

# St. Helena Rootstock Survey Trial

## What's happening after 12 years with HLB?

(please see original St. Helena post for background information)

2018/19 vs. 2019/20 vs. 2020/21

**Yield [boxes/tree] and Estimated PS/acre**

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CREC Citrus Plant Improvement*

## St. Helena Rootstock Survey Trial - Summary

- Location: Dundee, Polk county
- Scion: Vernia & Valquarius
- Rootstocks: large collection of new diploid and tetraploid rootstocks
- Date Planted: 2008 & 2010
- Design: According to the number of trees available
  - Replications: variable per rootstock
  - Plot size: 4-tree rectangular plots
  - Spacing: 9 x 20; 12 x 20; 15 x 25 ft.
- Data:
  - Yield (PS/box and PS/acre): 2018/19 to 2020/21
- Trial status: **ACTIVE**

Table 1. St. Helena Rootstock Survey Trial – List of rootstocks and parentage.

Valquarius Planted in 2008	
Rootstock	Parentage
681G26F2P12	C. latipes x trifoliolate orange (Sic.)
681G26F4P2	C. latipes x trifoliolate orange (Sic.)
681G26F4P6	C. latipes x trifoliolate orange (Sic.)
681G26F6P20	C. latipes x trifoliolate orange (Sic.)
69LTXamF14P37	C. latipes x sour orange (Sic.)
Amb+HBJL-1	C. amblycarpa + HBJL-1 pummelo
Amb+HBJL-2B	C. amblycarpa + HBJL-2B pummelo
Aqua 1803	Cleopatra x trifoliolate orange (Arg.)
Blue 1	[Nova + HBPummelo] x [sour orange + Palestine sweet lime]
Blue 2	[Nova + HBPummelo] x [sour orange + Palestine sweet lime]
Blue 3	[Nova + HBPummelo] x [sour orange + Palestine sweet lime]
Blue 4	[Nova + HBPummelo] x [sour orange + Palestine sweet lime]
Blue 9	[Nova + HBPummelo] x [sour orange + Palestine sweet lime]
Chang+Bent	Changsha mandarin + Benton citrange
Cleo	Cleopatra mandarin
Cleo+CZO	Cleopatra + Carrizo
FG 1702	TBD*
FG 1707	TBD*
FG 1709	TBD*
FG 1792	TBD*
FG 1793	TBD*
Green 7	[Nova + HBPummelo] x [sour orange + Carrizo]
Kuharske	Kuharske citrange, Carrizo open-pollinated zygotic
MG-11	Hirado Buntan pummelo - zygotic from open pollination

(\*) To be determined

Table 1 (cont'd). St. Helena Rootstock Survey Trial – List of rootstocks and parentage.

Valquarius Planted in 2008	
Rootstock	Parentage
Orange 13	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 14	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 16	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 18	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 1804	Cleopatra x trifoliate orange (Arg.)
Orange 21	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
Pink 1802	Cleopatra x Swingle citrumelo (Arg.)
Purple 2	[Nova + HBPummelo] x [Cleopatra + sour orange]
Purple 4	[Nova + HBPummelo] x [Cleopatra + sour orange]
Rough lemon	Rough lemon
SO+50-7	Sour orange + trifoliate orange 50-7
SO+CZO	Sour orange+ Carrizo citrange
SO+RPxSH99-5	Sour orange + rangpur, open pollinated
Swingle	Swingle citrumelo
UFR 1: Orange 3	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 13: FG 1731	putative <i>C. ichangensis</i> /Poncirus hybrid
UFR 14: FG 1733	putative pummelo/mandarin hybrid
UFR 2: Orange 4	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 3: Orange 15	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 4: Orange 19	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 6: Changsha+TF 50-7	Changsha mandarin + trifoliate orange 50-7
UFR 5: White 4	[Nova + HBPummelo] x [Succari + Argentine trifoliate orange]
Volk	Volkamer lemon
Wgft+50-7	White grapefruit + trifoliate orange
White 1801	Ruby blood orange x Barnes trifoliate orange (Arg.)
White 1805	Ruby blood orange x Barnes trifoliate orange (Arg.)

Table 1 (cont'd). St. Helena Rootstock Survey Trial – List of rootstocks and parentage.

Vernia Planted in 2008	
Rootstock	Parentage
Amb+HBJL-2B	C. amblycarpa + HBJL-2B pummelo
Aqua 1803	Cleopatra x trifoliate orange (Arg.)
Blue 1	[Nova + HB Pummelo] x [sour orange + Palestine sweet lime]
Blue 2	[Nova + HB Pummelo] x [sour orange + Palestine sweet lime]
Blue 3	[Nova + HB Pummelo] x [sour orange + Palestine sweet lime]
Blue 4	[Nova + HB Pummelo] x [sour orange + Palestine sweet lime]
Blue 9	[Nova + HB Pummelo] x [sour orange + Palestine sweet lime]
Chang+Bent	Changsha mandarin + Benton citrange
Cleo	Cleopatra mandarin
Cleo+CZO	Cleopatra + Carrizo
Green 7	[Nova + HB Pummelo] x [sour orange + Carrizo]
Kuharske	Kuharske citrange, Carrizo open-pollinated zygotic
MG 11	Hirado Buntan pummelo - zygotic from open pollination
Orange 1	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 13	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 14	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 18	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 1804	Cleopatra x trifoliate orange (Arg.)
Orange 2	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]
Orange 21	[Nova + HB Pummelo] x [Cleopatra + Argentine trifoliate orange]

Table 1 (cont'd). St. Helena Rootstock Survey Trial – List of rootstocks and parentage.

Vernia Planted in 2008	
Rootstock	Parentage
Purple 2	[Nova + HBPummelo] x [Cleopatra + sour orange]
Purple 4	[Nova + HBPummelo] x [Cleopatra + sour orange]
Rough lemon	Rough lemon
SO+50-7	Sour orange + trifoliate orange 50-7
SO+CZO	Sour orange+ Carrizo citrange
SO+RPxSH99-5	Sour orange + rangpur, open pollinated
Swingle	Swingle citrumelo
UFR 1: Orange 3	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 2: Orange 4	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 3: Orange 15	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 4: Orange 19	[Nova + HBPummelo] x [Cleopatra + Argentine trifoliate orange]
UFR 5: White 4	[Nova + HBPummelo] x [Succari + Argentine trifoliate orange]
UFR 6: Changsha+TF 50-7	Changsha mandarin + trifoliate orange 50-7
Volk	Volkamer lemon
Wgft+50-7	White grapefruit + trifoliate orange
White 1801	Ruby blood orange x Barnes trifoliate orange (Arg.)
White 1805	Ruby blood orange x Barnes trifoliate orange (Arg.)
Yellow 1800	Grapefruit x trifoliate orange (Arg.)

Table 1 (cont'd). St. Helena Rootstock Survey Trial – List of rootstocks and parentage.

Valquarius Planted in 2010	
Rootstock	Parentage
White 1	[Nova + HBPummelo] x [Succari + Argentine trifoliate orange]
6058x2071-01-02	[Sour orange + rangpur] x [Cleopatra + Argentine trifoliate orange]
SO+RPxSH99-4	Sour orange + rangpur, open pollinated

Vernia Planted in 2010	
Rootstock	Parentage
46x31-02-S3	Hirado Buntan (HB) pummelo x Shekwaswa, salinity tolerant
46x31-02-S9	Hirado Buntan (HB) pummelo x Shekwaswa, salinity tolerant
6058x2071-01-02	[Sour orange + rangpur] x [Cleopatra + Argentine trifoliate orange]
6058x6056-002	[Sour orange + rangpur] x [sour orange + Palestine sweet lime]
A-Mac	Tetraploid Macrophylla, Amblycarpa cytoplasm
AMB+5-1-99-2	C. amblycarpa + 5-1-99-2 pummelo
Amb+Volk	Tetraploid Volkameriana, Amblycarpa cytoplasm
N+HBP-SS-9	Nova + HBPummelo, open pollinated
Nova+7-2-99-2	Nova + pummelo 7-2-99-2
Nova+7-3-99-1	Nova + 7-3-99-1 pummelo
SO+RPXSH99-4	Sour orange + rangpur, open pollinated
SR+SH-99-11	tetrazygs SO+Rangpur, Sour orange + rangpur, open pollinated
UFR 16: 46x31-02-13	Hirado Buntan (HB) pummelo x Shekwaswa
UFR 17: Green 2	[Nova + HBPummelo] x [sour orange + Carrizo]
Wmur+HBJL-7	W. Murcott + HBJL-7 pummelo

## St. Helena Rootstock Survey Trial – Interpretive Summary (by Jude Grosser):

- This trial is providing some valuable insights regarding the long-term sustainability and profitability of various sweet orange/rootstock combinations. The trial has been grown using evolving Harrell's CRF (controlled release fertilizer) formulations, with the latest change being implemented in the spring 2018 application, where the manganese and magnesium concentrations were increased. HLB has been present throughout, and HLB symptoms were observed after just one year (2009). Thus, it is especially relevant to look at the past three years of yield and fruit quality data to determine which rootstocks (grown with an enhanced micronutrient package) have passed through the disease 'wave' and are now consistently producing high yields of quality fruit.
- In my opinion, the best overall performing rootstock is the Orange 1804 (Cleo x trifoliate orange) from the Foguet program in Argentina. This rootstock has produced approximately 3 boxes of fruit and per tree with both Valquarius and Vernia scions the past three seasons. Although seedy, seed trees of this rootstock are not available in Florida. Efforts to import seed from Argentina have been hampered by regulatory issues. Thus, we are now working out arrangements with our colleagues in Argentina and with DPI to be able to safely import seed needed to establish larger plantings. It is note worthy that most of the rootstocks containing Cleo and trifoliate orange genetics are performing well. Vernia resets on x639, also a Cleo x trifoliate orange hybrid, have grown off beautifully.

## St. Helena Rootstock Survey Trial – Interpretive Summary (by Jude Grosser):

- Three other rootstocks showing good promise are UFR-14 (FG 1733), the tetraploid somatic hybrid Amblycarpa + HBJL-2, and White 1 (a sibling of UFR-5). These three rootstocks excel for both yield and high soluble solids, and have shown good yields the past 3 seasons. Seed trees are also unavailable for these three rootstocks, but they are now through the PTP (Parent Tree Program), and TC (tissue culture) micropropagation is underway. The projected lbs. solids production/year at optimum planting density for these rootstocks and the Orange 1804 are above 3000 lbs. per acre, which would generate over \$6,000 per acre gross revenue at \$2/lb. solid. White 1 seed trees produce a mixture of zygotic and nucellar seeds, but the seed tree has been lost. White 1 is also performing very well in the Orie Lee trial in St. Cloud. White 1 has been established in TC, and is now being micropropagated by our TC companies for advanced trials. Unfortunately, the UFR-14 rootstock has been difficult to establish in TC. The first tree in the trial confirmed to have HLB, just 6 months after planting in 2008, was a Valquarius/UFR-14 tree; this tree has retained health and productivity, and still looks good today.
- There are a few rootstocks that excelled only with the Vernia scion; especially the somatic hybrids Cleopatra + Carrizo and Blue 1 (Nova+HBPummelo x Sour orange+Palestine sweet lime). Cleo + Carrizo makes a smaller tree, and produces very high lbs. solids. It can be propagated by seed, but the seed fruit only contains 1-3 seed per fruit; thus TC may be a better option. This rootstock has also shown potential to reduce fruit granulation, and a test has been set up to see if it can help with the Florida navel orange problem of granulation and low solids. Blue 1 makes a large tree, and has also shown promise in another trial in the Indian River. It can be propagated by seed. Both rootstocks are being considered for commercial release, and both are in the PTP. Both have also been established in TC by our cooperating TC companies.

