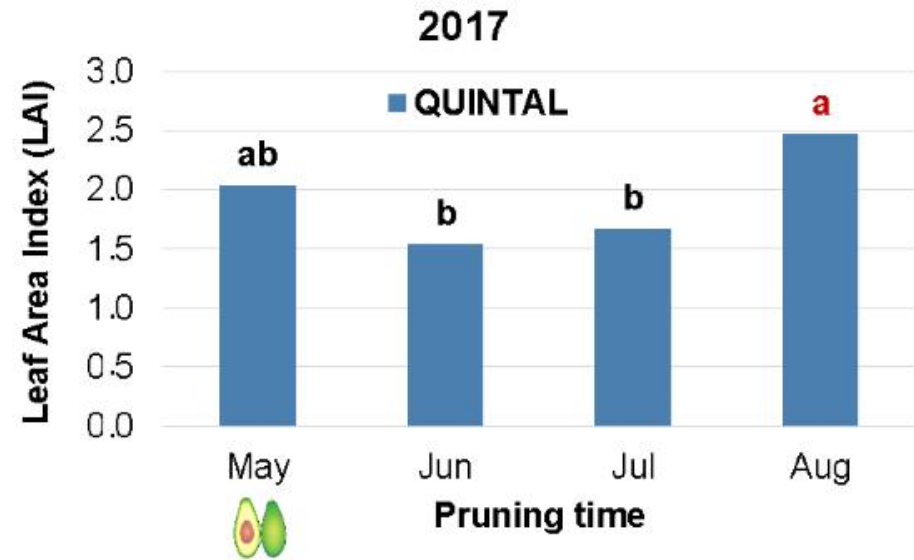
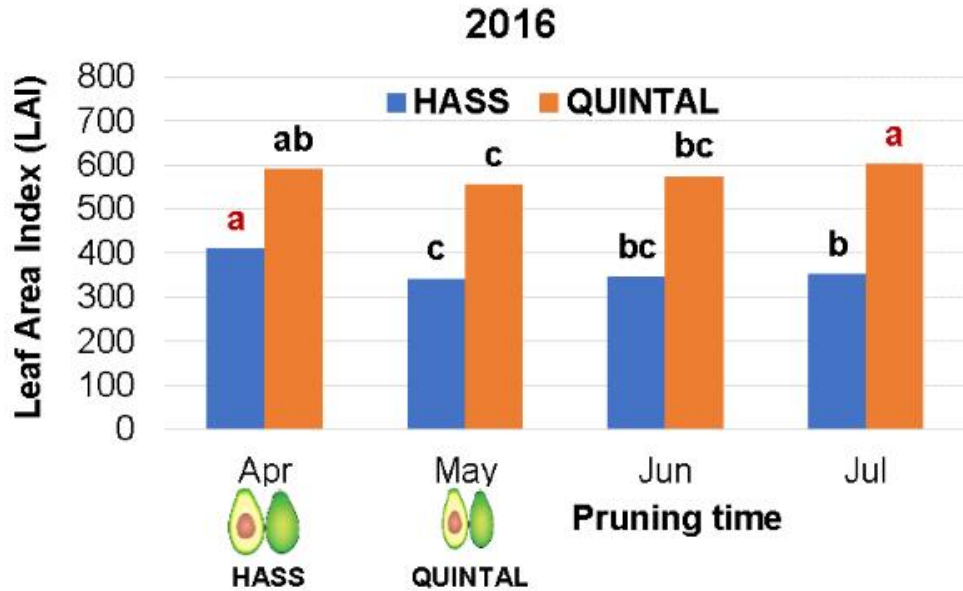
Leaf chlorophyll content



- ✓ In both years, pruning performed 1-2 months after the harvest (April-May) significantly increased leaf chlorophyll content of 'Hass' avocado trees.
- ✓ In 2016, pruning performed 2 months after harvest (July) significantly increased leaf chlorophyll content of 'Quintal' avocado trees.

