Rootstocks	Year of first avail.	Seed germination*	Seedling uniformity	Tree size	Spacing	Yield per tree	Yield per acre	Juice quality	Fruit size	Salinity	High pH
citrange	1994	80%-90%	80%-90%	1	8-10	1	I-H	H/I	1	[P-I]	Р
zo citrange	1932	>90%	90%	Lg	8-12	Ĥ	I-H	I-H/I	I-Lg	Р	Р
patra mandarin	1932	>90%	99%a	Lg	8-15	L-I	I	H/H	Sm	G	1
uske eitrange	1932	80%-90%	80%-90%	Lg	8-12	[H]	I-H	1/1	I/Lg	[P-1]	[P]
orange	Long established	>90%	91%	I-Lg	8-12	I-H	I-H	H+/H	I	G	G
gle citrumelo	1974	>90%	95%	I	8-12	Ţ	I	1/1	I	р	р
02	2007	>90%	98%	LG	12-14	Н	I	L-I/I	Lg		[I]
12	2001	>90%	96%	I	10-12	H	Н	H/H	I		G
	2007	>90%	98%	Sm	8-10	L,	H	H/H	Sm-I		[1]
42	2010	>90%	26	Sm-I	8-10			C	I	_	
amer lemón	IOW TO) USE	etne	e ne	2W	F101	I aa	LIT	ru	S	

Rootstock Selection Guide

By Rhuanito S. Ferrarezi, William S. Castle, Kim D. Bowman, Jude W. Grosser, Stephen H. Futch, Steve Rogers and Andres Gonzalez

irst published in 1989 as Rootstocks for Florida Citrus, the work of William Castle and his colleagues remains relevant 30 years later. The purpose of the fourth edition of the Florida Citrus Rootstock Selection Guide is to provide timely and useful citrus rootstock information to help Florida citrus growers make well-grounded, practical decisions. New problems with abiotic factors, pests and diseases make the guide a standard document for the Florida citrus industry. Initially published as a book, it is now a web-based Expert System with an interactive table with 21 characteristics of 48 rootstocks.

Much has changed within the Florida citrus industry since the discovery and spread of huanglongbing (HLB) disease. Rootstocks were not initially part of the discussion related to managing HLB, but that has changed, particularly given the accumulating evidence that trees on various rootstocks may differ in the incidence or tolerance of the disease.

The authors of the new guide have prepared this timely and necessary update of the former editions and have expanded the list of rootstocks. Information on the UFR series has been revised, and three new U.S. rootstocks (SuperSours) have been added that have not yet undergone the usual extensive field evaluation in Florida. These new rootstocks offer improvements regarding HLB tolerance and



Use SOAR® Citrus Mix post-bloom

- ✓ Increase available nutrients
- ✓ Correct mineral deficiencies
- ✓ Stimulate growth
- ✓ Create higher yields
- ✓ Improve fruit quality



CHEMICAL DYNAMICS Our Business Is To Help You Grow 4206 Business Lane | Plant City, Florida | 33566

Always read and follow label directions carefully. Soar[®] is a registered trademark of Chemical Dynamics, Inc. ©2020 Chemical Dynamics. All Rights Reserved.

800.277.4950 CHEMICALDYNAMICS.COM

several other meaningful traits, such as tree size, high yield and juice quality that appear essential to the future of the citrus industry.

INTERACTIVE WEB VERSION

The revised guide is available as an Electronic Data Information Service document at https://edis.ifas.ufl.edu/ hs1260 and online at http://flcrsg.com and https://crec.ifas.ufl.edu/extension/ citrus_rootstock. Interested parties are strongly encouraged to visit the online website since it offers a considerably expanded opportunity to interact with the rootstock information.

The University of Florida Institute of Food and Agricultural Sciences (UF/ IFAS) plant improvement and U.S. Department of Agriculture (USDA) Agricultural Research Service (ARS) citrus rootstock teams also present up-to-date data about rootstock field trials available at https://citrusresearch. ifas.ufl.edu/rootstock-field-data and https://citrusrootstocks.org, respectively (Figure 1, page 18).

The guide is supported by over 100 downloadable citations related to rootstock and trait. Furthermore, users of the website version can query the tabulated and background information via customized searches. Users may answer a brief questionnaire generated from the Expert System to calculate the best selection for a Florida citrus rootstock.

The Expert System complements the static rootstock table. Its essence is a series of questions asked in the form of a short interview to identify a user's specific set of circumstances or potentially limiting factors. The

system can reason through answers to select the best rootstock and 1) provide a measure of confidence that certain rootstocks are good matches for a site, 2) easily test different rootstock planting scenarios, 3) provide a second opinion regarding initial rootstock choices and 4) provide rootstock suggestions and options growers may not have considered.

More details about the system are available at https://journals.flvc. org/fshs/article/view/106037/101689. Briefly, the closer in value the selection score for a rootstock is to 100, the closer the match of that rootstock is for the grower's described situation. Results are normalized so the maximum value is 100 (making it easy to compare results within and between separate runs).

ROOTSTOCK CATEGORIES AND RATINGS

The rootstock information provided is a broad-based compilation of Florida information collected from field trials and commercial situations. The information is general in nature as it represents essentially "average" rootstock behavior across a range of conditions related mostly to scion variety and site conditions.

