



Photos by Martin Zapfen

Figure 1. Trial 1: UF 5-1-99-2 pumelle (A) and Star Ruby grapefruit (B) on US-942 rootstock, and UF 5-1-99-2 pumelle trees on US-942 (C), sour orange (D) and X-639 (E). Trial 2: Ray Ruby grapefruit on US-812 (F) and on Orange 16 (G) rootstocks. (All photos were taken in March 2021.)

Indian River Millennium Block shows rootstock effects

By Rhuanito S. Ferrarezi, J. Martin Zapfen-Macias, Mac Hossain, Tom James, Ronald D. Cave, Peter Spyke, William S. Castle, Jude W. Grosser, Fred Gmitter and Ed Stover

In the last decade, huanglongbing (HLB) has reduced production of Florida grapefruit by 75%, mandarin by 78% and sweet orange by 52%. This decrease is significant for the Indian River District, which produces approximately 80% of the total grapefruit crop grown in Florida (National Agricultural Statistics Service, 2021).

Several strategies have been considered to keep citrus groves productive in HLB times. Rootstock field trials are cost-effective since vigorous, healthy rootstocks enhance disease tolerance of the scion and boost yields that increase growers' profits.

University of Florida Institute of Food and Agricultural Sciences (UF/

IFAS) and U.S. Department of Agriculture Agricultural Research Service (USDA/ARS) breeding programs released many promising selections. However, there are still many questions about their performance concerning microclimates, soil types, production practices and adequate rootstock-scion combinations. Indian River growers can make better decisions about the materials to plant in the HLB era if more information is available.

The Millennium Block variety performance trial was created to evaluate a comprehensive collection of new selections. The project has two overall objectives: 1) assess the performance of new grapefruit scion cultivars with three commercial rootstocks under HLB endemic conditions in the Indian River District and 2) compare grapefruit, navel and mandarin growth and yield among trees on standard

rootstocks, University of Florida rootstocks (UFR) and other recently released rootstocks.

FOUR TRIALS

The project consists of four independent trials.

Trial 1 includes 18 grapefruit cultivars (Table 1) and three commercial rootstocks.

Trial 2 has 36 rootstocks with Ray Ruby grapefruit as the scion. Rootstocks being tested include sour orange, Willits, Cunningham, Kuharske, Cleopatra, Sun Chu Sha, X-639, US-802, US-812, US-897, US-942, US-1283, 2247×2075-02-26, A+Volk×Orange19-11-8, C-22, C-54, C-57, C-146, WGFT+50-7, UFR-1, 2247×6070-02-2, UFR-4, UFR-5, 46×20-04-42, 46×20-04-6 and UFR-7 to UFR-17.

Trial 3 includes rootstocks with Glen 56-11 navel orange as the scion. Rootstocks being tested include Willits, Kuharske, Cleopatra, Sun Chu Sha, X-639, US-802, US-812, US-897, US-942, US-1283, 2247×2075-02-26,

Table 1. Grapefruit scions are being tested on three industry-standard rootstocks (US-942, sour orange and X-639) in Trial 1.

Color	Scion	Type	Origin
Red	US 6-16-172	Pummelo hybrid	USDA
Red	US 6-17-48	Pummelo hybrid	
Pink	US HoneyCoat or US 1-26-51	Pink grapefruit	
White	US Seedless Surprise	Grapefruit hybrid	
Red	US 1-83-179	Grapefruit hybrid	
Red	US 6-17-16	Pummelo hybrid	
White	US 4-4-1	Grapefruit complex hybrid*	
Red	UF N40-16-11-11 or N11-11	Grapefruit	UF
Pink	Summer Gold or UF N2-28	Grapefruit	
Red	UF N40-16-11-7 or N11-7	Red grapefruit	
Red	UF N11-29 or N11-29	Red grapefruit	
Red	UF 914	Pummelo hybrid	
Red	UF N40-16-11-3	Red grapefruit	
Red	UF 5-1-99-2	Pummelette	
Red	UF N40-16-11-15	Red grapefruit	Standard
White	Jackson	Grapefruit	
Pink	Star Ruby	Grapefruit	
Pink	Ray Ruby	Grapefruit	

*Planted in 2020

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Glenn F-56-11 navel orange on



UF-950 mandarin on



Figure 2. Trial 3: Glenn F-56-11 navel orange on C-22 (A) and Willits (B) rootstocks. Trial 4: UF-950 mandarin on US-897 (C) and WGFT+50-7 (D) rootstocks. (All photos were taken in March 2021.)

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A+Volk×Orange19-11-8, C-22, C-54, C-57, C-146, Orange 14, UFR-1, UFR-2, 2247×6070-02-2, UFR-4, UFR-5, 46×20-04-6, UFR-7 to UFR-9 and UFR-15 to UFR-17.

Trial 4 includes rootstocks with UF-950 mandarin as the scion. Trial 4 is testing the same rootstocks as Trial 3, except for the replacement of Orange 14 by WGFT+50-7.

In September 2019, approximately 3,400 trees spaced at 8 by 24 feet (227 trees per acre) were planted. In August 2020, 1,100 new trees were planted, and additional trees will be delivered in the spring of 2021. Standard horticultural practices have been employed according to UF/IFAS recommendations. A three-month controlled-release fertilizer for young trees has been used.

To understand each scion/rootstock combination's performance, researchers are assessing tree size (measuring trunk diameter, tree height and width, and calculating canopy volume), tree phenological stage progress (from vegetative to production stage), the incidence of HLB [measuring the *Candidatus Liberibacter asiaticus* (Clas) bacterial titer] and Asian citrus psyllids as well as other pests and diseases of economic importance.

EARLY FINDINGS

The following summary data reflect the phenotypic characteristics after approximately 18 months of growth (February 2021). Although the trials are independent, rootstock performance varied according to the scions used.

In Trial 1 (grapefruit), UF

5-1-99-2 pummelette developed a canopy volume approximately five times larger than Star Ruby trees, which were smaller and more compact (Figure 1, page 18). Within the same evaluation, US-942 rootstock significantly induced a larger canopy volume and trunk diameter than sour orange and X-639 (Figure 1, page 18).

In Trial 2, Ray Ruby grapefruit trees on US-812 developed the most robust and dark green canopy color and are approximately three times larger than trees on Orange 16 (Figure 1, page 18).

In Trial 3, Glenn F-56-11 navel orange trees on C-22 showed more branches, which resulted in a canopy volume approximately twice as large as trees on Willits, which has produced the smallest canopy among the rootstocks evaluated (Figure 2).

In Trial 4, UF-950 mandarin trees on US-897 grew two times larger than trees on WGFT+50-7 (Figure 2, page 20).

HLB INCIDENCE

Asian citrus psyllids have been more abundant in the field as temperatures increase (March) and during new flush emergence (after fertilization in February). Lab analysis from August 2020 for HLB showed that while some trees are becoming CLas-infected, other trees within the treatment have not been affected by the disease yet. The treatment produces a diagnosis result that is HLB-free (cycle threshold > 32). However, the infection spreads as the number of CLas-infected plants increases.

TAKE-HOME MESSAGE

Overall, trees are growing well, with rootstock effects becoming apparent among different cultivars. This field evaluation will continue to track the impact of each combination's current vegetative attributes during the production time. The research aims to assist growers in the rootstock selection process with reliable data about the most biologically and economically tolerant materials for the Indian River region.

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