

# Finger lime could be new crop for citrus growers

By Manjul Dutt, Ethan Nielsen and Jude Grosser

**T**he finger lime is a citrus relative, scientifically named *Microcitrus australasica*. Finger limes are native to Australia and are so named because the fruits are long and fingerlike in shape (see figures 1 and 2).

Finger limes belong to a group of similar citrus relatives, all originating from Australia with common names such as Round lime, Mount White lime, Kakadu lime and Russell River lime.

In Australia, finger limes have become popular as “bush tucker,” a category of foods that come from the wild and command high prices as a specialty crop. In addition to domestic consumption, a significant amount is also exported to Asia and Europe. In the United States, finger limes have remained rare, only occasionally found as a citrus curiosity and cultivated to a limited extent in California and Florida. But perhaps these funny, little fruits have more than meets the eye.

The finger lime tree is characteristically very thorny. It usually has shorter internodes than conventional citrus cultivars with thorns as long as the leaves at every node (see Figure 1).

*In the field, finger limes have a low infection rate, showing a low titer of the HLB bacterium and fewer symptoms of the disease.*

## FRUIT CHARACTERISTICS

The fruit is oval in size and, depending on the cultivar, can range from 1.5 to 4 inches in length. In spite of finger limes being native, there are only a handful of named finger lime varieties from Australia.

Upon cutting open a finger lime fruit, out will spill little round balls. These are the fruit’s juice vesicles. Finger lime vesicles are spherical, unlike the long and narrow juice vesicles from typical citrus (see Figure 2). Also, unlike conventional citrus, finger lime juice vesicles are easy to separate. Because of their appearance, they have been marketed as “citrus



**Figure 1.** Top: A finger lime tree at the Division of Plant Industry’s arboretum in Winter Haven, Florida. Bottom left: Closeup of a flowering branch. Bottom right: Two finger lime fruits on a tree.

caviar.” Chefs at high-end restaurants are using this citrus caviar, which is said to accompany seafood very well, as a plate garnish and as a component of cocktails. Like limes and lemons, the finger lime is an acid fruit. The citrus caviar produces crunchy, tart little bursts of flavor when consumed.

## HLB TOLERANCE

Finger lime and several of its close Australian relatives are unique in their field tolerance to HLB. Experiments by scientists at the U.S. Department of Agriculture (USDA) have shown that Asian citrus psyllids, vectors of HLB, avoid feeding on finger limes. A recently published USDA study has shown that in the field, finger limes have a low infection rate, showing a low titer of the HLB bacterium and fewer symptoms of the disease.

According to Ed Stover from the USDA in Fort Pierce, “Ninety-six seed-source families, representing a broad



**Figure 2.** The top image is an intact finger lime DPI-50-36 fruit, while the bottom image is the same fruit that has been cut to demonstrate the spherical juice vesicles.



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*Study conducted in 2014 by Dr. John Curtis, Better crops LLC, FL, USA*



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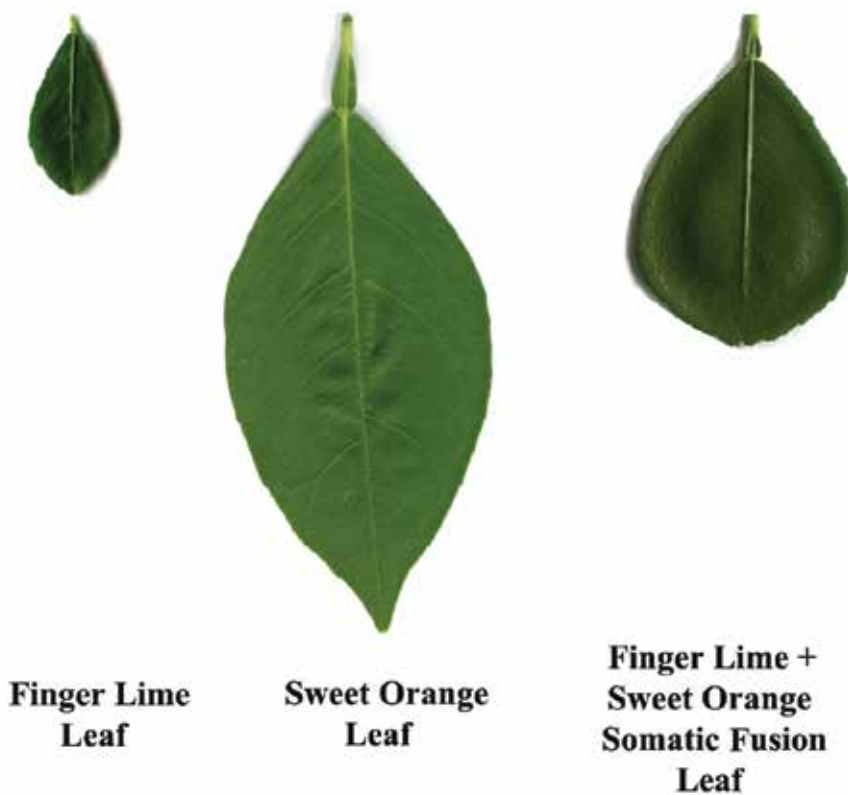
cross-section of genetic diversity from the Riverside citrus gene bank, were planted in a replicated study in Fort Pierce and evaluated for six years. A recently published paper (Ramadugu, C., M. Keremane, S. Halbert, Y-P. Duan, M.L. Roose, E. Stover, R. Lee. 2016. *Long-term field evaluation reveals HLB resistance in citrus relatives*. *Plant Disease* 100:1858-1869) indicates significant resistance almost exclusively in genera other than *Citrus*. Within the citrus gene pool, only accessions of *Poncirus*, *Eremocitrus* and *Microcitrus* showed considerable resistance to HLB, and most PCR (polymerase chain reaction) tests were negative for HLB. Even after six years of observation, four of five surviving finger lime plants remained HLB negative.”