## St. Helena Rootstock Survey Trial – Interpretive Summary (by Jude Grosser):

- Most of the rootstocks from the Foguet program (Argentina) have been quite impressive, and are a tribute to the great career of rootstock breeder José Luis Foguet. In addition to Orange 1804, Aqua 1803 and White 1805 merit further consideration, but also face the seed importation problem.
- The UFR rootstocks in the trial continue to perform reasonably well, and the tetraploids UFR-1,2,4,5,6 & 17 have been reliable and can be profitable if planted at the optimal planting density. UFR-1 trees have consistently shown good color with very full canopies; yields and fruit quality have also been good. UFR-1 is also performing well in our trial at Orie Lee's in St. Cloud. It has been underplanted commercially, but seed is available. UFR-6 continues to show promise for higher density plantings, and routinely produces fruit with outstanding quality, usually above 7.0 lbs. solids per box. UFR-15 (not included in the original two plantings) has been planted at St. Helena as resets, and the trees have grown off vigorously with dark green color and full canopies, and these vigorous trees have set a good crop for this season. UFR-15 makes larger trees than the other available UFR rootstocks, and it is a good candidate for resets in groves with traditional tree spacings. UFR-15 seed is available.

## St. Helena Rootstock Survey Trial – Interpretive Summary (by Jude Grosser):

### Efforts to Recover Potentially Zygotic Rootstock Hybrids Performing Well:

We have identified some standout trees that have grown vigorously resulting in healthy trees with full canopies and dark green color. Such trees have yielded 3-3.5 boxes/tree and juice with 12.0-12.5 Brix. These trees are on seed-derived rootstocks from seed trees that produce frequent zygotic seedlings. We have hypothesized that these standout trees could be on unique hybrid rootstocks. Initial efforts to sprout the trees without losing the scions were unsuccessful, so we recently cut the tops of the trees off. They are just now beginning to sprout (July, 2021). Our plan is to recover the rootstock genotype from each tree, and then run a molecular marker test to determine if each rootstock is indeed a zygotic (by comparison to the mother tree genotype). Any rootstock proven to be a unique zygotic will be cleaned up to generate pathogen-free material, then propagated by rooted cuttings and TC for advanced trials. Six trees were selected and cut, including two from HBPummelo x Shekwascha mandarin, and two from MG-11. One of the MG-11 trees produces very large fruit (pre-HLB size), and this tree also had the highest ct value (meaning the lowest *C<sub>Las</sub>* bacterial titer via qPCR test).

**Table 2. St. Helena Rootstock Survey Trial – 2018/19 vs. 2019/20 vs. 2020/21 Valquarius - Yield and Estimated\* PS/acre (PS=pounds solids). Trees planted in 2008**

Rootstock	2018/19 Yield [boxes/tree]	2019/20 Yield [boxes/tree]	2020/21 Yield [boxes/tree]	2018/19 [PS/box]	2019/20 [PS/box]	2020/21 [PS/box]	% Yield Variation from 2018/19 to 2019/20	% Yield Variation from 2019/20 to 2020/21	Optimum trees/acre*	Estimated PS/acre [increase 2017/18 to 2018/19, %]	Estimated PS/acre [increase 2018/19 to 2019/20, %]	Estimated PS/acre [increase 2019/20 to 2020/21, %]
SO+RPxSH99-5	1.1	0.5	2.2	6.9	6.5	6.8	-59%	384%	391	2912 [105]	1134 (-61)	5781 [410]
FG 1707	1.9	2.1	2.8	6.8	6.4	6.5	11%	32%	213	2808 [73]	2878 (3)	3853 [34]
FG 1792	1.2	0.9	2.3	6.7	6.6	6.5	-25%	155%	257	1967 [5]	1521 (-22)	3841 [153]
FG 1793	3.0	2.4	2.7	6.2	6.1	6.1	-21%	16%	202	3711 [178]	2920 (-21)	3348 [15]
Amb+HBIL-2B	2.3	2.7	2.3	6.4	6.1	6.2	18%	-14%	208	3074 [224]	3436 (12)	3002 [-13]
UFR 1: Orange 3	1.8	1.4	2.0	6.5	6.3	6.1	-22%	45%	235	2699 [113]	2056 (-24)	2918 [42]
681G26F4P2	1.8	1.5	1.9	6.1	6.2	6.6	-16%	29%	225	2428 [176]	2084 (-14)	2863 [37]
Orange 1804	3.2	3.2	2.9	5.9	5.7	5.4	1%	-11%	184	3523 [109]	3346 (-5)	2843 [-15]
Aqua 1803	2.2	2.0	2.1	6.2	6.2	5.8	-9%	4%	236	3146 [160]	2904 [-7]	2838 [-2]
White 1801	1.6	1.5	2.0	6.5	6.0	6.0	-9%	34%	230	2345 [233]	1998 (-15)	2712 [36]
White 1805	2.9	2.4	2.4	6.1	5.7	5.6	-17%	-2%	192	3401 [176]	2628 (-23)	2564 [-2]
Orange 13	2.0	1.7	1.8	6.6	6.2	6.1	-15%	6%	230	2973 [103]	2445 (-18)	2551 [4]
Blue 9	1.1	1.0	1.4	6.4	6.0	6.3	-6%	40%	264	1882 [69]	1634 (-13)	2388 [46]
FG 1709	1.1	1.5	1.3	6.5	6.4	6.4	32%	-8%	261	1833 [37]	2430 (32)	2217 [-9]
681G26F6P20	1.6	1.7	1.7	6.3	5.8	5.9	5%	2%	221	2265 [91]	2159 (-4)	2214 [3]
UFR 5: White 4	1.4	1.3	1.5	6.6	6.3	6.5	-6%	12%	226	2012 [56]	1868 (-7)	2163 [16]
UFR 14: FG 1733	1.9	2.4	1.7	6.2	6.0	5.9	25%	-29%	212	2529 [163]	3038 (20)	2128 [-30]
UFR 4: Orange 19	1.8	1.7	1.8	6.1	5.7	5.6	-3%	2%	213	2312 [134]	2092 (-9)	2126 [2]
Orange 18	1.2	1.0	1.1	6.3	6.0	5.9	-16%	13%	315	2371 [60]	1906 (-19)	2122 [11]
UFR 6: Changsha+TF 50-7	1.2	1.5	1.1	6.8	6.1	6.3	23%	-26%	301	2390 [96]	2729 (14)	2098 [-23]
Cleo+CZO	1.1	1.2	1.5	5.8	5.9	6.1	9%	28%	221	1368 [56]	1569 (15)	2085 [33]
681G26F4P6	2.2	1.9	1.6	6.2	6.1	6.1	-12%	-17%	207	2858 [62]	2429 (-15)	2039 [-16]
UFR 2: Orange 4	1.8	1.8	1.7	6.2	5.9	5.8	1%	-5%	203	2272 [82]	2161 (-5)	2024 [-6]
SO+50-7	1.0	0.8	1.0	6.5	6.1	6.1	-18%	25%	317	2101 [90]	1587 (-24)	1987 [25]
MG-11	2.1	1.8	1.6	6.0	6.0	5.5	-13%	-14%	230	2836 [110]	2505 (-11)	1985 [-21]

(\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Table 2 (cont'd). St. Helena Rootstock Survey Trial – 2018/19 vs. 2019/20 vs. 2020/21 Valquarius - Yield and Estimated\* PS/acre (PS=pounds solids). Trees planted in 2008.

Rootstock	2018/19 Yield [boxes/tree]	2019/20 Yield [boxes/tree]	2020/21 Yield [boxes/tree]	2018/19 [PS/box]	2019/20 [PS/box]	2020/21 [PS/box]	% Yield Variation from 2018/19 to 2019/20	% Yield Variation from 2019/20 to 2020/21	Optimum trees/acre*	Estimated PS/acre [increase 2017/18 to 2018/19, %]	Estimated PS/acre [increase 2018/19 to 2019/20, %]	Estimated PS/acre [increase 2019/20 to 2020/21, %]
Green 7	1.2	1.4	1.3	6.1	6.1	5.9	13%	-5%	259	1835 [30]	2113 (15)	1963 [-7]
Swingle	1.8	2.1	1.8	6.3	6.1	6.1	17%	-16%	182	2008 [34]	2340 (17)	1959 [-16]
Kuharske	2.8	2.2	1.7	6.2	6.1	5.7	-21%	-23%	198	3475 [121]	2656 (-23)	1915 [-28]
681G26F2P12	1.3	1.1	1.2	6.6	6.0	5.9	-13%	8%	261	2175 [57]	1760 (-19)	1873 [6]
Volk	2.6	2.4	2.3	5.8	5.3	4.7	-8%	-5%	171	2539 [84]	2180 (-14)	1840 [-16]
Cleo	1.5	1.6	1.6	6.0	6.0	5.9	5%	0%	186	1621 [165]	1754 (8)	1719 [-2]
UFR 3: Orange 15	1.7	1.6	1.4	5.9	5.7	5.2	-5%	-10%	230	2225 [65]	2109 (-5)	1715 [-19]
Blue 2	0.9	1.2	1.1	6.7	6.2	6.3	33%	-12%	250	1479 [-21]	1864 (26)	1667 [-11]
Orange 16	1.9	1.3	1.4	5.3	5.1	4.9	-33%	6%	248	2430 [117]	1626 (-33)	1658 [2]
UFR 13: FG 1731	1.1	1.2	1.1	6.7	6.5	6.6	9%	-10%	230	1652 [89]	1797 (9)	1638 [-9]
Blue 4	1.8	0.9	1.2	5.8	5.9	5.7	-52%	38%	229	2466 [144]	1196 (-11)	1554 [30]
SO+CZO	0.9	0.9	0.9	6.7	6.2	6.3	0%	0%	272	1707 [53]	1503 (-12)	1544 [3]
Purple 2	1.0	0.9	1.0	6.4	5.9	5.9	-15%	22%	249	1654 [27]	1253 (-24)	1534 [22]
Blue 1	1.1	1.0	1.1	6.6	6.1	5.6	-5%	6%	248	1856 [106]	1570 (-15)	1527 [-3]
Rough lemon	1.5	1.9	1.4	5.9	5.7	4.9	23%	-25%	221	1902 [163]	2325 (22)	1503 [-35]
Pink 1802	1.8	1.0	1.0	6.4	6.0	6.2	-44%	-5%	243	2832 [71]	1457 (-48)	1433 [-2]
Purple 4	0.6	0.8	0.8	6.9	6.2	6.3	37%	-5%	289	1127 [-6]	1464 (30)	1422 [-3]
69LTxamF14P37	1.1	1.1	1.3	6.0	6.1	5.0	0%	15%	224	1475 [125]	1494 (1)	1414 [-5]
Wgft+50-7	0.9	0.8	0.8	6.3	6.7	5.9	-12%	-2%	290	1725 [55]	1536 (-11)	1318 [-14]
Orange 21	1.4	1.4	0.9	6.1	5.8	4.9	-1%	-32%	252	2093 [77]	2032 (-3)	1164 [-43]
FG 1702	1.2	1.2	0.7	6.6	6.5	6.5	-4%	-43%	257	1943 [46]	1936 (0)	1089 [-44]
Orange 14	0.9	0.6	0.5	6.9	6.2	6.5	-32%	-12%	264	1554 [133]	1004 (-35)	923 [-8]
Chang+Bent	0.3	1.1	0.5	6.7	6.7	6.7	253%	-55%	288	557 [-39]	2048 [266]	916 [-55]
Blue 3	0.3	0.8	0.5	6.9	5.8	6.4	153%	-40%	301	677 [-50]	1329 (97)	868 [-35]
Amb+HB JL-1	1.1	0.8	na	6.6	6.2	na	-30%	na	257	1858 [114]	1229 (-34)	na

