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Growing finger limes in Florida: Lessons learned so far

By Manjul Dutt and Jude Grosser

Finger lime, a distant relative of sweet orange and grapefruit, is a relatively new crop species for Florida. It is an Australian native species that has been gaining in popularity and importance in the last few years because of its unique fruit characteristics and disease tolerance, which sets it apart from conventional sweet orange and mandarin cultivars.

The primary characteristic of this species is the round to teardrop-shaped juice vesicles that burst into individual juice sacs when the fruit is cut. The juice vesicles are known as "citrus caviar." They are consumed either fresh or processed and packaged.

Locally grown finger lime can be a useful addition to the "Fresh from Florida" portfolio and could bolster local food production systems, leading to increased sales to restaurants, bars (think margarita and mojito cocktails!) and grocery stores.

One of the pressing issues limiting large-scale production of finger limes in Florida is the lack of knowledge about the cultural conditions to successfully cultivate it in a huanglongbing (HLB) endemic environment. Recently, with funding from the Florida Department of Agriculture and Consumer Service's Specialty Crop Block Grant Program, a rootstock and fertilizer evaluation trial was established at the University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) Citrus Research and Education Center (CREC) in Lake Alfred.

The objective of this study is to understand how the different commercially available rootstocks and fertilizer regimes (slow release vs. conventional) impact finger lime growth and production. This article presents observations on the initial three years following planting.

GREENHOUSE GROWTH

The Division of Plant Industry's finger lime accession, DPI-50-36, was the scion cultivar evaluated in this study. It was budded onto 14 different rootstocks approximtely 6 months old.

Table 1 and Figure 1 (page 25) show the nursery growth rate of the budded plants. Nursery plant growth was considered rapid if the scion shoots grew 6 inches or more after bud break at the end of three months. A poor plant growth rate ranged from 1 to 3 inches at the end of three months.

The most vigorous scion growth in the nursery was on the Volkamer lemon, US-802 and UFR-4 rootstocks. Scions on the popular Swingle and Kuharske rootstocks had acceptable growth rates and would be viable rootstocks for finger limes. Scions on C-22, Cleopatra mandarin and UFR-16 performed relatively poorly.

FIELD PERFORMANCE

A field trial was set up at the CREC with three fertilizer treatments replicated in a split-plot design. The three fertilizer treatments were:

1) 11-6-20 granular controlled-release fertilizer (CRF) with 3.15 percent calcium, 1.5 percent magnesium, 0.05 percent manganese (Mn), 0.02 percent boron, 0.10 percent zinc (Zn), 0.05 percent copper and 0.15 percent iron (Fe)

Table 1. Bud take and growth rate of finger lime during the initial phases of growth.

Rootstock	Bud Take	Plant Growth Rating
C-22	60%	Poor
Cleopatra mandarin	80%	Poor
Kuharske	100%	Rapid
Sour orange	100%	Rapid
Swingle	100%	Rapid
UFR-4	100%	Rapid
UFR-5	80%	Rapid
UFR-15	100%	Rapid
UFR-16	80%	Poor
UFR-17	100%	Rapid
US-802	100%	Rapid
US-812	100%	Rapid
Volkamer lemon	100%	Rapid
X-639	80%	Rapid

Figure 1. A) In the greenhouse, finger lime DPI-50-36 scions show different growth rates based on rootstock. B) A 6-month-old finger lime scion is budded onto Kuharske rootsock.

2) 11-6-20 CRF supplemented with Tiger Sul Micronutrients® Greening Guard Citrus Mix (65 percent sulfur, 3 percent Fe, 7 percent Mn and 6 percent Zn)

3) Conventional 8:8:8 fertilizer treatment

The fertilizer application rate was based on UF/IFAS guidelines for citrus trees and applied at the higher recommended rate (year 1: 0.30 pound nitrogen (N)/tree/year, year 2: 0.60 pound N/tree/year and year 3: 0.90 pound N/tree/year). The Tiger Sul Micronutrient Mix was applied at the rate of 0.5 pound/tree.

The trees were planted in the spring of 2017. Observations reported here are for the first three years following planting. Results will be updated in subsequent years.

