

internal quality trait, it is also an important visual cue during purchase. Mechanical firmness measurements are now commonly included in external quality evaluation to distinguish fruit maturity stages such as “ready to buy” and “ready to eat” (Masuda et al., 2023).



Figure 1 External appearance and visual quality traits of peach fruit

## 2.2 Internal quality

Internal quality is the core determinant of peach eating quality and consumer satisfaction. Compared with external traits, it more directly determines whether the fruit is perceived as palatable and is a key factor influencing repeat purchases. Sugar-acid composition forms the chemical basis of peach flavor. Soluble sugars in peaches mainly include sucrose, glucose, fructose, and sorbitol, with sucrose typically accounting for 75%-88% of total sugars. Organic acids are dominated by malic acid, with contributions from other acids such as citric acid varying among cultivars (Wang et al., 2023). Soluble solids content (SSC) is commonly used as an indicator of sweetness, while titratable acidity (TA) reflects sourness; their ratio provides a more comprehensive measure of flavor balance (Petrucelli et al., 2023). Studies indicate that reducing crop load can increase SSC, total sugar, and sugar-acid ratio, thereby enhancing sweetness and overall flavor intensity (Zhang et al., 2020). Thus, the sugar-acid ratio is often a better predictor of consumer preference than sugar or acid alone.

Texture is another critical component of internal quality, including firmness, juiciness, crispness, mealiness, fibrousness, and melting/non-melting characteristics. Texture development is closely related to cell wall structure, pectin metabolism, and fruit softening during ripening. As fruit matures, cell walls degrade and pectin solubilization increases, leading to reduced firmness and changes in texture. Research indicates that firmness is not only a physical parameter but also closely associated with sensory perceptions such as sourness, green notes, and overripe flavors, making it an important indicator of maturity and overall quality (Masuda et al., 2023). Cultivation factors such as water supply, harvest timing, and crop load significantly influence texture; for example, moderate water stress helps maintain firmness, whereas excessive irrigation can lead to soft flesh and reduced storability.