# CRDF Rootstock Trials Report 2019

## Field trial evaluation of horticultural traits

Evaluations of field trials are ongoing using standardized CRDF protocols for data collection of HLB disease incidence and horticultural traits. During the first and second quarter of 2019 horticultural data, tree height (m), canopy volume ($m^3$) and trunk cross-sectional area (TCSA $cm^2$) were collected and analyzed for differences among rootstocks in each site. HLB disease index (DI) is rated on a scale of 0 to 5 on two sides of the canopy, with 0 denoting no visual HLB symptoms and 5 severe tree decline on more than 80% of the canopy. The maximum possible score for DI is 10. Leaves for PCR sampling are collected in January or February of each season for processing at the Southern Gardens Citrus Diagnostic lab. Trees are considered positive for HLB if the Ct value is 32 or lower. Leaves for assessment of nutrient status are collected in July or August for analysis at Waters Lab in Camilla, GA.

## Data analysis

All sites are planted in a completely randomized design with 5 replications per rootstock. Data are analyzed using mixed model analysis procedure GLMMIX using SAS® software with the appropriate comparisons to test for differences among rootstock means when it is appropriate. Rootstock data are analyzed within each site but not compared across sites. Results for the two ridge sites (BHG and Peace River) and one flatwoods site (Duda) are presented for all rootstocks. However, keep under consideration that UFR-16 was planted later at BHG and Peace River locations.

**Duda Rootstock Trial**, Felda, FL (Southwest)

The trial is planted in a completely randomized design (CRD) with five replications of each rootstock budded with 1-14-19 Valencia. All trees were planted on March 18-19, 2015. The rootstocks are US-942, US-812, UFR-2, UFR-3, UFR-4 and UFR-16, with Swingle citrumelo as a standard for comparison. Eight sentinel trees were randomly assigned to each plot at planting for data collection.

*Horticultural trait, HLB disease evaluation and leaf nutrient status*

Based on data collected from the trial in March 2019, there are significant differences ($p < 0.05$) among rootstocks for canopy volume, trunk cross-sectional area, tree height and HLB disease index (Table 1). For these criteria, rootstock performance rankings from the best to the least are as follows: US-942, UFR-4, US-812, Swingle, UFR-2, UFR-16, and UFR-3. The rootstocks that grew the best tend to have lower HLB DI ratings. HLB incidence for all rootstocks combined is 0.2 % in 2016, 21.4 % in 2017, 56.0 % in 2018 and 73.4% in 2019. (Table 5). There is no difference among rootstocks in HLB disease progress measured either by visible DI or PCR. Leaf analysis confirms that most nutrients are in the optimum range except Mg which is in the low range and Cu which is in the excess range, probably due to residue from applications for foliar and fruit bacterial or fungal disease control (Table 2).

*Fruit yield and juice quality*

Based on data collected from the trial in March 2019 for yield (boxes/tree and boxes/acre) and juice (lbs solids/box and lbs solids /acre) significant differences ($p < 0.05$) among rootstocks are found. For these criteria, rootstock performance rankings from the best to the least are as follows: US-942, US-812, UFR-

4, UFR-2, Swingle, UFR-16, and UFR-3 (Table 3). Few significant differences are detected among rootstocks in juice quantity and quality (Table 4).

*Table 1. **Duda** rootstock trial horticultural traits and HLB Disease Index means ± standard error in May 2019*

| Rootstock | Canopy volume ($m^3$) | TCSA ($cm^2$) | Tree height (m) | HLB DI (max. 10) |
|---|---|---|---|---|
| Swingle | 8.6 ± 0.5 BC | 53.5 ± 2.3 A | 2.18 ± 0.04 BC | 4.1 ± 0.2 A |
| UFR-16 | 7.6 ± 0.5 CD | 51.9 ± 2.3 A | 2.09 ± 0.04 C | 4.6 ± 0.2 A |
| UFR-2 | 8.8 ± 0.5 ABC | 53.1 ± 2.3 A | 2.15 ± 0.04 BC | 3.7 ± 0.2 A |
| UFR-3 | 5.8 ± 0.5 D | 38.5 ± 2.3 B | 1.90 ± 0.04 D | 4.5 ± 0.2 A |
| UFR-4 | 10.6 ± 0.5 AB | 61.7 ± 2.3 A | 2.39.1 ± 0.04 A | 4.2 ± 0.2 A |
| US-812 | 10.1 ± 0.5 AB | 56.3 ± 2.3 A | 2.29 ± 0.04 AB | 3.5 ± 0.2 A |
| US-942 | 11.1 ± 0.5 A | 60.3 ± 2.3 A | 2.43 ± 0.04 A | 3.9 ± 0.2 A |

Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 2. **Duda** rootstock trial leaf macro- and micronutrient concentrations in August 2019*

| | N % | P % | K % | Mg % | Ca % | S % | B ppm | Zn ppm | Mn ppm | Fe ppm | Cu ppm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Swingle | 2.7 | 0.19 | 1.9 AB | 0.25 AB | 3.3 | 0.31 | 84 | 40 | 51 | 72 | 70 |
| UFR-16 | 2.5 | 0.18 | 1.9 A | 0.28 AB | 3.2 | 0.30 | 85 | 37 | 48 | 77 | 78 |
| UFR-2 | 2.6 | 0.19 | 1.9 ABC | 0.28 AB | 3.3 | 0.30 | 82 | 39 | 52 | 78 | 80 |
| UFR-3 | 2.6 | 0.19 | 1.8 A | 0.28 AB | 3.1 | 0.31 | 93 | 46 | 60 | 83 | 88 |
| UFR-4 | 2.7 | 0.19 | 1.7 C | 0.29 A | 3.5 | 0.32 | 91 | 48 | 66 | 85 | 100 |
| US-812 | 2.7 | 0.18 | 1.7 ABC | 0.26 AB | 3.4 | 0.31 | 87 | 39 | 57 | 86 | 69 |
| US-942 | 2.7 | 0.18 | 1.7 BC | 0.25 B | 3.4 | 0.32 | 90 | 43 | 60 | 91 | 84 |

Values represent the mean and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by a different letter differ significantly at the 5% level

*Table 3. **Duda** rootstock trial yield and soluble solids means ± standard error in March 2019*

| Rootstock | Yield boxes/tree | Yield boxes/acre | Lbs solids/box | Lbs solids /acre |
|---|---|---|---|---|
| Swingle | 0.72 ± 0.08 BC | 147.4 ± 17.03 BC | 5.16 ± 0.16 A | 764.8 ± 94.88 AB |
| UFR-16 | 0.61 ± 0.08 BC | 125.8 ± 17.03 BC | 4.30 ± 0.16 B | 546.2 ± 94.88 B |
| UFR-2 | 0.75 ± 0.08 ABC | 153.8 ± 17.03 ABC | 4.93 ± 0.16 AB | 763.7 ± 94.88 AB |
| UFR-3 | 0.53 ± 0.08 C | 109.6 ± 17.03 C | 4.95 ± 0.16 AB | 559.9 ± 94.88 B |
| UFR-4 | 0.82 ± 0.08 ABC | 169.2 ± 17.03 ABC | 4.76 ± 0.16 AB | 803.8 ± 94.88 AB |
| US-812 | 0.94 ± 0.08 AB | 193.1 ± 17.03 AB | 5.25 ± 0.16 A | 1013.3 ± 94.88 A |
| US-942 | 1.10 ± 0.08 A | 225.5 ± 17.03 A | 4.59 ± 0.16 AB | 1040.1 ± 94.88 A |

Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 4. **Duda** rootstock trial juice quality means ± standard error in March 2019*