(\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

**Table 3. St. Helena Rootstock Survey Trial – 2018/19 vs. 2019/20 vs. 2020/21 Vernia - Yield and Estimated\* PS/acre (PS=pounds solids). Trees planted in 2008.**

Rootstock	2018/19 Yield [boxes/tree]	2019/20 Yield [boxes/tree]	2020/21 Yield [boxes/tree]	2018/19 [PS/box]	2019/20 [PS/box]	2020/21 [PS/box]	% Yield Variation from 2018/19 to 2019/20	% Yield Variation from 2019/20 to 2020/21	Optimum trees/acre*	Estimated PS/acre [increase 2017/18 to 2018/19, %]	Estimated PS/acre [increase 2018/19 to 2019/20, %]	Estimated PS/acre [increase 2019/20 to 2020/21, %]
Purple 2	2.0	1.6	2.6	6.1	6.0	6.4	-21%	65%	250	3026 [29]	2357 (-22)	4191 [78]
MG 11	2.3	2.1	2.6	6.8	6.5	5.6	-7%	20%	206	3209 [91]	2848 (-11)	2977 [5]
Aqua 1803	2.2	2.1	2.1	6.6	6.4	5.9	-5%	3%	226	3363 [130]	3019 (-10)	2872 [-5]
Orange 1804	2.9	2.8	2.3	6.5	6.4	6.0	-4%	-18%	208	3906 [147]	3854 (-6)	2836 [-26]
White 1805	1.4	1.4	1.5	6.9	6.4	6.5	-4%	12%	282	2776 [95]	2442 (-12)	2772 [14]
Blue 1	2.5	2.0	2.1	6.5	6.1	6.4	-20%	4%	209	3346 [201]	2534 (-24)	2767 [9]
Yellow 1800	2.4	1.8	2.0	6.5	6.5	6.1	-25%	9%	230	3580 [134]	2669 (-25)	2741 [3]
UFR 2: Orange 4	1.1	0.9	1.6	6.7	6.4	6.6	-15%	65%	254	1901 [105]	1537 (-19)	2580 [68]
UFR 1: Orange 3	1.6	1.4	1.8	6.8	6.1	6.1	-14%	28%	227	2434 [117]	1897 (-22)	2456 [29]
Cleo+CZO	1.8	1.8	1.4	6.9	6.7	6.8	1%	-25%	256	3136 [65]	3093 (-1)	2370 [-23]
Blue 4	1.0	1.0	1.3	6.5	6.4	6.5	-3%	29%	289	1855 [69]	1783 (-4)	2335 [31]
Wgft+50-7	1.9	1.2	1.5	6.7	6.6	6.4	-39%	25%	250	3079 [115]	1906 (-38)	2311 [21]
Blue 3	0.9	1.0	1.1	6.7	6.6	6.7	9%	9%	320	2020 [168]	2048 (2)	2275 [11]
Volk	3.5	2.6	2.5	5.6	5.6	5.1	-27%	-4%	180	3548 [115]	2601 (-27)	2266 [-13]
Orange 14	1.1	0.9	1.3	6.8	6.4	6.3	-17%	42%	279	2090 [99]	1624 (-22)	2265 [39]
Orange 1	1.5	1.1	1.4	7.0	6.4	6.3	-27%	27%	256	2607 [178]	1775 (-32)	2239 [26]
UFR 3: Orange 15	1.2	1.0	1.5	6.7	6.7	6.4	-14%	47%	233	1830 [86]	1567 [-14]	2230 [42]
Orange 21	1.9	1.5	1.5	6.6	6.1	6.0	-19%	-2%	246	3099 [101]	2240 (-27)	2226 [-1]
UFR 4: Orange 19	1.9	1.6	1.7	6.4	6.1	5.9	-16%	5%	226	2773 [150]	2173 (-21)	2224 [2]
UFR 6: Changsha+TF 50-7	1.4	1.0	1.1	7.3	6.8	7.0	-26%	8%	277	2841 [221]	1932 (-32)	2135 [11]

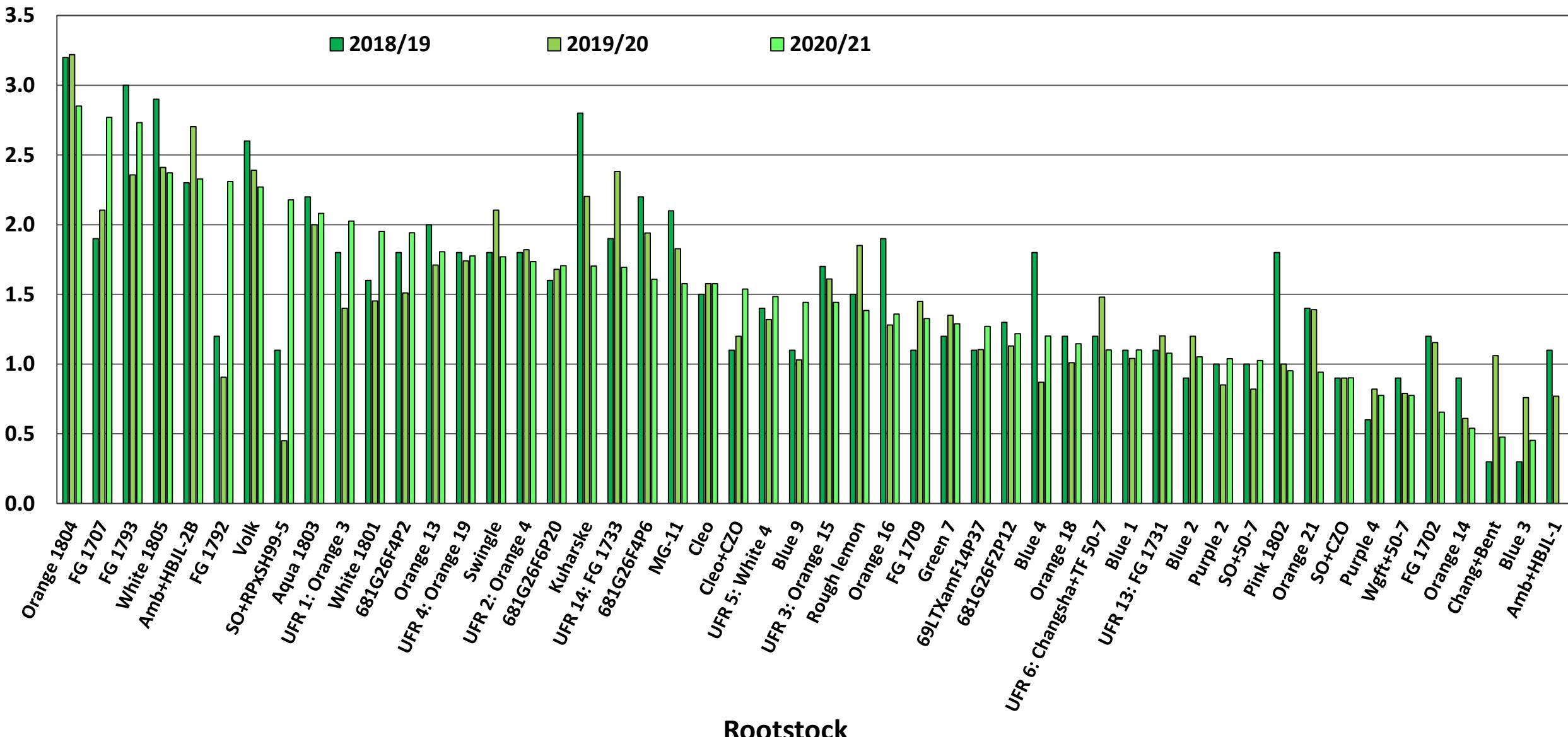
(\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Table 3 (cont'd). St. Helena Rootstock Survey Trial – 2018/19 vs. 2019/20 vs. 2020/21 Vernia - Yield and Estimated\* PS/acre (PS=pounds solids). Trees planted in 2008.

Rootstock	2018/19 Yield [boxes/tree]	2019/20 Yield [boxes/tree]	2020/21 Yield [boxes/tree]	2018/19 [PS/box]	2019/20 [PS/box]	2020/21 [PS/box]	% Yield Variation from 2018/19 to 2019/20	% Yield Variation from 2019/20 to 2020/21	Optimum trees/acre*	Estimated PS/acre [increase 2017/18 to 2018/19, %]	Estimated PS/acre [increase 2018/19 to 2019/20, %]	Estimated PS/acre [increase 2019/20 to 2020/21, %]
Blue 2	1.1	0.9	1.2	7.0	6.4	6.4	-22%	39%	279	2159 [73]	1519 (-30)	2116 [39]
Green 7	1.2	1.0	1.4	7.1	6.7	6.5	-18%	39%	235	1995 [75]	1525 (-23)	2089 [37]
Purple 4	1.1	1.1	1.3	7.5	6.7	6.6	-5%	22%	246	1952 [45]	1718 (-12)	2073 [21]
Swingle	1.8	1.4	1.5	6.7	6.8	6.3	-24%	9%	219	2653 [126]	2032 (-23)	2044 [1]
Orange 13	1.4	0.8	1.4	6.9	6.5	6.2	-41%	63%	246	2339 [98]	1316 (-44)	2044 [55]
SO+RPxSH99-5	0.4	1.1	1.1	7.1	6.8	6.5	177%	0%	282	796 [-32]	2155 (-1)	2024 [-6]
Rough lemon	1.2	2.5	1.8	6.3	6.3	5.2	108%	-28%	208	1513 [43]	3283 [117]	1973 [-40]
UFR 5: White 4	1.4	1.0	1.4	6.9	6.4	6.2	-30%	43%	224	2234 [186]	1406 (-37)	1930 [37]
Pink1802	1.1	0.8	1.0	6.9	6.4	6.5	-24%	21%	290	2101 [130]	1561 (-26)	1908 [22]
Kuharske	2.6	2.3	1.6	6.9	6.8	6.3	-12%	-31%	190	3371 [96]	2976 (-12)	1880 [-37]
White 1801	1.4	1.4	1.4	6.6	6.4	6.1	0%	0%	218	2017 [69]	1962 (-3)	1856 [-5]
SO+50-7	0.8	0.9	0.9	7.1	6.7	6.8	14%	0%	281	1567 [57]	1702 (9)	1733 [2]
Chang+Bent	1.2	0.9	1.0	6.7	6.5	6.9	-28%	10%	240	1905 [23]	1365 (-28)	1579 [16]
Orange 18	1.5	0.9	0.9	6.7	6.2	6.4	-39%	3%	261	2612 [62]	1413 (-44)	1554 [10]
Cleo	1.7	1.6	1.3	5.6	5.9	5.6	-6%	-19%	211	1972 [91]	1992 (1)	1528 [-23]
SO+CZO	1.0	0.7	0.7	7.3	6.8	6.8	-31%	2%	261	1974 [178]	1232 (-32)	1249 [1]
Blue 9	1.0	0.9	0.8	7.1	6.8	6.2	-15%	-9%	249	1712 [42]	1425 (-17)	1184 [-17]
Amb+HBJL-2B	1.3	0.5	na	6.7	6.0	na	-62%	na	273	2369 [144]	0815 (-66)	na
Orange 2	0.9	0.7	na	6.9	6.4	na	-27%	na	198	1230 [-1]	0830 (-32)	na

