more than a 60% increase in yield value per unit area compared with conventional pruning (Xu et al., 2013). For declining trees, heavy heading-back pruning can increase single fruit weight and gradually restore yield as the canopy is renewed. When these findings in loquat are combined with evidence from citrus (for example, increasing pruning intensity-removing up to 75% of main branches—can raise yield per tree by nearly 20% and improve fruit size and internal quality) (Al-Saif et al., 2023), a consistent pattern emerges: well-designed pruning systems regulate canopy vigor and fruit load, combined with flower and fruit thinning, shifting production from "many small fruits" to "fewer large, high-value fruits." Even if the absolute number of fruits decreases, economic yield usually increases.

6 Effects of Pruning Systems on Fruit Quality

6.1 External fruit characteristics (size, uniformity, color)

Compared with retaining 10~12 flower buds per panicle, keeping only 4 buds can produce loquat fruits with greater single-fruit weight as well as larger longitudinal and transverse diameters, mainly because competition among "sinks" is reduced (Nordi et al., 2025). Consumers generally prefer fruits that are larger, have a higher flesh proportion, and contain smaller seeds, which confirms the commercial importance of pruning and thinning practices that reduce crop load to increase fruit size. Double-heading pruning promotes the formation of strong fruiting shoots with thicker branches and more leaves, which supports the development of larger floral organs and further increases fruit size, reflecting enhanced cell division during the early stages of fruit development. After thinning, fruit bagging can improve external quality by enhancing peel color and reducing surface defects. Aluminum-polyethylene composite bags increased fruit weight, length, and width to 1.37, 1.18, and 1.13 times those of the control, respectively, while also increasing peel thickness and edible rate, and significantly reducing sunburn, black spots, and damage from insects and birds (Zhi et al., 2021).

6.2 Internal quality (soluble solids, acidity, flavor balance)

Pruning, by regulating crop load and canopy microclimate, also affects internal fruit quality traits such as soluble solid content, titratable acidity, and their ratio, which together determine flavor balance. In flower bud thinning experiments, retaining 4 buds per panicle significantly increased soluble solids content and maturity index compared with higher crop load treatments, indicating sweeter fruits and a more balanced sugar-acid ratio at harvest. This improvement is mainly due to a more favorable source-sink relationship, allowing more carbohydrates to be allocated to each fruit. Although mineral nutrition is an important factor influencing internal quality-for example, Ca, Mg, Fe, and N levels in leaves and soil can significantly affect fruit weight, soluble solids, and titratable acidity-pruning systems can indirectly interact with these factors by adjusting leaf area per fruit and improving assimilate use efficiency (Huang et al., 2021). Fruits treated with paper bags showed the highest soluble sugar content and the lowest titratable acidity, with a sugar-acid ratio nearly twice that of unbagged fruits. Aluminum bags and aluminum-polyethylene composite bags slightly increased titratable acidity and some amino acids, but still improved the overall sugar–acid balance and enhanced fruit firmness.

6.3 Nutritional quality and market value

Larger fruits with a higher flesh proportion can increase economic returns, as buyers are more willing to pay a premium for loquats that are large, have small seeds, and show good appearance. Double-heading pruning, by promoting vigorous shoot growth and larger fruits, can indirectly enhance nutrient accumulation, mainly due to the increase in the edible portion of each fruit. Bagging treatments significantly improve the "health" level of fruit-that is, the proportion of undamaged, marketable fruits-by reducing sunburn, decay, black spots, and insect or bird damage. The proportion of healthy fruits increases by 75%~144% compared with unbagged controls, depending on the type of bag (Zhi et al., 2021). Aluminum-polyethylene bags are associated with higher carotenoid content and various amino acids, while paper and aluminum bags show positive relationships with phenolic compounds and proline, suggesting that microenvironment regulation can also influence bioactive compounds related to antioxidant capacity and nutritional value. Since fruit quality (size, flavor, and nutritional composition) directly determines grading and commercial value, pruning strategies that promote effective thinning and facilitate bagging can significantly increase overall market value per unit area, even when total fruit number is reduced.