Initial soil pH at the finger lime grove at the time of planting ranged

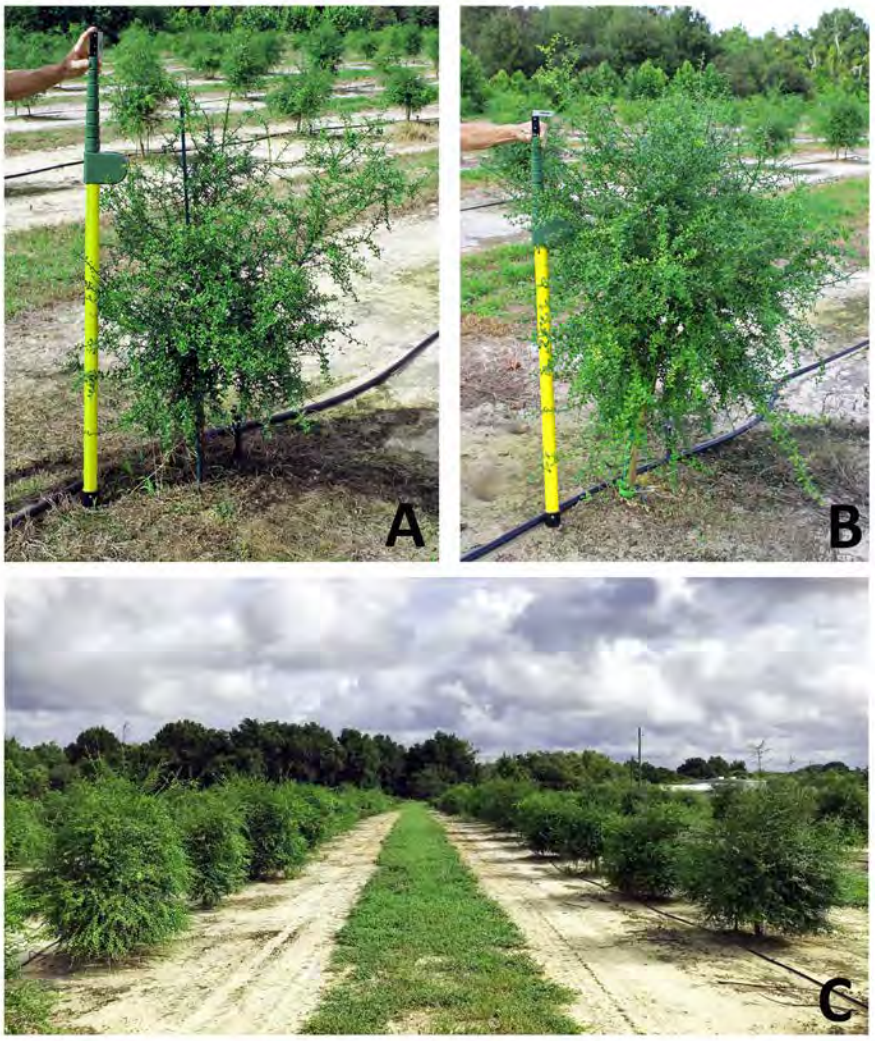

Figure 2. A two-year-old DPI-50-36 finger lime scion on Cleopatra mandarin rootstock (A) shows less growth than a two-year-old DPI-50-36 finger lime scion on Volkamer lemon rootstock (B). The plants are part of the Citrus Research and Education Center finger lime field trial (C).

from 6.4 to 6.6. Phosphorus levels were adequate, but N and potassium levels were low. Trees were planted with a 10-foot spacing within the row and 20 feet between rows. Fertilizers were applied twice a year, in early March and September.

In 2017, the finger lime grove was battered by Hurricane Irma six months after planting. Several trees were uprooted and subsequently replanted. Interestingly, this did not have a detrimental effect on most of the trees, which resumed normal growth the following spring. Soil was sampled on a yearly basis, just before the fall fertilizer application.

Trees are slow to establish in the initial year after planting with very little vegetative growth.

Year 1

There were no differences in tree height after one year of planting. In fact, trees were observed to have very little growth in the first eight months after planting. An appreciable decrease in the soil pH was not observed in treatments containing the Tiger Sul Micronutrient Mix in year one. There were no differences in tree growth among all the treatments, and all trees were HLB negative.

Year 2

Rootstock differences in tree growth were recorded in the second year. The vigorous rootstocks like Volkamer lemon, sour orange and US-802 generally had taller tree heights than the other rootstocks. Cleopatra mandarin and C-22 produced the shortest trees. Soil pH was reduced by an average of 0.2 in the Tiger Sul Micronutrient Mix supplemented treatment. All trees remained HLB negative.

Year 3

Growth trends were similar to year 2 among all the fertilizer treatments. Finger lime on Volkamer lemon, sour orange and US-802 continued to produce the tallest trees, whereas finger lime on Cleopatra mandarin and C-22 were the shortest. Kuharske and Swingle rootstocks produced comparably sized trees. A few trees suspected of being infected with HLB were tested. All had qPCR Ct values over 34 and considered negative to *Candidatus* Liberibacter asiaticus infection and HLB disease. Sporadic flowering and fruit set occurred in some trees.

General Observations

- The DPI-50-36 finger lime is compatible with most commonly available rootstocks. However, there is a definite rootstock-tree growth interaction.
- C-22 had low bud take in the greenhouse and poor growth in the field.
- Trees are slow to establish in the initial year after planting with very little vegetative growth. This has also been observed in other plantings not connected to this study.
- Thus far, no major differences have been observed in tree performance among the three nutrition treatments.
- Trees flowered from year three onward.
- Trees have remained HLB free.

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