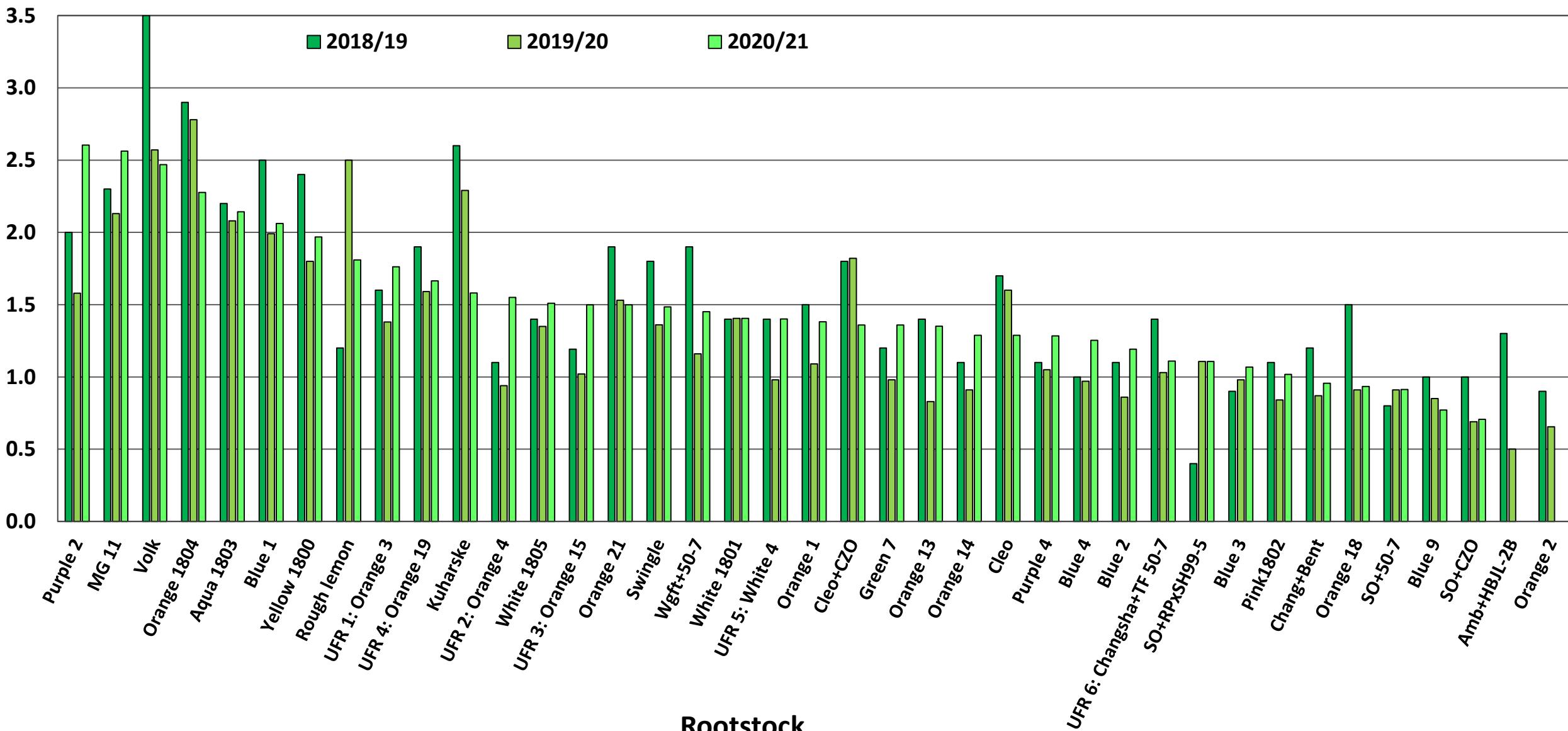
(\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Fig. 1. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 & 2020/21 Yield [boxes/tree] - Valquarius trees planted in 2008.



Rootstock

Fig. 2. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 & 2020/21 Yield [boxes/tree] - Vernia trees planted in 2008.



Rootstock

Fig. 3. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 & 2020/21 Estimated PS/acre (PS=pounds solids) - Valquarius trees planted in 2008.

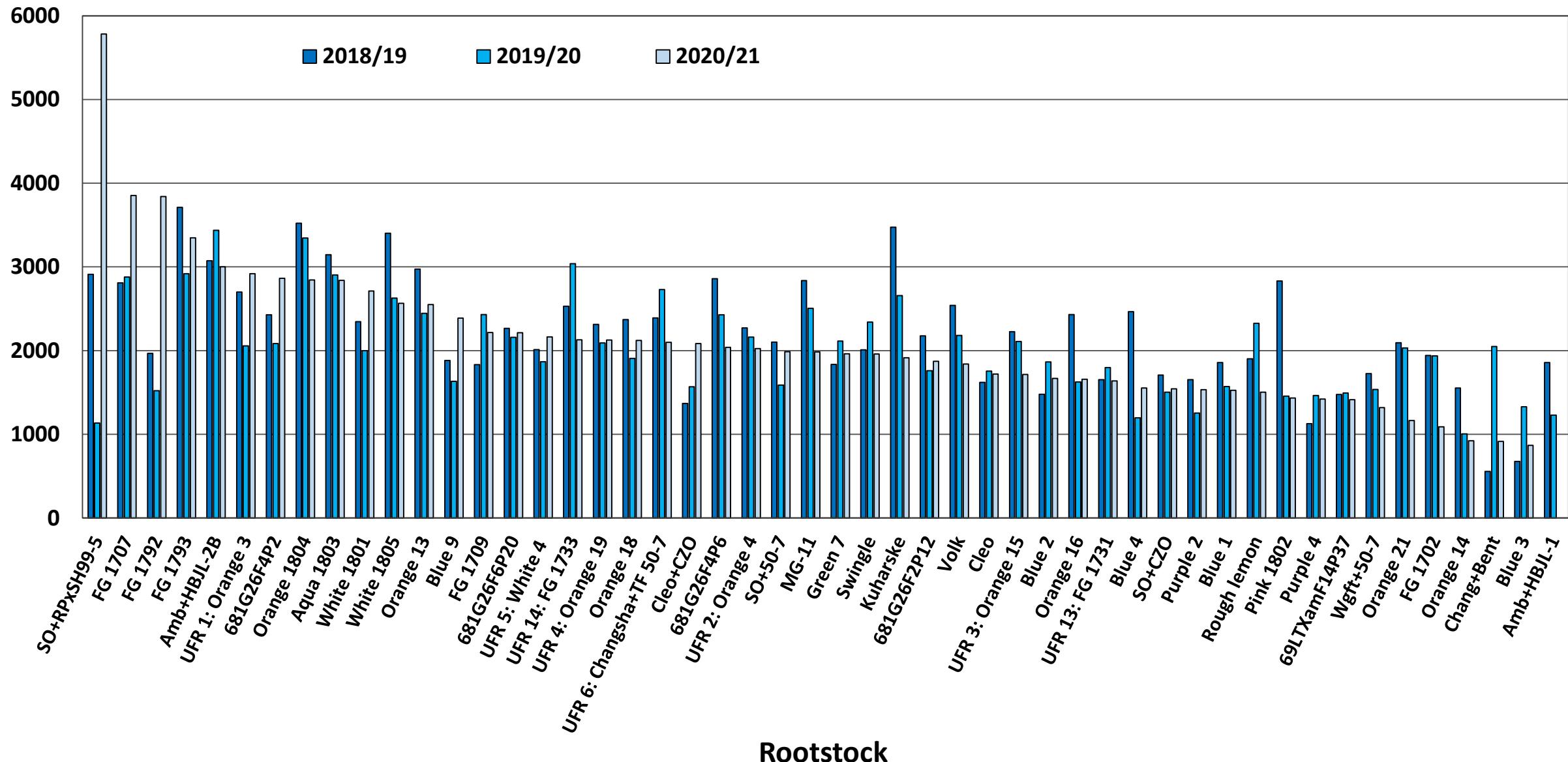
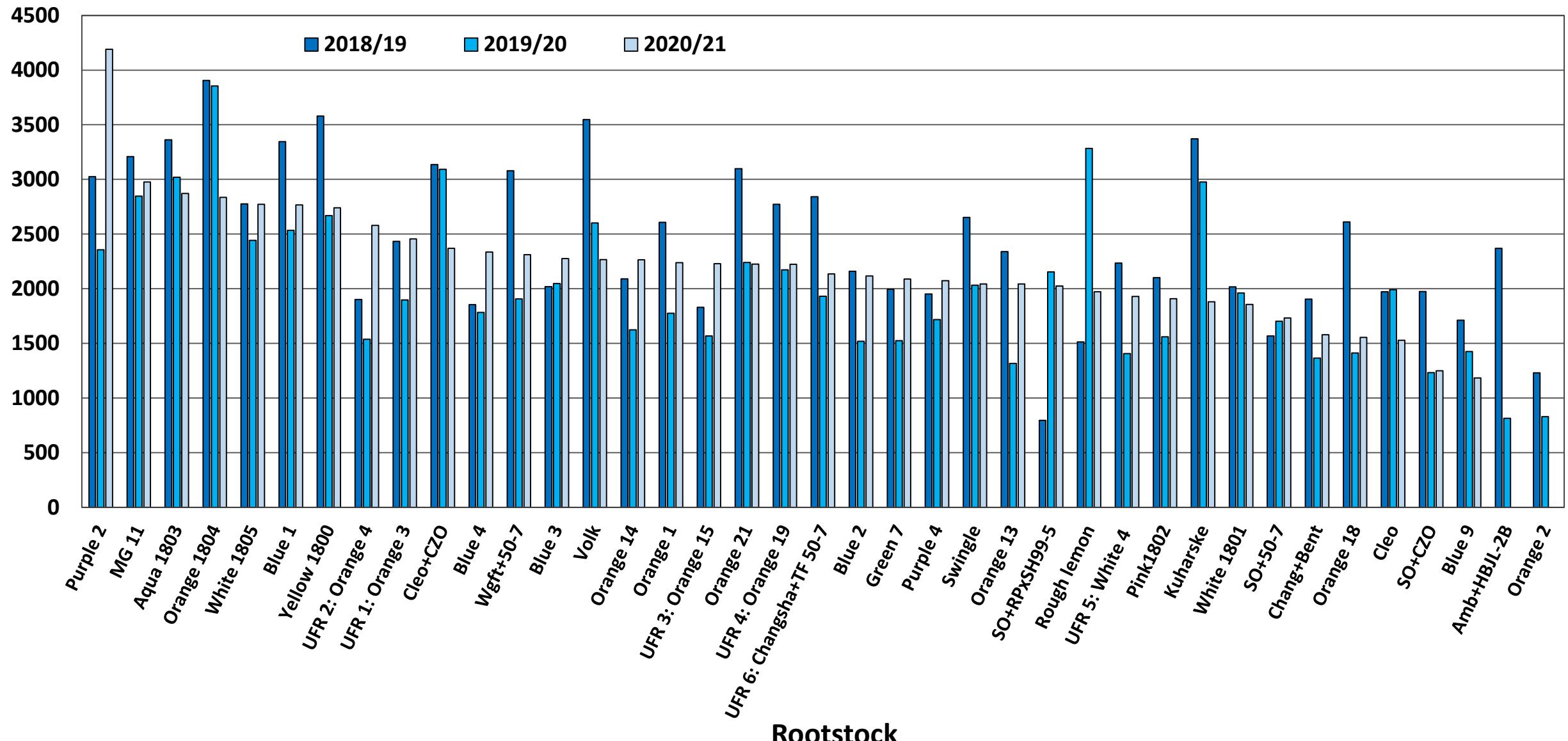


Fig. 4. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 & 2020/21 Estimated PS/acre (PS=pounds solids) - Vernia trees planted in 2008.