| Rootstock | Percentage Juice | Total acid | Total brix | Ratio | Juice color |
|---|---|---|---|---|---|
| Swingle | 0.58 ± 0.01 A | 0.78 ± 0.02 A | 9.83 ± 0.23 A | 12.69 ± 0.40 AB | 36.70 ± 0.13 A |
| UFR-16 | 0.55 ± 0.01 A | 0.75 ± 0.02 AB | 8.68 ± 0.23 B | 11.57 ± 0.40 B | 35.68 ± 0.13 C |
| UFR-2 | 0.58 ± 0.01 A | 0.69 ± 0.02 AB | 9.53 ± 0.23 AB | 13.86 ± 0.40 A | 36.48 ± 0.13 AB |
| UFR-3 | 0.56 ± 0.01 A | 0.71 ± 0.02 AB | 9.73 ± 0.23 A | 13.86 ± 0.40 A | 36.26 ± 0.13 AB |
| UFR-4 | 0.56 ± 0.01 A | 0.75 ± 0.02 AB | 9.50 ± 0.23 AB | 12.71 ± 0.40 AB | 35.94 ± 0.13 BC |
| US-812 | 0.58 ± 0.01 A | 0.75 ± 0.02 AB | 9.99 ± 0.23 A | 13.36 ± 0.40 AB | 36.78 ± 0.13 A |
| US-942 | 0.56 ± 0.01 A | 0.66 ± 0.02 AB | 9.14 ± 0.23 AB | 13.82 ± 0.40 A | 36.08 ± 0.13 BC |

Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 5. Incidence of HLB trees based on detection by PCR for the three rootstock trials from 2016-2019*

| Trial site /rootstock | 2016 HLB % incidence | 2017 HLB % incidence | 2018 HLB % incidence | 2019 HLB % incidence |
|---|---|---|---|---|
| ***Duda*** | | | | |
| Swingle | 0.0 | 12.5 | 62.5 | 77.5 |
| UFR-16 | 2.5 | 12.5 | 57.5 | 75.0 |
| UFR-2 | 0.0 | 15.0 | 30.0 | 72.5 |
| UFR-3 | 0.0 | 15.0 | 42.5 | 75.0 |
| UFR-4 | 0.0 | 10.0 | 57.5 | 72.5 |
| US-812 | 0.0 | 15.0 | 55.0 | 62.5 |
| US-942 | 0.0 | 10.0 | 65.0 | 65.0 |
| **Rootstocks combined** | **0.35** | **21.4** | **56.0** | **73.4** |
| | | | | |
| ***BHG*** | | | | |
| Sour | 0.0 | 27.5 | 85.0 | 67.5 |
| *UFR-16 | -- | 5.0 | 30.7 | 47.5 |
| UFR-2 | 2.5 | 22.5 | 52.5 | 80.0 |
| UFR-3 | 0.0 | 5.0 | 57.5 | 82.5 |
| UFR-4 | 2.5 | 20.0 | 75.0 | 75.0 |
| US-812 | 5.0 | 50.4 | 85.0 | 75.0 |
| US-942 | 0.0 | 30.0 | 87.5 | 65.0 |
| **Rootstocks combined** | **1.7** | **21.4** | **73.8** | **70.3** |
| | | | | |
| ***Peace River*** | | | | |
| Carrizo | 0.0 | 72.5 | 72.5 | 67.5 |
| *UFR-16 | -- | 0.0 | 42.5 | 65.0 |
| UFR-2 | 0.0 | 67.5 | 82.5 | 90.0 |
| UFR-3 | 2.5 | 60.0 | 60.0 | 93.3 |
| UFR-4 | 2.5 | 67.5 | 67.5 | 67.5 |
| US-812 | 0.0 | 67.5 | 90.0 | 67.5 |
| US-897 | 0.0 | 65.0 | 62.5 | 72,5 |
| US-942 | 0.0 | 72.5 | 72.5 | 70.0 |
| **Rootstocks combined** | **0.71** | **63.4** | **75.9** | **74.3** |

*UFR-16 planted one year later

**BHG rootstock Trial**, Venus, FL (Ridge).

The trial was planted in a completely randomized design with five replications of each rootstock budded with 1-14-19 Valencia. Eight sentinel trees were randomly assigned to each plot at planting for data collection. Valencia trees on 5 of 7 rootstocks were planted July 2015. The rootstocks are UFR-2, UFR-4, US-942 and US-812, with sour orange as a standard for comparison. Trees on UFR-3 were planted in September 2015 and trees on UFR-16 were planted in June 2016. The trial at BHG was heavily impacted by Hurricane Irma in 2017.