This matches observations by those who have grown finger limes that they don't appear to show any symptoms of HLB when grown in affected areas. The Division of Plant Industry's Citrus Arboretum in Winter Haven is a good example of this. There are many infected citrus trees in the arboretum, but the finger limes remain healthy and asymptomatic.

## BREEDING EFFORTS

Horticulturally, finger limes are both graft and sexually compatible with citrus. To retain the characteristics that deter psyllid feeding and HLB tolerance or resistance, new genetic combinations are being created at the Citrus Research and Education Center (CREC) by hybridizing finger limes and their close relatives with conventional citrus. Using both conventional and somatic cell fusion techniques, a large population of diploid, triploid and tetraploid hybrids have been produced. Hybrid status is confirmed using molecular markers.

Diploid and triploid progeny were created using conventional breeding between selected monoembryonic citrus cultivars with pollen obtained from finger lime accessions at the USDA-Agricultural Research Service National Germplasm Repository for Citrus and Dates in Riverside, California.



**Figure 3.** A comparison between a finger lime leaf, a sweet orange leaf and a finger lime somatic hybrid with sweet orange leaf. The solid bar at the bottom represents 1 centimeter for scale.

Tetraploid progeny were created using the process of somatic fusion, which is an additive process that combines the DNA of two parents. It is hoped that this process will be able to create new citrus cultivars that combine the best attributes from each parent: the spherical juice vesicle trait from the finger lime coupled with lower acidity, larger size and sweetness from the other sweet orange/mandarin parent (see Figure 3).

## FIELD EVALUATION

Field evaluation of finger lime accession (DPI-50-36) is underway to better understand the rootstock and nutritional requirements for optimum growth under Florida conditions. The first experiment is testing various commercial rootstocks to determine which works best for finger limes under Florida conditions.

A replicated trial with several rootstocks under three nutritional regimens

[6-month controlled release fertilizer (CRF), 6-month CRF with additional micronutrients, and fertigation] will evaluate traits including plant growth, fruit/juice vesicle characteristics and tolerance to HLB. Results from the research should help growers assess whether or not the finger lime could be a viable addition to their citrus portfolio and that could be commercially cultivated as a niche specialty crop.

## CURRENT AVAILABILITY AND CHALLENGES

If growers would like to get started growing finger limes, there are currently only a few varieties available from the Florida Citrus Budwood Program: DPI-50-36, DPI-205-1 and DPI-205-4 (the giant finger lime, which may be a hybrid, as the fruit are a more typical lime shape).

According to Peter Chaires, executive director of Florida's New

Varieties Development & Management Corporation, "There are between 7 and 10 acres of finger limes being cultivated statewide. The most significant challenge for cultivation has been the harvest, due to the thorniness of the bushes/trees. Commercial harvesting crews are not very interested in work-

*There are currently only a few varieties available from the Florida Citrus Budwood Program.*

ing with these." He says development of a thornless finger lime would be wonderful.

Chaires says he has "seen a wide range of flesh and rind colors, including pink red, burgundy and lavender. They are quite popular with upscale restaurants and food service." He has seen the finger limes served with salads, fish and other meat and vegetable dishes and swirled into salad dressings. The finger lime juice vesicles can be quite versatile as a garnish.

The process for importation of budwood (VI 697 accession) from California's Citrus Clonal Protection Program is underway. The accession is commercially grown in California. The process for importation of several red pulp finger limes from Australia is also underway. Several seedling selections are currently being evaluated at the University of Florida's CREC. Superior line(s) selected for color, size and hardness from the CREC selections will be made available to Florida growers in the near future. 🍊

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