Rootstock

Fig. 5. St. Helena Rootstock Survey Trial – Yield variation [%] from 2018/19 to 2019/20 and 2019/20 to 2020/21 - Valquarius trees planted in 2008.

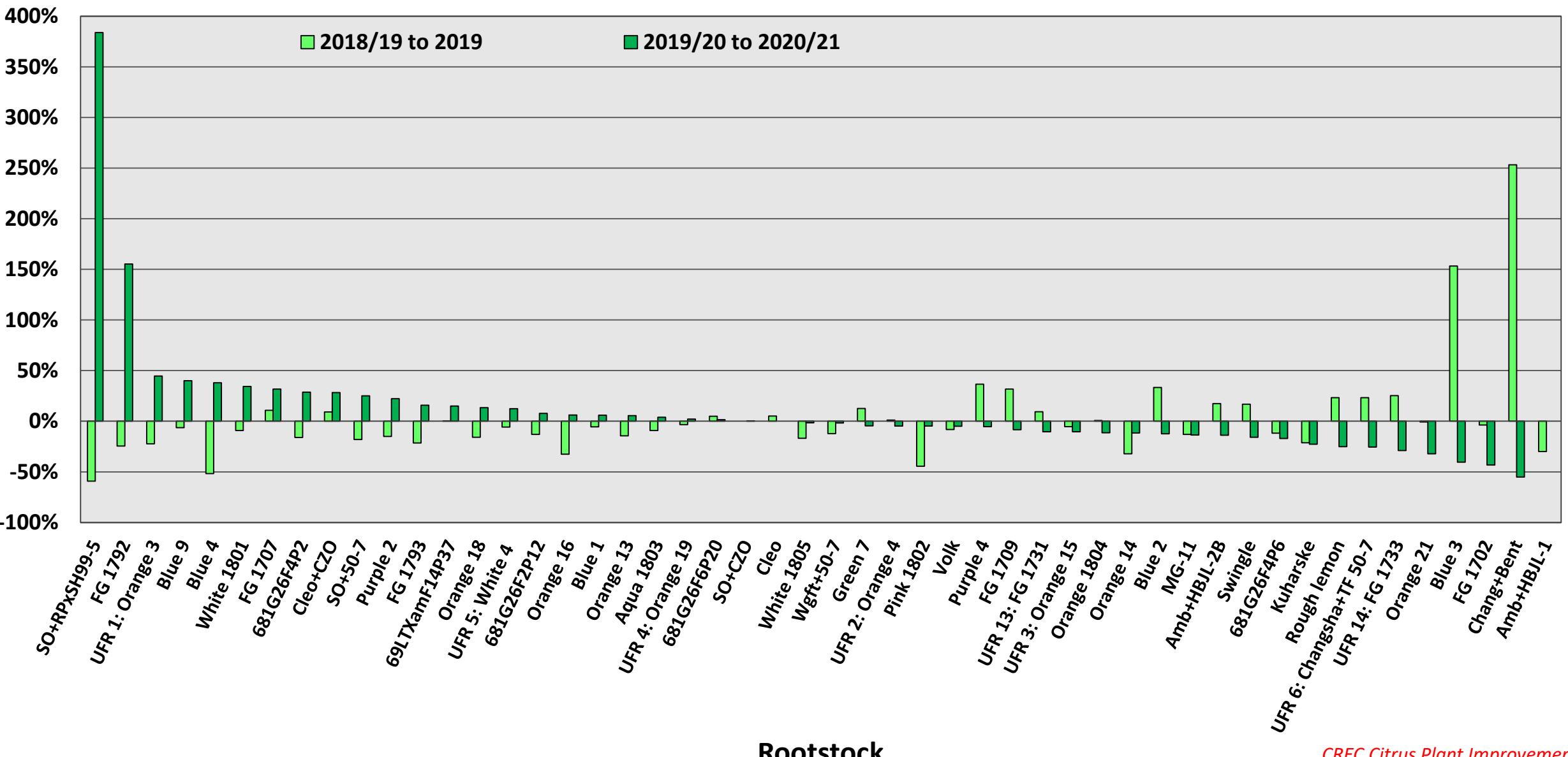


Fig. 6. St. Helena Rootstock Survey Trial – Yield variation [%] from 2018/19 to 2019/20 and 2019/20 to 2020/21 - Vernia trees planted in 2008.

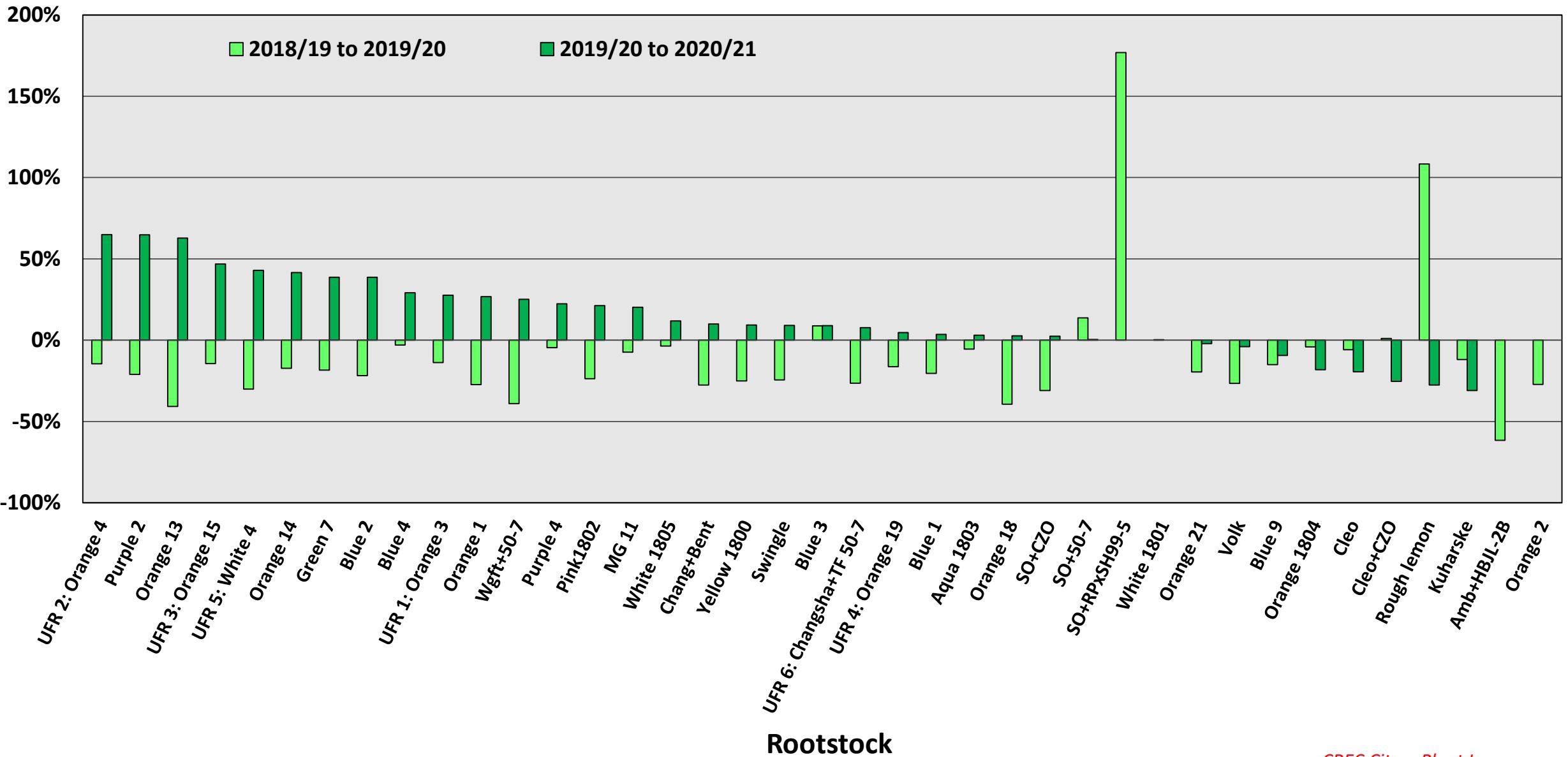
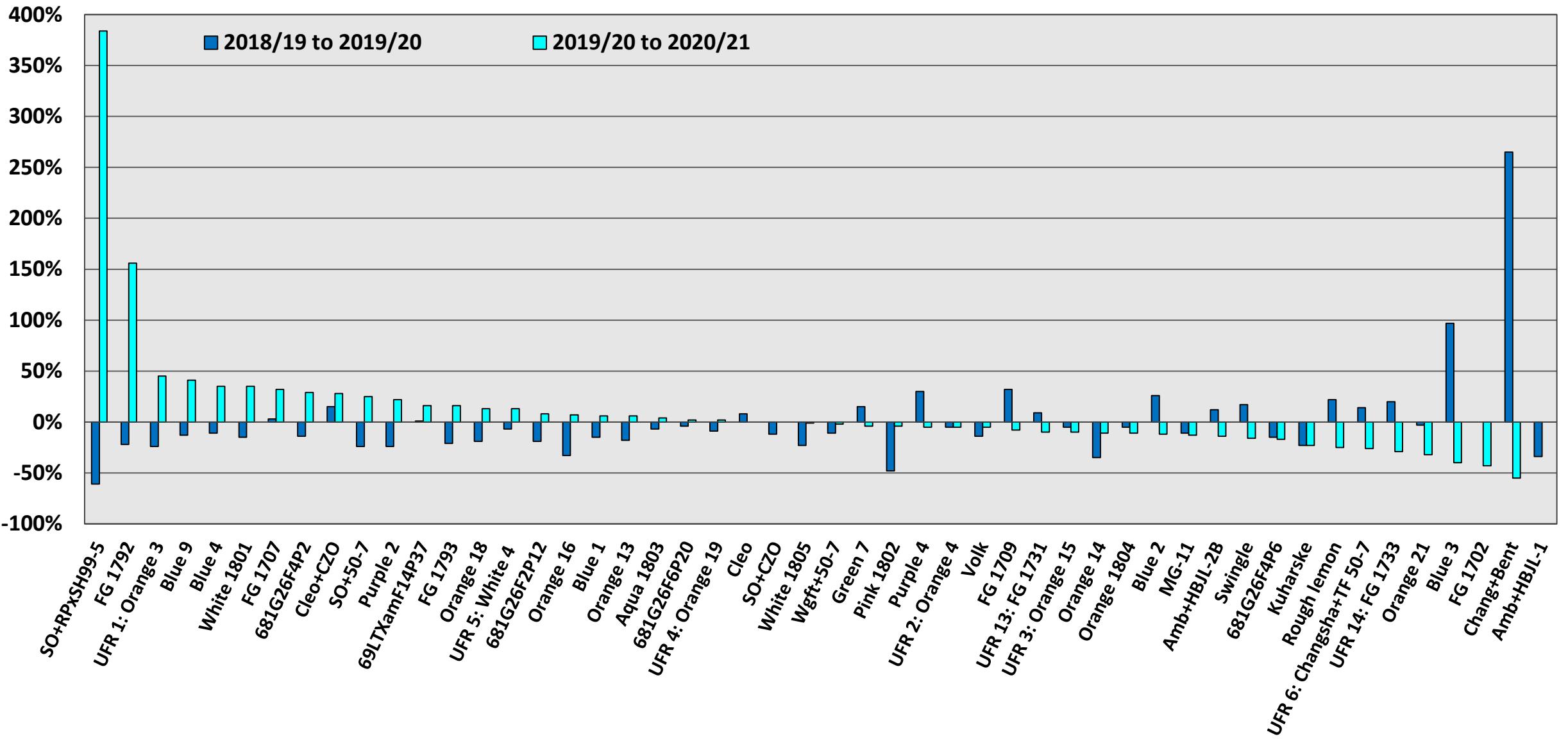


Fig. 7. St. Helena Rootstock Survey Trial – Estimated PS\*/acre variation [%] from 2018/19 to 2019/20 and 2019/20 to 2020/21 - Valquarius trees planted in 2008.