*Horticultural trait, HLB disease evaluation and leaf nutrient status*

Based on data collected from the trial in March 2019, there are significant differences ($P < 0.05$) among rootstocks for canopy volume, TCSA, tree height and HLB disease index (Table 6). Based on these criteria, rootstock performance rankings for each variable ranks from the best to the least are as follows: US-812, US-942, UFR-4, sour orange, UFR-16, UFR-2, and UFR-3. The rootstocks that grew the best have significantly lower HLB DI ratings. HLB incidence for all rootstocks combined is 1.7 % in 2016, 21.4 % in 2017, 73.8% in 2018 and 70.3 % in 2019. (Table 5). Leaf analysis confirms that most nutrients are in the optimum range except Ca which is in the low range and N and B which are in the high range (Table 7). Cu is in the excess range probably due to residue from applications for foliar and fruit bacterial or fungal disease control.

*Fruit yield and juice quality*

For data collected in March and April 2019 for yield (boxes/tree and boxes/acre) and juice (lbs solids/box and lbs solids /acre) there are significant differences ($p < 0.05$) among rootstocks. Based on these criterial, rootstock performance rankings from the best to the least are as follows: US-942, US-812, sour orange, UFR-4, UFR-2, UFR-16, and UFR-3 (Table 8). The lbs solids /acre are substantially lower for UFR rootstocks compared to the others. Few significant differences in juice quality are detected among rootstocks (Table 9).

*Table 6. **BHG** rootstock trial horticultural traits and HLB Disease Index means ± standard error in March 2019*

| Rootstock | Canopy volume ($m^3$) | TCSA ($cm^2$) | Tree height (m) | HLB DI (max. 10) |
|---|---|---|---|---|
| Sour | 2.60 ± 0.12 C | 27.9 ± 0.94 A | 1.57 ± 0.03 CB | 4.38 ± 0.18 A |
| *UFR-16 | 1.96 ± 0.12 D | 16.2 ± 0.94 B | 1.49 ± 0.03 CD | 4.18 ± 0.18 AB |
| UFR-2 | 1.98 ± 0.12 D | 18.2 ± 0.94 B | 1.43 ± 0.03 D | 3.90 ± 0.18 AB |
| UFR-3 | 1.63 ± 0.12 D | 15.3 ± 0.94 B | 1.40 ± 0.03 D | 3.98 ± 0.18 AB |
| UFR-4 | 2.90 ± 0.12 CB | 24.8 ± 0.94 A | 1.62 ± 0.03 B | 3.53 ± 0.18 CB |
| US-812 | 3.46 ± 0.12 A | 28.5 ± 0.94 A | 1.77 ± 0.03 A | 3.10 ± 0.18 C |
| US-942 | 3.17 ± 0.12 AB | 28.5 ± 0.94 A | 1.67 ± 0.03 AB | 2.90 ± 0.18 C |

*UFR-16 planted one year later

Values represent the mean. Letter groupings were obtained using the Tukey-Kramer method.
Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 7. **BHG** rootstock trial leaf macro- and micronutrient concentrations in July 2019*

| | N % | P % | K % | Mg % | Ca % | S % | B ppm | Zn ppm | Mn ppm | Fe ppm | Cu ppm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sour | 2.9 | 0.18 | 2.0 AB | 0.42 | 2.9 | 0.41 | 126 | 25 | 50 AB | 79 ABC | 31 AB |
| *UFR-16 | 3.0 | 0.19 | 2.1 A | 0.44 | 2.6 | 0.36 | 131 | 24 | 43 B | 67 C | 29 AB |
| UFR-2 | 2.8 | 0.19 | 1.9 ABC | 0.45 | 2.7 | 0.38 | 132 | 26 | 51 AB | 82 ABC | 31 AB |
| UFR-3 | 2.9 | 0.20 | 2.1 A | 0.42 | 2.6 | 0.37 | 134 | 27 | 45 AB | 75 BC | 34 A |
| UFR-4 | 3.0 | 0.18 | 1.8 C | 0.45 | 2.7 | 0.38 | 135 | 27 | 51 A | 77 BC | 28 AB |
| US-812 | 3.1 | 0.18 | 1.9 ABC | 0.43 | 2.9 | 0.38 | 121 | 25 | 44 AB | 93 A | 24 B |
| US-942 | 2.8 | 0.18 | 1.8 BC | 0.41 | 2.9 | 0.38 | 130 | 27 | 48 AB | 86 AB | 30 AB |

*UFR-16 planted one year later

Values represent the mean and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by a different letter differ significantly at the 5% level