RESULTS

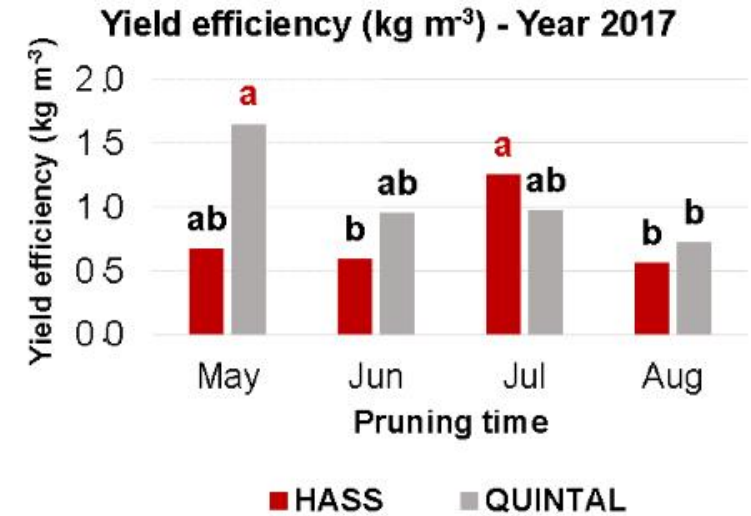
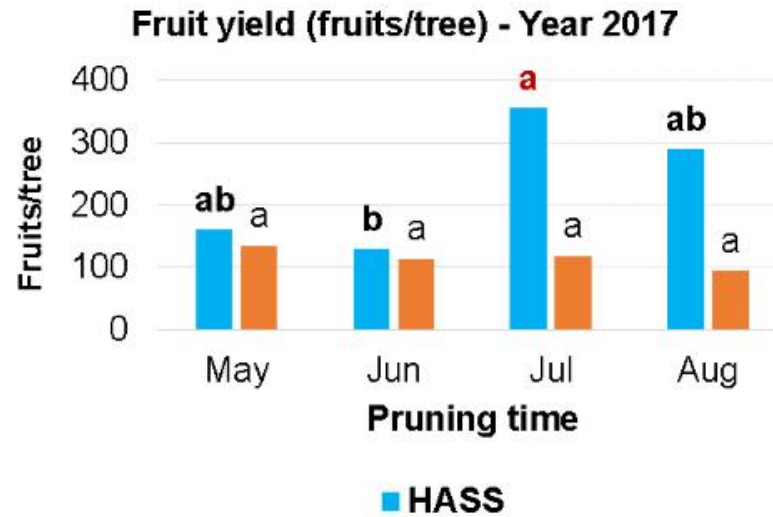
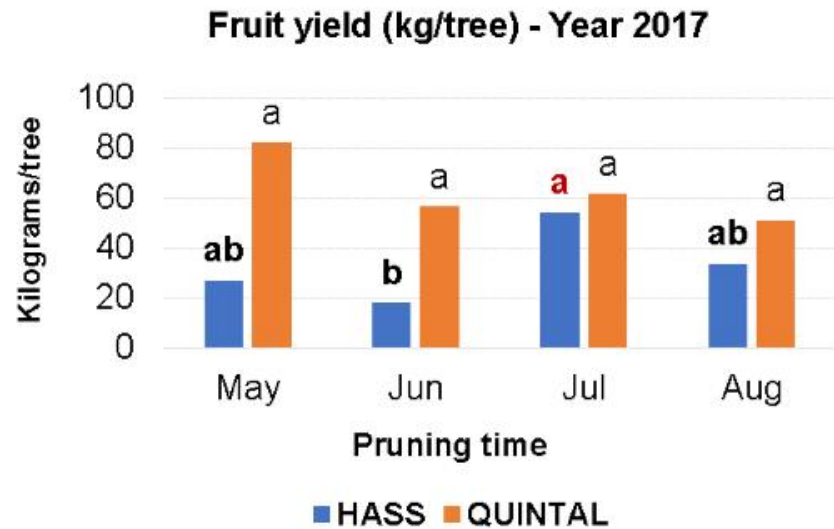
Leaf Area Index



- ✓ In 'Hass' avocados, pruning performed immediately after harvesting (April) induced higher Leaf Area Index.
- ✓ In both years, pruning performed 2-3 months after harvest (July-Aug) increased Leaf Area Index in 'Quintal' avocados.

