

Rootstock Options for Grapefruit Varieties Suggested by Field Research Conducted in the Indian River Region*

Bill Castle, Professor Emeritus, UF/IFAS/Citrus Research and Education Center, Lake Alfred



....with inputs from Drs. Fred Gmitter and Jude Grosser, CREC/Lake Alfred

bcastle@ufl.edu

[863] 206-8687

fgmitter@ufl.edu

[863] 956-1511

jgrosser@ufl.edu

[863] 956-1151

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Sour orange has been the Indian River's preeminent rootstock with a long successful history of use for grapefruit varieties. Citrus tristeza virus used to be the only concern among growers with trees on sour orange, but now there are other problems such as greening disease and *Diaprepes* weevil. Are there any new rootstock options beyond sour orange? Yes.

Many growers have cooperated with us in trials on their property in the River region as we have searched for rootstocks with attributes similar to the desired ones of sour orange. The results of the older trials were published and are available on the CREC Rootstock Selection Guide website:

http://www.crec.ifas.ufl.edu/extension/citrus_rootstock/templates/guide/. Go to the website and search <grapefruit>.

Listed below are two of those publications, each with an edited abstract and pertinent information highlighted regarding the most promising rootstocks. These trials were conducted primarily when blight was of foremost concern. Canker and HLB had not yet caused any changes in production practices among the trial sites.

The third trial described below was active until recently. *HLB affected the trial with differences apparent among rootstocks.*

1. Castle, Bowman, Baldwin, Grosser and Gmitter. 2011. **Rootstocks Affect Tree Growth, Yield, and Juice Quality of 'Marsh' Grapefruit.** HortScience 46(6):841–848.

http://www.crec.ifas.ufl.edu/extension/citrus_rootstock/Rootstock_Literature/Castle%20et%20al.%20Becker%20Hobe,%20HS.%20Hobe%20Sound%20Marsh%20Rtstk.pdf

This trial was conducted on a site just west of Hobe Sound. The 'Marsh' grapefruit trees were planted in June 1995. Formal data were collected until 2004. More than 40 rootstocks were evaluated. Cropping began and yield was first recorded when the trees were two years old.

Abstract. Two adjacent rootstock trials were conducted in the east coast Indian River region of Florida with 'Marsh' grapefruit scion. The objective was to find rootstocks to replace sour orange because of losses to citrus tristeza virus, and to replace Swingle citrumelo because of its limited usefulness in

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certain poorly drained coastal sites. The trials were conducted in randomized complete blocks with 12 single-tree replicates with trees spaced 15 x 22 ft. The soils were of the Wabasso and Riviera series. The first trial consisted largely of trees on citranges and citrumelo rootstocks, 'Cipo' sweet orange and various hybrid rootstocks. The second trial involved mandarin rootstocks and sour orange and related rootstocks. Trees were grown for 7 years. Yield and juice quality data were collected for the last 4 years of that period. Those rootstocks identified as the most promising, based on combinations of smaller tree size and high productivity and juice quality, were a USDA Sunki mandarin x Flying Dragon trifoliate orange [TF] hybrid [same parentage as US-942], two Sunki mandarin x Swingle trifoliate orange hybrids (C-54, C-146), C-35 citrange, and a Cleopatra mandarin x Rubidoux TF hybrid (x639). The trees on these five rootstocks cropped well leading to soluble solids (SS) values of 2,700 to 3,000 PS/acre when they were 7-years old. The trees on C-54 and C-146 were relatively large, somewhat taller than trees on sour orange, whereas those on C-35 and the Sunki x Flying Dragon hybrid were smaller and similar to sour orange in tree height. Juice quality among the trees on C-35 and the Sunki x Flying Dragon hybrid was relatively high with SS concentrations better than sour orange while fruit from trees on the other three rootstocks had lower solids concentration than sour orange. The trees on C-35 and the Sunki x Flying Dragon hybrid would be good candidates for higher density orchards.

2. Castle. 2012. **Horticultural and Economic Impact of Rootstocks on Fresh-market 'Marsh' Grapefruit.** HortScience 47(8):1007–1013. 2012.

http://www.crec.ifas.ufl.edu/extension/citrus_rootstock/Rootstock_Literature/2012%20Greene.%20HS,%20Greene%20Rtsttk%20Trial.pdf

This trial was located off of Orange Avenue, west of Fort Pierce. The 'Marsh' grapefruit trees on 14 rootstocks were planted in September 1990. Cropping began when the trees were two years old. Yield was first measured at that time and continued for 10 years. In three of those years, the whole crop was harvested from each tree and fruit size distribution measured in the field with a portable sizer.