*Table 8. **BHG** rootstock trial yield and soluble solids means ± standard error in March 2019*

| Rootstock | Yield boxes/tree | Yield boxes/acre | Lbs solids/box | Lbs solids /acre |
|---|---|---|---|---|
| Sour | 0.36 ± 0.02 B | 86.5 ± 4.66 B | 5.03 ± 0.24 A | 436 ± 31.03 B |
| *UFR-16 | 0.08 ± 0.02 D | 20.0 ± 4.66 D | 4.33 ± 0.24 A | 85 ± 31.03 D |
| UFR-2 | 0.17 ± 0.02 CD | 39.9 ± 4.66 CD | 5.12 ± 0.24 A | 206 ± 31.03 CD |
| UFR-3 | 0.08 ± 0.02 D | 19.2 ± 4.66 D | 4.85 ± 0.24 A | 93 ± 31.03 D |
| UFR-4 | 0.20 ± 0.02 C | 47.3 ± 4.66 C | 4.94 ± 0.24 A | 236 ± 31.03 C |
| US-812 | 0.50 ± 0.02 A | 119.5 ± 4.66 A | 4.73 ± 0.24 A | 563 ± 31.03 AB |
| US-942 | 0.51 ± 0.02 A | 123.3 A± 4.66 | 4.73 ± 0.24 A | 585 ± 31.03 A |

*UFR-16 planted one year later

Values represent the mean. Letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 9. **BHG** rootstock trial juice quality means ± standard error in March and April 2019*

| Rootstock | Percentage juice | Total Acid | Total Brix | Ratio | Juice color |
|---|---|---|---|---|---|
| Sour | 0.58 ± 0.01 A | 0.66 ± 0.02 A | 9.7 ± 0.39 A | 14.7 ± 0.62 A | 37.4 ± 0.18 A |
| *UFR-16 | 0.52 ± 0.01 B | 0.64 ± 0.02 A | 9.2 ± 0.39 A | 14.4 ± 0.62 A | 36.8 ± 0.18 A |
| UFR-2 | 0.56 ± 0.01 AB | 0.60 ± 0.02 A | 10.1 ± 0.39 A | 16.8 ± 0.62 A | 37.4 ± 0.18 A |
| UFR-3 | 0.56 ± 0.01 AB | 0.60 ± 0.02 A | 9.6 ± 0.39 A | 16.1 ± 0.62 A | 37.4 ± 0.18 A |
| UFR-4 | 0.57 ± 0.01 AB | 0.65 ± 0.02 A | 9.7 ± 0.39 A | 15.0 ± 0.62 A | 36.9 ± 0.18 A |
| US-812 | 0.57 ± 0.01 AB | 0.63 ± 0.02 A | 9.3 ± 0.39 A | 14.8 ± 0.62 A | 37.4 ± 0.18 A |
| US-942 | 0.55 ± 0.01 AB | 0.62 ± 0.02 A | 9.5 ± 0.39 A | 15.3 ± 0.62 A | 37.5 ± 0.18 A |

*UFR-16 planted one year later

Values represent the mean. Letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

**Peace River rootstock trial**, Babson Park, FL (Ridge).

The trial was planted in a completely randomized design (CRD) with five replications of each rootstock budded with 1-14-19 Valencia. Valencia trees on seven of eight rootstocks were planted in April 2015. The rootstocks were US-942, US-812, UFR-2, UFR-3 (short half of the trees), UFR-4 and UFR-16, with Carrizo citrange as a standard for comparison. Planting of trees was completed in September 2015. Trees on UFR-16 were planted in August 2016. Eight sentinel trees were randomly assigned to each plot at planting for data collection.

*Horticultural Trait, HLB disease evaluation and leaf nutrient status*

For data collected from the trial in March 2019, there are significant differences ($p < 0.05$) for horticultural traits for canopy volume, TCSA, tree height and HLB DI (Table 10). For these criteria, rootstock performance rankings from the best to the least are as follows: US-942, US-812, Carrizo, US-897, UFR-4, UFR-2, UFR-16 and UFR-3. The rootstocks UFR-3 and UFR-16 that grew the least have the highest HLB DI ratings. HLB incidence for all rootstocks combined is 0.71 % in 2016, 63.4% in 2017, 75.9% in 2018 and 74.3% in 2019. (Table 5). HLB infection increased more rapidly in the Peace River trial site compared to the other two sites. It's noteworthy that this site is bordered on all sides by blocks of mature trees, some in severe decline, at time of planting. Leaf analysis confirmed that most nutrients are in the optimum range except Ca and Fe which are in the low range and Cu which is in the high range (Table 11). Cu is in the excess range probably due to residue from applications for foliar and fruit bacterial or fungal disease control.

