

why retained fruits attain larger final size under reduced competition. Fruit thinning also improves important internal quality traits, although these responses are somewhat more variable than size responses. In the recent Brazilian study, a higher number of flower buds reduced soluble solids, whereas stronger thinning produced larger and sweeter fruit. Chemical thinning with NAAm similarly increased fruit diameter, improved grading, and advanced harvest, showing that thinning can enhance commercial quality as well as earliness. At the same time, thinning effects on acidity-related variables are not always uniform across studies or cultivars. One multi-cultivar loquat trial found no significant effect of thinning intensity on pH, titratable acidity, or total soluble solids. This agrees with the broader view that loquat fruit quality is determined not only by crop load, but also by cultivar, climate, mineral nutrition, and orchard management conditions. The overall effect of thinning on fruit quality is therefore best understood as part of a wider management system. Bagging improves fruit health, appearance, and protection from insect, bird, and abiotic damage. Likewise, pruning systems that increase shoot vigor and leaf quality can strengthen carbohydrate supply and support larger fruit, reinforcing the benefits achieved through thinning alone. The future of loquat thinning technology will depend on reducing labor cost while preserving the precision that makes thinning effective. Hand thinning remains highly efficient but is slow and expensive, and this continues to limit wider adoption in commercial orchards. Chemical thinning offers a partial solution, but current loquat studies still show variability in response within trees and a need for further development before routine large-scale use. A second major direction is the integration of thinning with other sustainable orchard practices. In semi-arid production systems, deficit irrigation can save substantial water and, when properly managed, maintain profitability without requiring stronger thinning intensity.

More broadly, sustainable loquat production will likely rely on combining thinning with pruning, bagging, rootstock choice, and mineral management rather than optimizing each practice in isolation. Future research should also move beyond fruit removal itself and consider whole-system efficiency and value creation. Loquat flowers removed during thinning represent a large discarded biomass, yet recent evidence shows they can be upcycled into value-added functional products rich in flavonoids and antioxidant activity. At the same time, predictive tools based on mineral nutrition and fruit quality modeling may help build more precise management frameworks for fruit weight, soluble solids, and acidity in loquat orchards. In conclusion, fruit thinning is not merely a corrective practice for excessive fruit set, but a strategic tool for balancing yield, fruit quality, and orchard profitability in loquat production. Its long-term value will be greatest when it is embedded in precision, resource-efficient, and integrated production systems designed for sustainable loquat cultivation.

Acknowledgments

I extend my sincere gratitude to the anonymous reviewers for their valuable and insightful comments, which have greatly strengthened this paper.

Conflict of Interest Disclosure

The author affirms that this research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

References

- Agusti M., Juan M., Almela V., and Gariglio N., 2000, Loquat fruit size is increased through the thinning effect of naphthaleneacetic acid, *Plant Growth Regulation*, 31(3): 167-171.
<https://doi.org/10.1023/a:1006376219543>
- Akkuş S., and Polat A.A., 2021, Effect of some quince rootstocks on inflorescence properties, flowering and fruit set in loquat (*Eriobotrya japonica* Lindl.), *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi*, 25 (2): 253-257
<https://doi.org/10.18016/ksutarimdog.vi.910339>
- Andrade D., Paz Covarrubias M., Benedetto G., Pereira E.G., and Almeida A.M., 2019, Differential source-sink manipulation affects leaf carbohydrate and photosynthesis of early- and late-harvest nectarine varieties, *Theoretical and Experimental Plant Physiology*, 31(2): 341-356.
<https://doi.org/10.1007/s40626-019-00150-0>
- Assefa A., and Debella A., 2020, Review on effect of fruit load on dry matter production and partitioning in crops, *International Journal of Agricultural Research and Review*, 6(3): 30-38.
<https://doi.org/10.20431/2454-9487.0603004>