(\*) PS=pounds solids

Rootstock

CREC Citrus Plant Improvement

Fig. 8. St. Helena Rootstock Survey Trial – Estimated PS\*/acre variation [%] from 2018/19 to 2019/20 - Vernia trees planted in 2008.

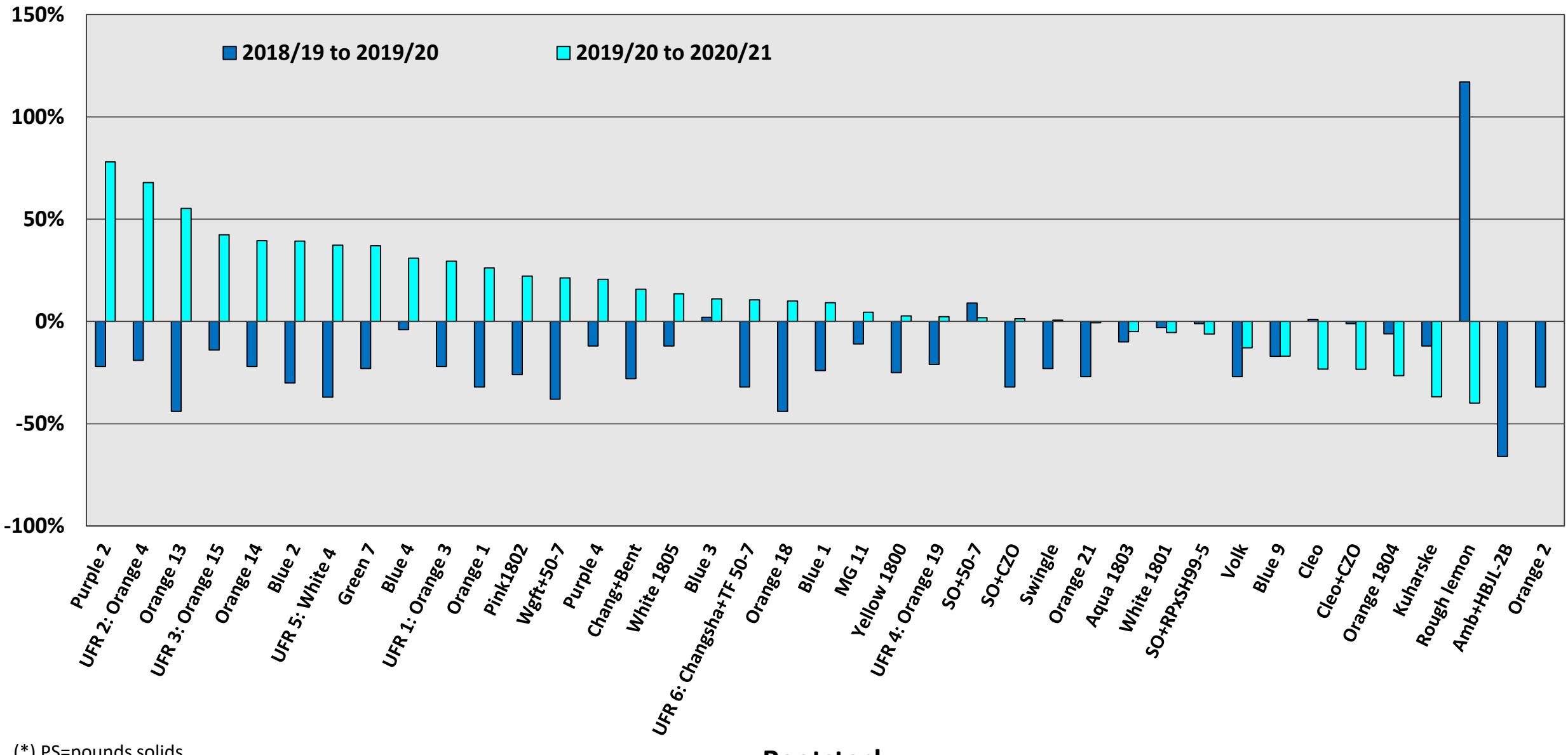


Table 4. St. Helena Rootstock Survey Trial – 2018/19 vs. 2019/20 vs. 2020/21 Vernia & Valquarius - Yield and Estimated\* PS/acre (PS=pounds solids). Trees planted in 2010.

Scion	Rootstock	2018/19 Yield [box/tree]	2019/20 Yield [box/tree]	2020/21 Yield [box/tree]	2018/19 [PS/box]	2019/20 [PS/box]	2020/21 [PS/box]	% Yield variation from 2018/19 to 2019/20	% Yield variation from 2019/20 to 2020/21	Optimum trees/acre*	Estimated PS/acre [increase 2017/18 to 2018/19, %]	Estimated PS/acre [increase 2018/19 to 2019/20, %]	Estimated PS/acre [increase 2019/20 to 20/21, %]
Vernia	UFR 16: 46x31-02-13	2.1	1.8	1.8	6.4	6.2	5.9	-13%	0%	229	3070 [72]	2614 (-15)	2480 [-5]
	SO+RPXSH99-4	1.0	1.1	1.3	6.1	5.7	6.6	8%	21%	270	1598 [80]	1653 (4)	2330 [41]
	46x31-02-S3	1.8	1.4	1.6	6.3	6.1	5.6	-22%	16%	251	2890 [117]	2150 (-25)	2298 [7]
	6058x6056-002	1.7	1.5	1.7	5.9	5.7	5.3	-13%	16%	215	2076 [89]	1823 (-12)	1961 [8]
	UFR 17: Green 2	1.8	1.6	1.4	6.3	6.0	6.3	-13%	-9%	208	2380 [183]	1941 (-18)	1863 [-4]
	A-Mac	1.1	1.4	1.3	6.2	6.0	5.7	31%	-9%	243	1682 [-9]	2111 (26)	1823 [-14]
	Nova+7-2-99-2	1.5	1.1	1.2	6.6	6.2	5.7	-27%	7%	260	2618 [146]	1780 (-32)	1733 [-3]
	6058x2071-01-02	1.1	0.8	0.9	6.4	6.4	6.4	-29%	10%	314	2119 [138]	1577 (-25)	1729 [10]
	46x31-02-S9	1.1	0.9	1.2	6.6	6.0	6.0	-17%	31%	231	1678 [13]	1267 [-24]	1666 [31]
	Amb+Volk	1.4	1.3	1.2	6.5	6.2	5.4	-9%	-7%	240	2187 [93]	1915 (-12)	1541 [-20]
	Nova+7-3-99-1	1.0	1.4	1.2	6.2	5.9	5.3	36%	-15%	213	1280 [25]	1698 (52)	1301 [-23]
	N+HBP-SS-9	0.6	0.5	0.7	6.8	6.4	6.4	-10%	36%	269	1184 [4]	0937 (-21)	1258 [34]
	SR+SH-99-11	0.2	0.6	0.3	6.6	6.1	6.5	190%	-44%	335	446 [-18]	1186 (166)	708 [-40]
	Amb + 5-1-99-2	0.7	0.7	0.5	6.5	5.9	na	0%	-29%	282	1272 [16]	1182 [-32]	na
	Wmur+HB JL-7	1.0	0.6	0.8	6.7	6.2	na	-42%	29%	235	1506 [14]	0844 (-37)	na
Valquarius	6058x2071-01-02	1.6	1.3	1.3	5.9	5.9	5.5	-17%	0%	277	2593 [20]	2167 (-17)	2034 [-6]
	SO+RPxSH99-4	0.7	0.5	0.6	6.6	5.7	6.1	-29%	16%	304	1329 [42]	1363 [3]	1082 [-21]
	White 1	3.1	1.9	2.2	6.2	6.2	na	-40%	16%	189	3630 [240]	2191 [-40]	na

(\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Fig. 9. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 Yield & 2020/21 [boxes/tree] – **Vernia & Valquarius** trees planted in 2010.