*Fruit yield and juice quality*

For data collected from the trial for yield (boxes/tree and boxes/acre) and juice (lbs solids/box and lbs solids /acre) there are significant differences ($p < 0.05$) among rootstocks. For these criteria, rootstock performance rankings from the best to the least are as follows: US-942, US-812, Carrizo, US-897, UFR-4, UFR-2, UFR-3 and UFR-16. (Table 12). The lbs solids /acre are substantially lower for UFR-3 and UFR-16 compared to the others. Fewer significant differences in juice quality are detected among rootstocks except for total brix which is highest in US-812 and lowest in UFR-16 planted one year after the other rootstocks (Table 13).

*Table 10.* ***Peace River*** *rootstock horticultural traits and HLB Disease Index means ± standard error in May 2019*

| Rootstock | Canopy volume ($m^3$) | TCSA ($cm^2$) | Tree height (m) | HLB DI (max. 10) |
|---|---|---|---|---|
| Carrizo | 4.9 ± 0.40 ABC | 35.4 ± 2.3 AB | 1.85 ± 0.07 ABC | 3.5 ± 0.20 BC |
| *UFR-16 | 2.2 ± 0.40 D | 18.3 ± 2.3 D | 1.54 ± 0.07 CD | 4.5 ± 0.20 A |
| UFR-2 | 3.2 ± 0.40 CD | 23.1 ± 2.3 CD | 1.60 ± 0.07 BCD | 3.6 ± 0.20 BC |
| UFR-3 | 2.2 ± 0.40 D | 16.6 ± 2.3 D | 1.38 ± 0.07 D | 4.1 ± 0.20 AB |
| UFR-4 | 4.5 ± 0.40 ABC | 33.4 ± 2.3 ABC | 1.85 ± 0.07 ABC | 3.7 ± 0.20 ABC |
| US-812 | 5.0 ± 0.402 AB | 34.0 ± 2.3 AB | 1.90 ± 0.07 AB | 3.8 ± 0.20 ABC |
| US-897 | 3.8 ± 0.40 BCD | 26.6 ± 2.3 BCD | 1.70 ± 0.07 ABCD | 4.0 ± 0.20 ABC |
| US-942 | 5.7 ± 0.402 A | 37.9 ± 2.3 A | 1.98 ± 0.07 A | 3.2 ± 0.20 C |

*UFR-16 planted one year later

Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

*Table 11. **Peace River** rootstock trial leaf macro- and micronutrient concentrations in July 2019*

| | N % | P % | K % | Mg % | Ca % | S % | B ppm | Zn ppm | Mn ppm | Fe ppm | Cu ppm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Carrizo | 2.7 | 0.16 B | 1.6 AB | 0.32 | 2.8 | 0.38 | 81 | 38 | 41 | 55 | 86 |
| *UFR-16 | 2.9 | 0.17 AB | 1.7 AB | 0.33 | 2.9 | 0.41 | 93 | 43 | 45 | 58 | 104 |
| UFR-2 | 2.8 | 0.19 A | 1.7 AB | 0.35 | 2.8 | 0.38 | 91 | 37 | 44 | 59 | 76 |
| UFR-3 | 2.8 | 0.18 AB | 1.8 A | 0.31 | 2.6 | 0.35 | 92 | 39 | 39 | 57 | 91 |
| UFR-4 | 2.9 | 0.19 AB | 1.6 AB | 0.34 | 2.9 | 0.38 | 90 | 34 | 41 | 57 | 75 |
| US-812 | 2.7 | 0.17 AB | 1.6 AB | 0.31 | 2.7 | 0.36 | 84 | 39 | 41 | 56 | 81 |
| US-897 | 2.7 | 0.17 AB | 1.6 B | 0.30 | 2.7 | 0.35 | 77 | 35 | 42 | 55 | 78 |

