

CITRUS

Citrus covers approximately 500,000 acres in Florida and accounts for more than \$9 billion in economic activity annually in the state. Almost 90 percent of oranges grown in Florida are processed into juice, but the state is also known for producing fresh citrus, including grapefruit and tangerine. Citrus is the most important agricultural commodity grown in Florida, with a rich history in the state and its culture. Early Spanish explorers introduced citrus trees to Florida, planting them near St. Augustine. Citrus caught on quickly, and cultivated sweet oranges could be found in the St. John's River basin and in the Tampa Bay area. Just after the Civil War, the citrus industry reached a production milestone of 100 million boxes and peaked at a production of 250 million boxes. Production has declined in recent years because of urbanization and devastating disease outbreaks, including citrus greening and canker. But the Florida citrus industry still thrives south of Interstate 4, with 8,000 Florida growers responsible for more than 75,000 jobs.

From the Beginning

The UF/IFAS citrus breeding program began in the mid-1980s to develop scions and rootstocks that resist disease and withstand the cold. Initially, researchers adapted emerging biotechnologies to assist with the breeding effort. Key discoveries included a hybridization program to develop seedless triploid fresh fruit varieties adapted to the Florida environment and tree-size-controlling, disease-resistant rootstocks that feature high-density planting and early production. Since 1991, UF/IFAS plant breeders have also been developing cold-hardy cultivars for North Florida, using *Poncirus trifoliata*, a nonedible citrus, as the donor species for the cold-resistant trait. From 1996 to 2008, approximately 40 cold-hardy citrus genotypes were selected, representing mandarin-, grapefruit- and sweet-orange-like fruits. Recent releases of the UF/IFAS citrus breeding program include the first UF-developed citrus cultivar, the Sugar Belle® brand 'LB8-9' (USPP21,356), a high-quality mandarin hybrid, and sweet-orange cultivars for processing to enhance the quality of juice, including the Valquarius™ brand 'SF14W-62' (USPP21,535), an early-maturing Valencia selection that can be harvested 6–8 weeks earlier, and the Valenfresh™ brand 'N7-3' (USPP21,224), a seedless late-season Valencia selection that holds quality into June. The program also recently released a red-grapefruit-like hybrid '914' (USPPAF) that may prove to avoid interactions with medications and a seedless mandarin '950' (USPP23,359) that may allow Florida growers to compete with imported Clementines.

Today and Tomorrow

The UF/IFAS citrus breeding program is focusing its current efforts in several areas — breeding improved sweet oranges, breeding improved fresh fruit selections, and breeding improved rootstocks. To improve sweet oranges, the program has worked on developing early-maturing, mid-season selections with fewer seeds and improved juice color and flavor, as well as late-maturing, high-quality juice selections that will stay on the tree into the summer to expand

the harvesting season. A priority for the program is to develop cultivars resistant to industry-threatening diseases, including Huanglongbing (citrus greening) and citrus canker.

The fresh fruit breeding program has been researching easy-to-peel tangerine varieties with different maturity dates; grapefruit and pummelo varieties with a range of maturity dates and canker resistance; and seedless lime and lemon selections with improved quality, disease resistance, and cold-hardiness. All of these will provide new marketing opportunities for Florida growers.

The program has also been developing improved rootstocks for Florida, with the goal of generating rootstocks that will allow sustainable and profitable production in various growing regions of the state. Rootstocks will need to have wide soil adaptation, cold-hardiness, tree-size control, salinity tolerance, and disease and nematode resistance (including blight, Citrus tristeza virus, Phytophthora, Diaprepes, and Huanglongbing). The program expects to release its first rootstocks in the near future, featuring semi-dwarf rootstocks with early production and improved disease resistance.

The survival and long-term viability of the Florida citrus industry are in jeopardy at this point in time, as a consequence of the devastation caused by the statewide spread of Huanglongbing. In response, the citrus breeding program is sharply focused on providing genetic solutions to this disease, using all available technologies. This includes looking at rootstock and scion performance from the many field trials established throughout the state. Already, some experimental rootstocks appear to be conferring significantly greater tolerance of the disease than those that are commercially available. Citrus breeders are using genomic tools to understand mechanisms of tolerance seen in genetically diverse selections to improve disease resistance. UF/IFAS citrus breeders are also placing greater emphasis on fruit quality, based on rapidly changing consumer expectations and demands for better health benefits, as well as the novelty of new products. The goal is to provide a suite of high-quality citrus cultivar options from which innovative growers and businesses can select and choose products to drive the industry forward.



Citrus Varieties and Selections Released from 2002

Release Date	Title
4/13/06	Sugar Belle® 'LB8-9' (USPP21,356) - Mandarin Hybrid Cultivar
4/19/09	Valenfresh™ 'N7-3' (USPP21,224) - Sweet Orange Cultivar
4/19/09	Valquarius™ 'SF14W-62' (USPP21,535) - Sweet Orange Cultivar
1/25/11	'5-1-99-5' (PPAF) - Red Pummelo Cultivar
1/25/11	'N40W-6-3' - Mandarin Selection
1/25/11	'T2-21' - Sweet Orange Selection (Valencia Somaclone)
1/25/11	'B9-65' - Sweet Orange Selection (Valencia Somaclone)
1/25/11	'411' - Mandarin Selection
1/25/11	'900' - Mandarin Selection
1/25/11	'950' (USPP23,359) - Mandarin Cultivar
10/17/11	53 Lemon Selections
4/19/12	'C2-5-12' - Red Pummelo Selection
4/19/12	'OLL-8' - Sweet Orange Selection
4/19/12	'914' (USPPAF) - Pummelo Grapefruit Hybrid Cultivar
4/19/12	'5-1-99-2' - Red Pummelo
1/22/13	C4-15-19 - Mandarin Selection
1/22/13	'N13-32' - Hamlin Sweet Orange Selection
1/22/13	'11-1-24' - Low-Seeded Midsweet Orange Selection

Varieties Introduced from Brazil — Evaluated and Made Available by UF/IFAS

10/7/09	Ouro - Sweet Orange
10/7/09	Rosa - Sweet Orange
10/7/09	Seleta Agrocitros - Sweet Orange
10/7/09	Seleta Branca - Sweet Orange
10/7/09	Seleta Vermelha (EarlyGold) - Sweet Orange
10/7/09	Serra D'Agua - Sweet Orange



RESEARCHER CONTACT

Fred G. Gmitter, Jr.
 UF Research Foundation Professor, Citrus Genetics
 Citrus Research and Education Center
 863-956-1151 • fgmitter@ufl.edu

Jude W. Grosser
 Professor, Plant Cell Genetics
 Citrus Research and Education Center
 863-956-8680 • jgrosser@ufl.edu

José X. Chaparro
 Associate Professor, Fruit Tree Breeding & Genetics
 Horticultural Sciences Department
 352-392-1928 • jaguey58@ufl.edu