3 Key Techniques for High-Quality Fingered Citron Seedling Propagation

3.1 Cutting propagation techniques

Cutting propagation is an important vegetative method for producing true-to-type citrus planting material when seed propagation gives non-uniform offspring or when rapid clonal multiplication is needed. In citrus, rooting success depends strongly on the physiological status and maturity of the cutting, the season of collection, the rooting medium, hormonal treatment, and the surrounding microclimate (Guchhait et al., 2024; Saini et al., 2025). Reviews across citrus species indicate that virus-free hard, semi-hard, and softwood cuttings can all be used, but semi-hardwood materials often show the best rooting and survival performance. Auxin treatment is especially important, and indole-3-butyric acid is repeatedly identified as a key regulator that improves root initiation, root number, root quality, and subsequent shoot growth. Rooting media must simultaneously provide water retention, drainage, aeration, and mineral supply, because these physical properties directly influence rooting percentage and early seedling vigor.

For fingered citron seedling production, evidence from citrus cutting systems suggests using healthy semi-lignified shoots from superior mother plants, retaining physiologically active buds, treating the basal end with appropriate auxin, and placing the cuttings in a porous, moist rooting medium under protected high-humidity conditions. Citrus studies show that mist-house or intermittent-mist systems can improve propagation success, and single-node or single-bud cuttings can root efficiently under nursery conditions. In one citrus rootstock study, 82~91% of single-node cuttings of the best-performing genotype established as rooted, growing plants by eight weeks, although rooting efficiency differed sharply among genotypes. This value is a genotype-specific citrus rootstock result and should not be treated as a target for fingered citron. Cuttings can approach seedling size within a short nursery period, but vegetatively propagated plants tend to have a higher shoot-to-root ratio and a root system dominated by adventitious and lateral roots rather than a clear taproot, so nursery hardening and root-quality assessment are important before field planting (Albrecht et al., 2020). For fingered citron, the specific hormone concentration, humidity regime, rooting period, and acceptance thresholds still require validation with local material and nursery conditions.

3.2 Grafting propagation techniques

Grafting is a core technique in citrus propagation because it combines the genetic identity and fruiting characteristics of the scion with the stress tolerance, disease resistance, and growth-regulating effects of the rootstock (Shivran et al., 2022). Citrus nurseries commonly use bud grafting methods such as chip budding, T-budding, and inverted T-budding, as well as branch grafting methods such as cleft, splice, wedge, whip-and-tongue, and side grafting. Successful grafting depends on rootstock-scion compatibility, proper developmental stage, stem thickness, close cambial contact, operator skill, and favorable temperature and humidity during healing (Hussain et al., 2017). Compatible combinations improve plant growth, water and nutrient uptake, fruit quality, and tolerance to drought, temperature stress, salinity, waterlogging, and major diseases, whereas unsuitable combinations lead to weak growth, delayed bearing, and poor nursery performance (Wang et al., 2025).

For high-quality fingered citron seedlings, grafting should use vigorous, disease-free rootstocks of suitable stem diameter and healthy scions with full buds collected from standardized mother orchards. Comparative studies in other citrus taxa provide useful technical references, but their numerical parameters should not be transferred directly to fingered citron. For example, wedge grafting on six-month-old rootstocks achieved 90.0% graft success and 88.87% plant survival in Khasi mandarin (Deshmukh et al., 2017), while wedge and side grafting performed well in Kinnow mandarin (Hussain et al., 2017). Nursery-scale citrus studies have also evaluated inverted T-budding at 25~30°C and protected minigrafting systems using defined grafting heights or short apical segments (Mendes et al., 2019; Suárez Padrón et al., 2022). These cases show that rootstock age, grafting method, cambial contact, healing environment, and post-grafting care are important control factors. For fingered citron, however, suitable rootstock age, grafting type, temperature and humidity, and healing period should be determined by local validation rather than adopted as fixed values from other citrus species.