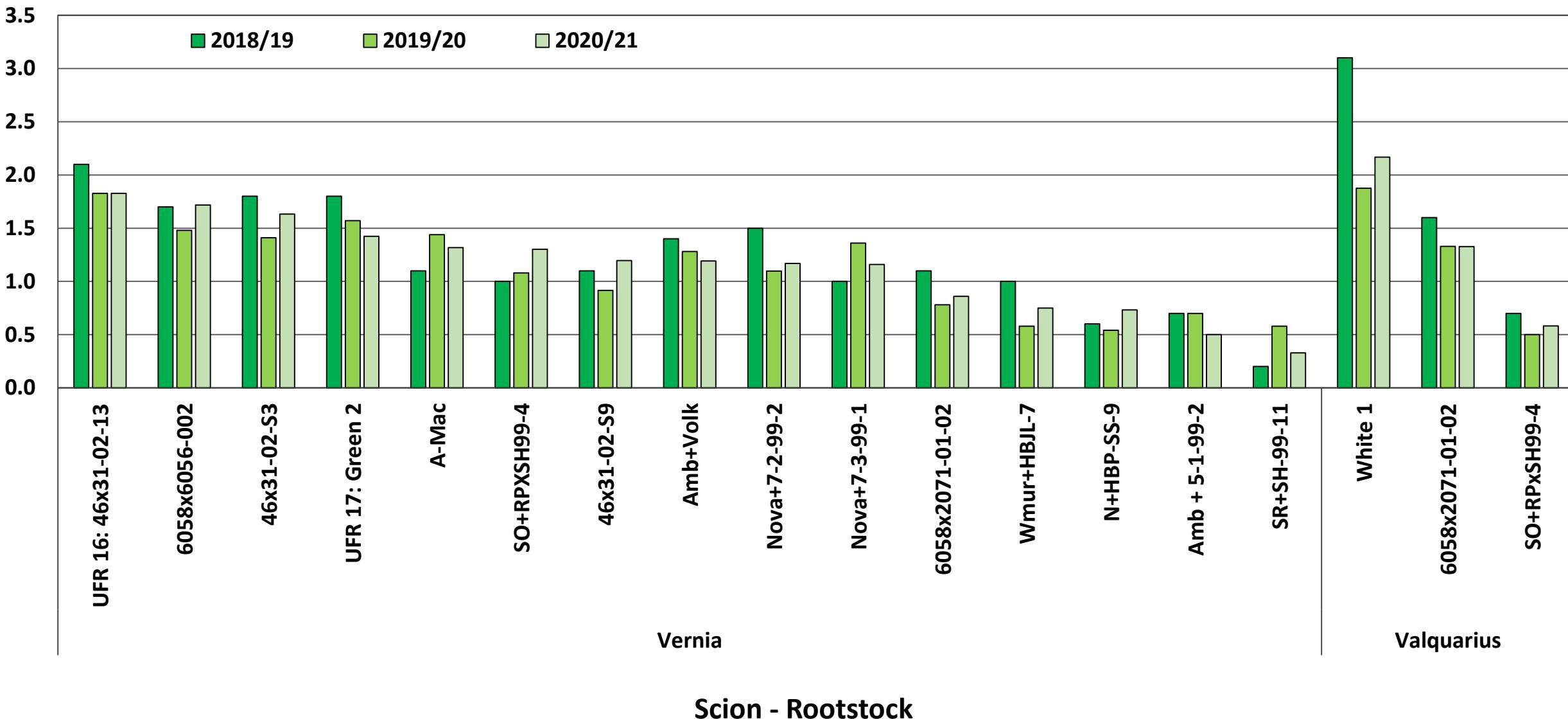
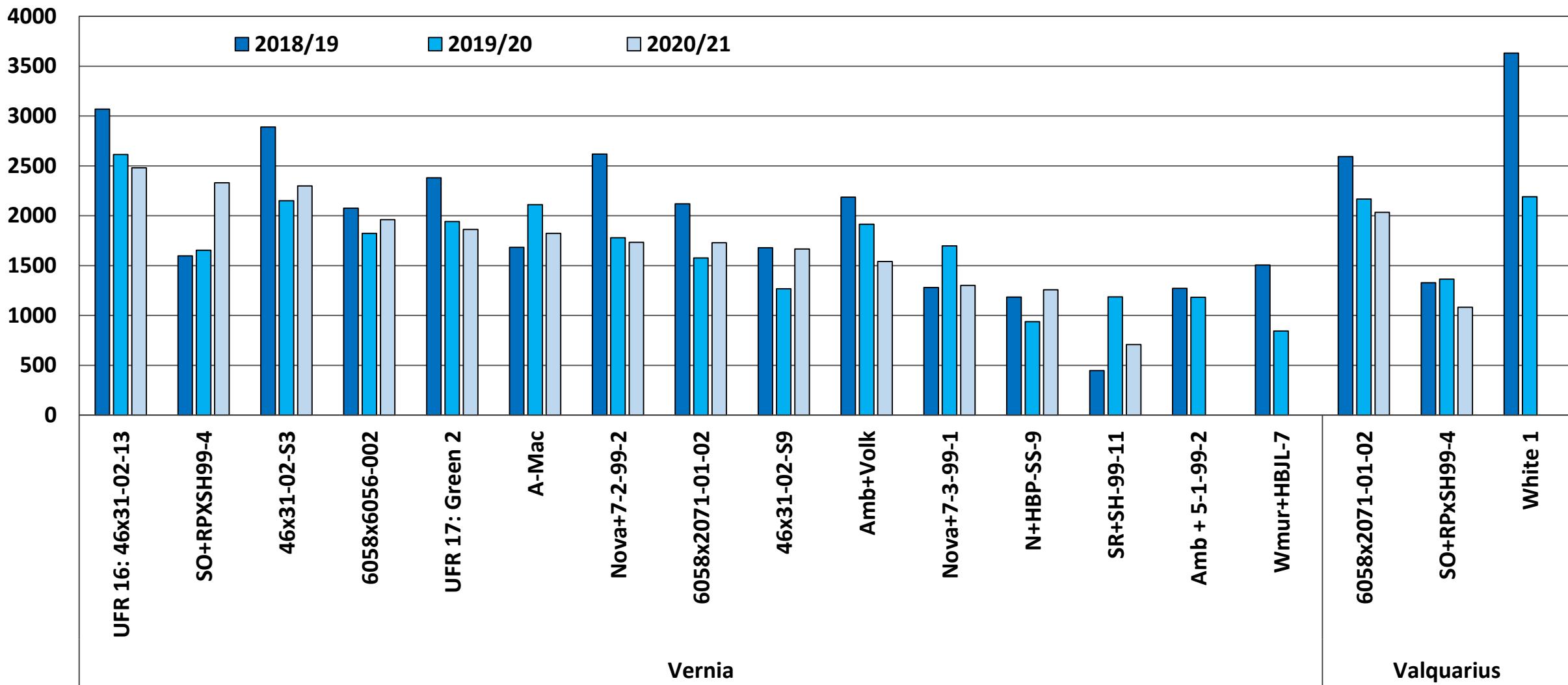


Fig. 10. St. Helena Rootstock Survey Trial – 2018/19 & 2019/20 Estimated PS\*/acre – Vernia & Valquarius trees planted in 2010.



(\*) PS=pounds solids

Scion - Rootstock

*CREC Citrus Plant Improvement*

Fig. 11. St. Helena Rootstock Survey Trial – Yield variation [%] from 2018/19 to 2019/20 & 2019/20 to 2020/21 – Vernia & Valquarius trees planted in 2010.

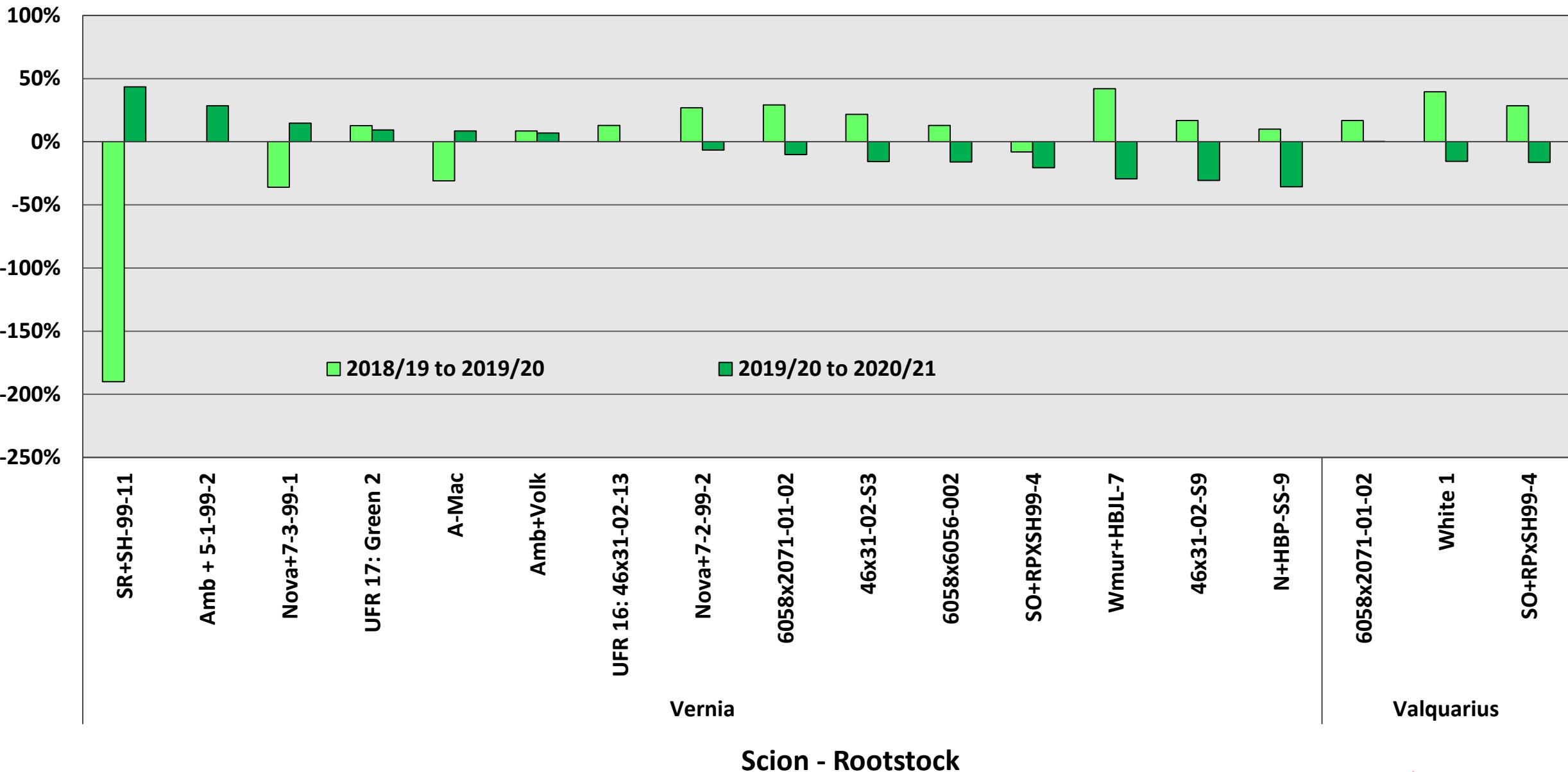
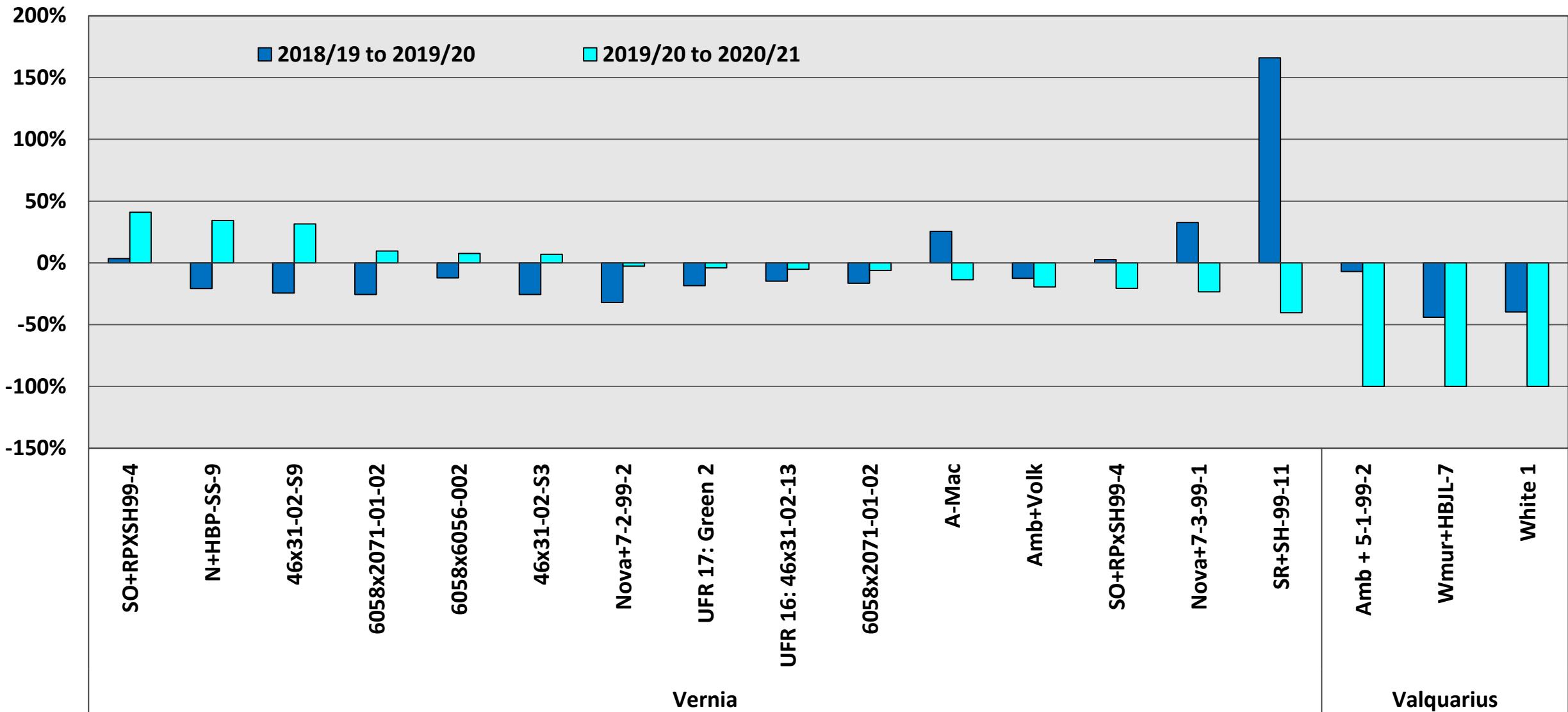


Fig. 12. St. Helena Rootstock Survey Trial – Estimated PS\*/acre variation [%] from 2018/19 to 2019/20 & 2019/20 to 2020/21 – Vernia & Valquarius trees planted in 2010.