The quality of information varies due primarily to the time period of evaluation. Thus, the rootstocks have been grouped accordingly into three categories:

1) Most used rootstocks are commercial rootstocks with a long history of use and are the ones for which the descriptions are the most reliable (highlighted in blue)

2) Minor use rootstocks include those that have been in minor commercial use for a while and others that were prominent at one time but have faded in importance as newer rootstocks were introduced and adopted commercially (highlighted in green). The information presented for most of the rootstocks in this category is reliable but is sometimes not as fully developed as with the most used commercial rootstocks.

3) Recently released rootstocks were more recently created in breeding programs and have been under evaluation in Florida for only a few years (highlighted in yellow), eventually selected from field trials and small



TGF 7900 R - 75 HP 4 CYLINDERS TURBO DIESEL ENGINE COMMON RAIL, 232 CUBIC INCH, TORQUE 240 FOOT-POUND AT 1600 RPM | Front steering with actio[™], integral chassis with longitudinal oscillation up to 15° degree - 16x16 Transmission with synchro shuttle - Independent pto 540/540 e and ground speed pto - Hydraulic pump 13.2 gallons/min with oil cooler - Super low profile safe spray "Protector" Cab 5'9" tall with powerful air conditioning system - With front tires 300/80-15.3 and rear 360/70 R20 outer width 55 inches (minimal possible outer width 47 inches) - Weight 5910 lbs.

THE SUPREME TRACTOR



Sprout Guards may also be custom ordered to any size needed, regarding mechanical harvesting.



Don't have time to sprout trees?

Grow them tall and straight with Sprout Guards.

Call today for pricing

Mike Hurst Citrus Services, Inc. (863) 443-0531, hurstcitrus@amail.com

FOUR GENERATIONS of FLORIDA CITRUS NURSERIES



Black Sprout Guards, 8"x18"

BEST WRAP, BEST PRICE

AND BEST SERVICE



WINTER GARDEN, FLORIDA

www.blue-heron-nurseries.com





Figure 1. TOP: University of Florida Institute of Food and Agricultural Sciences rootstock trial at Orie Lee Family Groves in St. Cloud, Florida, with 6-year-old OLL sweet oranges on UFR-2, UFR-1, UFR-4 and UFR-6. Trees have been grown the past four years with no formal psyllid control program but have been supplemented with controlled release fertilizer (photo from May 2020). BOTTOM: U.S. Department of Agriculture rootstock trial in St. Lucie County with 4-year-old Valencia sweet oranges on sour orange, SuperSour 3 and Swingle.

commercial cooperative trials. Recently released rootstocks have limited commercial experience.

It is also important to note that in rating rootstocks, the differences for a stated factor are sometimes based on a combination of visual observations and data. Tree height, for example, is essentially a relative rating based on the standard of comparison. A tree on a rootstock rated as "large" would be equivalent in height to a mature tree on rough lemon rootstock. On the other hand, a rootstock's rating regarding citrus nematode or phytophthora tolerance is fundamentally based on quantitative screening trials plus commercial experience.

MORE INFORMATION

Users should open http://flcrsg. com and click Expert System in the upper menu or link to Expert System on the landing page. A series of screens will appear to assist you in selecting your specific situation. The line of questioning is determined on a caseby-case basis depending on how the interview develops. The system uses its rules to match and score input against the 1,008 possible factors in the guide (combination of 21 traits and 48 rootstocks).

The user is presented a report with a ranked list of rootstocks that, *on average*, are top candidates for the given situation. A good match is 100 percent, while a result closer to 0 percent indicates the opposite. The rankings are based on a "selection score" (not a statistical value), referring to a relative ranking of the expert system's confidence score suggesting rootstocks suitable for the site situation described during the interview process. The Expert System does not keep or archive information provided by users, but users can print a copy of their reports.

A comprehensive table shows the descriptive information presented in the guide and used in the Expert System query. This includes the year of first commercial availability, several horticultural traits (seed germination, seedling uniformity, tree size, suggested in-row spacing, yield/tree, yield/acre, juice quality and fruit size), tolerance to biotic stresses (salinity, high pH, clay soil, wet soil, drought and freezes) and to diseases and pests (HLB incidence, blight, Phytophthora nicotianae, P. palmivora/diaprepes weevil complex, burrowing and citrus nematodes, xyloporosis, exocortis and tristeza).

CONCLUDING REMARKS

The knowledge about rootstocks changes rapidly. This new edition of the guide consolidates information to assist growers in making scientifically sound decisions about what to plant to maintain a strong and profitable citrus industry.

Acknowledgments: The authors thank James Graham, David Tucker, Alfred Krezdorn (deceased), Charles Youtsey (deceased), Andrew Persaud and Jamie Burrow. Funding provided by Citrus Research and Development Foundation project #18-13 and U.S. Department of Agriculture National Institute of Food and Agriculture Citrus Disease Research and Extension Program project #2018-70016-27453.♥

Rhuanito S. Ferrarezi is an assistant professor, William S. Castle is an emeritus professor, Jude W. Grosser is a professor, Stephen H. Futch is an emeritus Extension agent, and Andres Gonzalez is a research assistant — all with UF/IFAS. Kim Bowman is a research geneticist at the USDA/ARS in Fort Pierce. Steve Rogers is chief executive officer of Ecostat.



SPECIALIZED RISK MANAGEMENT FOR THE AGRICULTURE INDUSTRY Carden & Associates, Inc. 888.296.7533 www.cardeninsurance.com



Citrus This Week

Get the latest citrus industry news sent direct to your e-mail every week. Visit **CitrusIndustry.net** and sign up for the **Citrus Industry This Week** e-newsletter.