nutrient allocation per fruit increases, resulting in higher fruit weight, size, SSC, total sugar, sugar-acid ratio, and improved coloration (Wang et al., 2023). Studies show that retaining 25%-75% of initial fruit set can increase fruit weight by 20%-50% and SSC by up to 50% (Mazzoni et al., 2022). However, excessive thinning reduces total yield, so optimal thinning intensity must be determined based on cultivar characteristics, tree vigor, and market goals. Early thinning during bloom or early fruit development is generally more effective in improving quality and resource allocation.

Plant growth regulators (PGRs) are widely used to regulate fruit enlargement, maturity, and quality attributes such as firmness, coloration, and storability. Compounds such as gibberellins, cytokinins, calcium treatments, and biostimulants can improve fruit size, surface quality, and postharvest performance (Zhen et al., 2025). However, their effectiveness depends strongly on cultivar, dosage, timing, and environmental conditions. Improper use may lead to soft texture, poor sugar accumulation, or uneven ripening. Therefore, PGRs should be used as supplementary tools rather than substitutes for proper orchard management.

Harvest timing is a critical factor determining final fruit quality (Figure 4). Since postharvest handling can only maintain rather than improve quality, the maturity stage at harvest directly affects eating quality, storability, and consumer satisfaction. Early-harvested fruits are firmer and more suitable for storage and transport but often have lower SSC and weaker aroma. In contrast, delayed harvest improves sweetness and flavor but reduces shelf life and increases the risk of physiological disorders (Shin et al., 2023). In recent years, non-destructive indicators such as color indices, firmness, SSC, IAD, and DMC have been widely used to determine optimal harvest timing more accurately. This reflects a shift from experience-based decisions to data-driven, multi-index evaluation in harvest management.

Figure 4 Harvesting stage and maturity management of peach fruit