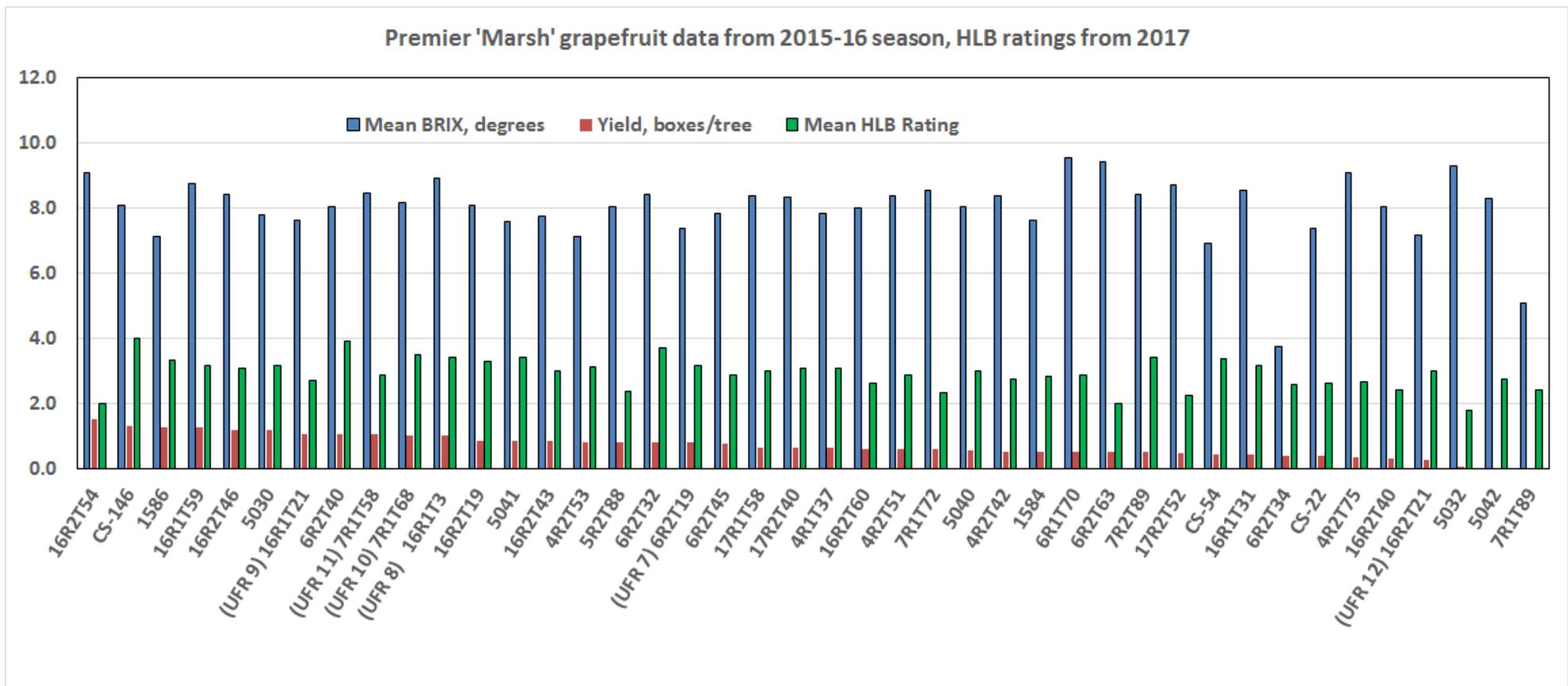
Abstract. A rootstock trial with a 'Marsh' grapefruit scion was established in the flatwoods of the Florida east coast Indian River region in 1990. The trees were planted in an Alfisol of the Pineda series. The trial consisted of trees on 16 rootstocks, primarily citranges, mandarins and various hybrids, in three or six replicates of three-tree plots in a randomized complete block design. Tree growth and survival, yield, and juice quality were measured annually or periodically for 10 years. In three seasons, whole-tree crops were sized in the field. Using the fruit size distribution data, crop value or income/tree was estimated.

Tree height after 10 years ranged from 5.6 to 13.5 ft and survival was greater than 90% with a few exceptions. Mean cumulative yield was 295 boxes/tree and ranged from 16 boxes (Hamlin + Flying Dragon trifoliate orange) to 40 boxes/tree for a hybrid of trifoliate orange x Milam (PTM 1584). At tree age 9 years, mean soluble solids production was 32,100 PS/acre with a 240% difference between the lowest and highest value. There were differences in the distribution among four commercial-sized fruit size categories. When the yield and fruit size data were combined for 3 years and converted to income/tree using commercial Florida Freight On Board prices in November and March, the trees on a trifoliate orange x Milam hybrid (1584) had the highest estimated income (\$354 U.S., March data) followed by Calamandarin (\$321) and Norton citrange (\$292). The lowest income/tree was \$112 (Hamlin + Flying Dragon trifoliate orange). When all data were considered, the best matches to current grower

interest in smaller sized trees, high yield and fruit quality, were the **hybrid 1584** and **C-35 citrange** rootstocks.

3. Castle, Gmitter, Grosser. 2017. **Rootstocks for 'Marsh' Grapefruit with Emphasis on Horticultural Performance and Response to Greening Disease [HLB].**

- This trial was planted in March 2007 at a location off of Highway 60, west of Vero Beach, in E-W double-row beds at 15 x 25 ft. There were plots of mostly 6 trees, replicated 4x, or 24 trees total/rootstock.
- There were 42 rootstocks, mostly citranges created in the CREC plant breeding program plus other hybrids introduced from California and Brazil.
- The trees began bearing at two years of age when yield data were first collected. Yield and juice quality data collection continued for 8 more years.
- The trial trees were rated most years for the incidence and tree effects of HLB. Additionally, in October 2014, the CREC plant breeding team hosted a field day in which the 50 or so folks attending were asked to walk through the Marsh trees and mark on a map all the "good" trees they saw regarding tree and fruit condition. Those marked maps were collected and the data compiled.
- **The Good news?** The best trees as discerned by growers in 2014 have remained largely the same when reassessed in 2017.
- Recent data and ratings are presented in the **figure below** with rootstocks annotated with their **UFR release number**.
- Among the top performing 20-25% of rootstocks were:
 - **C-146**
 - **UFR 8, 9, 10 and 11.**



The HLB ratings: 0 = dead; 1 = obvious HLB visual limb/leaf symptoms with tree stunting and fruit drop; 2 = leaf symptoms present with some tree decline but less so than for a tree rated 1 and some fruit drop; 3 = mild HLB leaf and limb symptoms, but tree in fairly good condition with little fruit drop ; 4= some leaf symptoms, little effect of HLB with light fruit drop; good crop; 5 = few symptoms; little to no fruit drop; good crop of wholesome fruit. NOTE: Ratings are the average across all trees on each rootstock.