*UFR-16 planted one year later

Values represent the mean and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by a different letter differ significantly at the 5% level

*Table 12. **Peace River** rootstock trial yield and soluble solids means ± standard error in March 2019*

| Rootstock | Yield boxes/tree | Yield boxes/acre | Lbs solids/box | Lbs solids /acre |
|---|---|---|---|---|
| Carrizo | 0.61 ± 0.05 AB | 183.0 ± 13.8 AB | 5.02 ± 0.13 AB | 916.2 ± 68.06 AB |
| *UFR-16 | 0.15 ± 0.05 D | 44.9 ± 13.83 D | 4.30 ± 0.13 C | 194.0 ± 68.06 E |
| UFR-2 | 0.36 ± 0.05 CD | 107.7 ± 13.83 CD | 4.98 ± 0.13 AB | 533.9 ± 68.06 CD |
| UFR-3 | 0.18 ± 0.05 D | 54.1 ± 13.83 D | 5.50 ± 0.13 AB | 302.4 ± 68.06 DE |
| UFR-4 | 0.41 ± 0.05 BC | 125.3 ± 13.83 BC | 5.02 ± 0.13 AB | 627.2 ± 68.06 BC |
| US-812 | 0.69 ± 0.05 A | 209.3 ± 13.83 A | 5.55 ± 0.13 AB | 1160.1 ± 68.06 A |
| US-897 | 0.57 ± 0.05 AB | 173.7 ± 13.83 AB | 5.42 ± 0.13 AB | 934.5 ± 68.06 AB |
| US-942 | 0.72 ± 0.05 A | 216.41 ± 13.83 A | 4.89 ± 0.13 CB | 1058.2 ± 68.06 A |

*UFR-16 planted one year later
Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values followed by the same letter do not differ significantly at the 5% level

*Table 13. **Peace River** rootstock trial juice quality means ± standard error collected in March 2019*

| Rootstock | Percentage juice | Total acid | Total brix | Ratio | Juice color |
|---|---|---|---|---|---|
| Carrizo | 0.58 ± 0.01 A | 0.62 ± 0.02 AB | 9.58 ± 0.19 ABC | 15.51 ± 0.39 AB | 37.4 ± 0.16 A |
| *UFR-16 | 0.55 ± 0.01 B | 0.66 ± 0.02 AB | 8.7 ± 0.10 D | 13.26 ± 0.39 C | 36.6 ± 0.16 B |
| UFR-2 | 0.6 ± 0.01 A | 0.62 ± 0.02 AB | 9.28 ± 0.19 CD | 14.93 ± 0.39 ABC | 37.0 ± 0.16 AB |
| UFR-3 | 0.6 ± 0.01 A | 0.68 ± 0.02 A | 10.21 ± 0.19 AB | 14.95 ± 0.39 ABC | 37.3 ± 0.16 AB |
| UFR-4 | 0.58 ± 0.01 AB | 0.69 ± 0.02 A | 9.64 ± 0.19 ABC | 13.91 ± 0.39 BC | 36.8 ± 0.16 AB |
| US-812 | 0.59 ± 0.01 A | 0.68 ± 0.02 A | 10.38 ± 0.19 A | 15.3 ± 0.39 AB | 37.3 ± 0.16 AB |
| US-897 | 0.60 ± 0.01 A | 0.64 ± 0.02 A | 9.98 ± 0.19 ABC | 15.51 ± 0.39 AB | 37.3 ± 0.16 AB |
| US-942 | 0.58 ± 0.01 A | 0.59 ± 0.02 B | 9.37 ± 0.19 BCD | 16.05 ± 0.39 A | 37.14 ± 0.16 AB |

*UFR-16 planted one year later
Values represent the mean ± standard error and letter groupings were obtained using the Tukey-Kramer method. Values within a column followed by the same letter do not differ significantly at the 5% level

**General impressions of rootstock performance (so far)**

1. UFR-4 performs better in the flatwoods site than in the two ridge sites.

2. US-942 performs well in all sites, but the lbs solids are lower compared to other rootstocks.

3. US-812 produces the highest lbs solids in the Peace River site and a similar yield to US 942. It will be instructive to follow yield and fruit quality as the trees get older.