

Chemical thinning studies support the same pattern and add information on appearance and maturity. Application of naphthaleneacetic acid 10-15 days after anthesis increased average fruit size and also improved coloration while advancing harvest time (Agustí et al., 2000). NAAM treatments likewise increased fruit diameter by 11% to 18%, improved grading, and promoted earlier harvest, showing that thinning affects not only size but also market presentation and earliness.

4.2 Sugar-acid composition and flavor quality

Fruit thinning generally improves sweetness-related traits in loquat, although the response is not uniform across studies. In ‘Precoce de Itaquerá’, maintaining four buds per cluster produced larger and sweeter fruit, and a higher number of flower buds reduced soluble solids content. A separate thinning study also found that fruit thinning increased sugar contents, indicating that reduced sink competition favors sugar accumulation in the retained fruit.

The balance between sugars and acids, which is central to eating quality, also tends to improve after thinning or thinning-like crop regulation. In the same Brazilian study, pH and ripeness ratio were negatively associated with higher bud number, indicating that stronger thinning improved the sugar-acid balance important for consumer acceptance. Chemical thinning with naphthaleneacetic acid improved total soluble solids concentration (Agustí et al., 2000), although one cultivar trial reported that thinning intensity did not significantly affect pH, titratable acidity, or total soluble solids, so the compositional response appears cultivar- and condition-dependent rather than universal.

4.3 Nutritional quality and bioactive compounds

Evidence on nutritional quality shows that thinning changes fruit composition beyond sugars and acids, particularly through effects on mineral distribution. Fruit thinning significantly altered the mineral composition of loquat fruit (Gariglio and Agustí, 2005), and the most intense treatments increased potassium but reduced iron in flesh tissue at colour break. Thinning also reduced several mineral concentrations in the rind, especially K and Fe, which increased the concentration gradient between flesh and rind tissues.

These compositional changes are relevant because quality improvement can be accompanied by physiological costs. Fruit thinning has been linked to higher purple spot incidence, and the association appears to involve both increased sugar accumulation and altered solute gradients during rapid fruit development. Broader loquat quality studies also indicate that crop-regulating treatments can enhance bioactive substances such as phenolics, flavonoids, and carotenoids while improving the sugar-to-acid ratio and aroma compounds, which supports the view that sink regulation can reshape secondary metabolism as well as external and sensory quality (Zhang et al., 2025). Overall, fruit thinning improves external fruit quality most consistently, especially fruit size, mass, grading, and earliness. Its effects on flavor and nutritional composition are generally positive but less uniform, and excessive thinning can increase purple spot risk even as it enhances sweetness and some compositional traits.

5 Physiological and Metabolic Mechanisms Underlying Fruit Thinning-Mediated Improvement of Loquat Quality

5.1 Regulation of leaf photosynthetic characteristics by fruit thinning

Fruit thinning changes leaf photosynthetic behavior primarily by altering the source-sink ratio between leaves and developing fruits. Source-sink balance is a major determinant of carbon partitioning in fruit trees, and thinning directly modifies this balance by reducing sink demand. In orchard systems, this shift can improve canopy light distribution and gas exchange, and a meta-analysis in apple showed that thinning significantly increased leaf net photosynthetic rate, stomatal conductance, and transpiration while also improving fruit quality traits (Junna et al., 2021). For loquat, this framework is physiologically relevant because sugar translocation from leaves is essential for fruit development, and impaired translocation can compromise sink growth (Sotiras et al., 2019).

The photosynthetic response to thinning is not uniformly stimulatory, because excessive sink reduction can cause feedback inhibition in leaves. In nectarine, thinned trees showed lower net photosynthesis associated with stomatal limitation and transient sugar accumulation in leaves, indicating that an increased source-sink ratio can temporarily exceed drain capacity (Andrade et al., 2019). Peach experiments after fruit removal similarly found