RESULTS

Fruit yield & Yield Efficiency



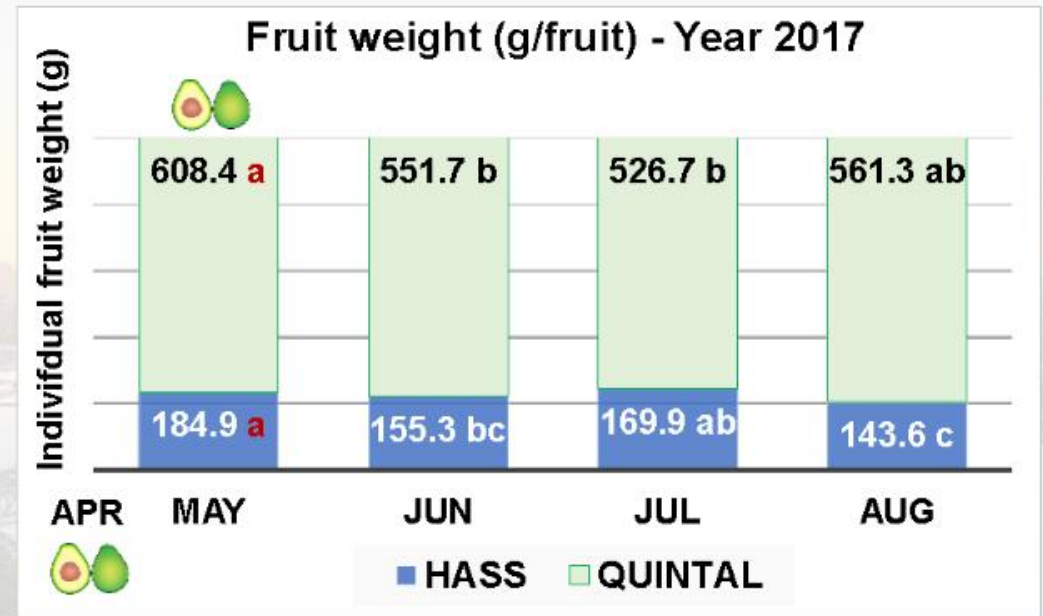
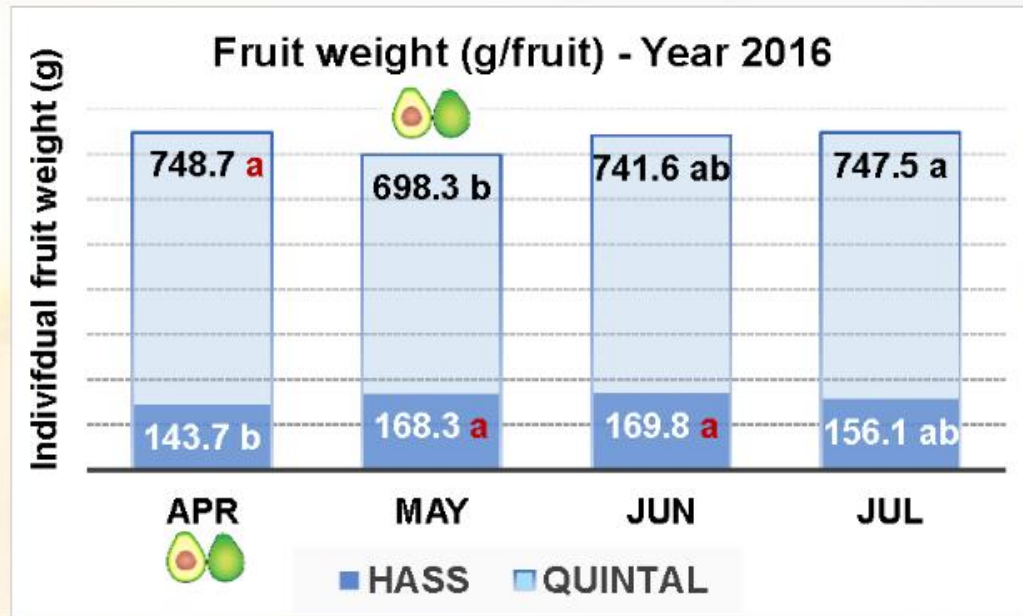
- ✓ A combined strategy of both mechanical and hand pruning practices applied in a high-density 'Hass' orchard in **early-winter (July) increased yield per tree and yield efficiency.**
- ✓ No significant differences between pruning dates were found for the 'Quintal' variety.
- ✓ In both cultivars, **late-winter pruning (August)** in the onset of flowering, **reduced yield efficiency.**



RESULTS



Fruit size



- ✓ In 2014-2017, 'Hass' avocado was harvested in April, while Quintal avocado was harvested in May.
- ✓ In both cultivars, a **combined strategy** of both mechanical and hand pruning practices applied **immediately after or up to 2 months after the harvest** induced larger fruit size.

CONCLUSIONS

- 🌀 In a high-density 'Hass' avocado orchard, a **combined strategy of mechanical hedging and hand pruning inside tree canopy** resulted in higher yield and larger fruit size, as compared to the sole mechanical pruning.
- 🌀 When applied **in early-winter (July)**, this combined pruning strategy increased yield per tree and yield efficiency of 'Hass' avocado trees.
- 🌀 In high-density 'Hass' and 'Quintal' orchards, **late-winter pruning (August)** close to the onset of flowering, **reduced yield efficiency** and **regrowth shoot length**, but it was not effective for controlling final tree size.



CONCLUSIONS

- 👉 Pruning performed immediately after harvesting (April) **increased Leaf Chlorophyll Content and Leaf Area Index** of 'Hass' avocado trees.
- 👉 Pruning performed 2-3 months after harvest (July) **increased leaf chlorophyll content and Leaf Area Index** of 'Quintal' avocado trees.
- 👉 In both cultivars, a combined strategy of both mechanical and hand pruning practices applied **immediately after the harvest induced larger fruit size.**



Questions

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