(\*) PS=pounds solids

Scion - Rootstock

CREC Citrus Plant Improvement

Table 5. St. Helena Rootstock Survey Trial – Valquarius – Cumulative PS/acre (PS=pounds solids) and box/acre for actual and optimum trees/acre. Trees planted in 2008.

Rootstock	Tree height* [ft.]	Tree width* [ft.]	Actual Spacing [ft.]*	Actual no. trees/acre*	Actual Cum PS/acre 2010/11 to 2020/21*	Actual Yearly Average box/acre 2010/11 to 2020/21*	Optimum trees/acre**	Estimated Cum PS/acre 2010/11 to 2020/21**	Estimated Yearly Average box/acre 2010/11 to 2020/21**
Amb+HBJL-2B	8.2	10.5	12 x 20	182	18,818	327	208	21,566	375
UFR 1: Orange 3	8.3	9.4	9 x 20	242	22,159	395	235	21,518	384
Orange 13	7.1	9.6	12 x 20	182	16,885	293	230	21,398	372
White 1805	8	11.5	12 x 20	182	19,874	368	192	21,024	389
UFR 13: FG 1731	7.2	9.5	12 x 20	182	16,546	269	230	20,967	340
FG 1707	8.7	10.2	12 x 20	182	17,852	298	213	20,951	349
Aqua 1803	7.1	9.4	12 x 20	182	15,724	288	236	20,445	374
UFR 14: FG 1733	7.7	10.4	12 x 20	182	17,391	303	212	20,313	353
FG 1793	8.2	10.9	12 x 20	182	18,223	320	202	20,282	356
681G26F4P6	8.2	10.6	12 x 20	182	17,573	307	207	20,042	350
Orange 1804	9	11.9	12 x 20	182	19,211	369	184	19,476	374
UFR 6: Changsha+TF 50-7	7.1	7.2	9 x 20	242	15,280	256	301	19,005	319
Kuharske	7.7	11	15 x 25	116	10,798	209	198	18,406	357
MG-11	7.7	9.5	12 x 20	182	14,498	270	230	18,372	342
FG 1792	7.5	8.5	12 x 20	182	12,923	240	257	18,299	340
Cleo+CZO	7.2	9.9	9 x 20	242	20,035	361	221	18,296	330
UFR 5: White 4	7.9	9.7	12 x 20	182	14,403	245	226	17,934	305
FG 1709	7	8.4	12 x 20	182	12,460	212	261	17,918	304
Blue 9	6.7	8.4	9 x 20	242	16,411	284	264	17,902	310
Swingle	7.7	12	15 x 25	116	11,332	214	182	17,755	335
SO+50-7	6.7	6.9	9 x 20	242	13,436	237	317	17,600	310
SO+RPxSH99-5	5.7	5.7	9 x 20	242	10,859	207	391	17,546	335
681G26F6P20	7.3	9.9	12 x 20	182	14,388	249	221	17,520	303
681G26F4P2	7.8	9.8	12 x 20	182	14,053	241	225	17,420	298
UFR 3: Orange 15	6.9	9.5	12 x 20	182	13,613	263	230	17,250	334

(\*) Measured.

(\*\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Table 5 (cont'd.). St. Helena Rootstock Survey Trial – Valquarius – Cumulative PS/acre (PS=pounds solids) and box/acre for actual and optimum trees/acre. Trees planted in 2008.

Rootstock	Tree height* [ft.]	Tree width* [ft.]	Actual Spacing [ft.]*	Actual no. trees/acre*	Actual Cum PS/acre 2010/11 to 2020/21*	Actual Yearly Average box/acre 2010/11 to 2020/21*	Optimum trees/acre**	Estimated Cum PS/acre 2010/11 to 2020/21**	Estimated Yearly Average box/acre 2010/11 to 2020/21**
UFR 2: Orange 4	7.7	10.9	12 x 20	182	15,310	277	203	17,123	309
Blue 2	6.9	8.7	9 x 20	242	16,464	281	250	17,009	290
Purple 2	7.4	8.7	9 x 20	242	16,278	289	249	16,749	297
Volk	8.5	12.7	15 x 25	116	11,349	269	171	16,707	396
Orange 14	5.7	8.3	12 x 20	182	11,278	194	264	16,405	282
681G26F2P12	7.1	8.4	12 x 20	182	11,238	196	261	16,160	282
Pink 1802	7.2	9.1	12 x 20	182	11,820	211	243	15,825	283
SO+CZO	6.3	8.1	12 x 20	182	10,446	179	272	15,654	268
Orange 16	7	8.8	12 x 20	182	11,316	217	248	15,461	296
Green 7	6.7	8.5	12 x 20	182	10,704	196	259	15,275	280
Purple 4	6.2	7.6	9 x 20	242	12,477	219	289	14,900	262
UFR 4: Orange 19	7.5	10.2	12 x 20	182	12,395	229	213	14,546	269
Blue 1	7.4	8.9	9 x 20	242	14,119	260	248	14,469	266
Orange 18	6.4	7	12 x 20	182	8,323	149	315	14,445	259
Blue 4	7.8	9.9	9 x 20	242	15,183	307	229	14,368	291
Amb+HBJL-1	6.2	8.5	12 x 20	182	10,047	222	257	14,227	314
White 1801	6.7	9.5	12 x 20	182	11,144	187	230	14,122	237
Orange 21	5.9	8.7	12 x 20	182	10,016	195	252	13,907	271
Wgft+50-7	6.5	7.6	12 x 20	182	8,681	155	290	13,870	248
FG 1702	6.7	8.5	12 x 20	182	9,669	183	257	13,691	259
Rough lemon	7.2	9.9	15 x 25	116	7,186	147	221	13,673	280
Chang+Bent	6.4	7.6	9 x 20	242	11,103	187	288	13,214	222
Cleo	7.7	11.7	15 x 25	116	8,065	158	186	12,915	253
Blue 3	6.6	7.2	9 x 20	242	9,278	180	301	11,540	224
69LTXamF14P37	7.2	9.7	12 x 20	182	9,346	175	224	11,535	216

(\*) Measured.

(\*\*) Calculated using measured average width and hypothetical 20 ft. between all rows.

Table 6. St. Helena Rootstock Survey Trial – Vernia – Cumulative PS/acre (PS=pounds solids) and box/acre for actual and optimum trees/acre. Trees planted in 2008.

Rootstock	Tree height* [ft.]	Tree width* [ft.]	Actual Spacing [ft.]*	Actual no. trees/acre*	Actual Cum PS/acre 2010/11 to 2020/21*	Actual Yearly Average box/acre 2010/11 to 2020/21*	Optimum trees/acre**	Estimated Cum PS/acre 2010/11 to 2020/21**	Estimated Yearly Average box/acre 2010/11 to 2020/21**
Purple 2	8.6	8.9	9 x 20	242	25,112	343	250	27,121	354
Orange 1804	9.2	10.5	12 x 20	182	22,839	329	208	26,174	377
Blue 1	9	10.5	9 x 20	242	30,236	528	209	26,113	456
Cleo+CZO	8.1	8.6	9 x 20	242	24,534	418	256	25,953	443
Aqua 1803	7.9	9.7	12 x 20	182	20,565	286	226	25,607	357
MG-11	8.7	10.7	12 x 20	182	21,598	288	206	24,514	327
Wgft+50-7	7.9	8.7	9 x 20	242	22,146	341	250	22,878	352
White 1805	7.9	7.7	12 x 20	182	14,004	188	282	21,758	292
Blue 2	7.4	7.8	9 x 20	242	18,858	301	279	21,741	347
Volk	9.1	12.1	15 x 25	116	13,972	242	180	21,651	375
Yellow 1800	8.1	9.5	12 x 20	182	17,062	237	230	21,621	300
UFR 4: Orange 19	8.3	9.7	12 x 20	182	17,168	257	226	21,377	321
Chang+Bent	7.4	9.3	9 x 20	242	21,297	400	240	21,121	397
Purple 4	7.9	9.2	9 x 20	242	20,663	336	246	21,005	341
Orange 21	7.3	9	12 x 20	182	15,329	257	246	20,776	348
Orange 14	6.6	8.4	12 x 20	182	13,362	198	279	20,540	304
Blue 4	7.5	7.6	9 x 20	242	17,056	244	289	20,368	291
UFR 6: Changsha+TF 50-7	7.6	7.9	9 x 20	242	17,352	272	277	19,862	311
Kuharske	7.9	11.6	15 x 25	116	12,111	186	190	19,809	305
UFR 1: Orange 3	7.7	9.7	12 x 20	182	15,529	219	227	19,422	274

(\*) Measured.

(\*\*) Calculated using measured width and hypothetical 20 ft. between all rows.

Table 6 (cont'd.). St. Helena Rootstock Survey Trial – Vernia – Cumulative PS/acre (PS=pounds solids) and box/acre for actual and optimum trees/acre - Trees planted in 2008.

Rootstock	Tree height* [ft.]	Tree width* [ft.]	Actual Spacing [ft.]*	Actual no. trees/acre*	Actual Cum PS/acre 2010/11 to 2020/21*	Actual Yearly Average box/acre 2010/11 to 2020/21*	Optimum trees/acre**	Estimated Cum PS/acre 2010/11 to 2020/21**	Estimated Yearly Average box/acre 2010/11 to 2020/21**
Blue 3	7.2	7.2	9 x 20	242	14,504	224	224	19,179	296
Swingle	7.6	10	15 x 25	116	9,948	161	161	18,755	304
UFR 3: Orange 15	7	9.4	12 x 20	182	14,375	205	205	18,454	263
Orange 1	7	8.7	12 x 20	182	13,072	192	192	18,437	271
UFR 5: White 4	8	9.8	12 x 20	182	14,906	216	216	18,396	267
Orange 18	6.9	8.4	12 x 20	182	12,710	213	213	18,277	307
SO+50-7	6.5	7.9	9 x 20	242	15,657	254	254	18,180	295
Green 7	7	9.3	12 x 20	182	13,949	200	200	18,061	259
Orange 13	7.6	8.9	12 x 20	182	12,987	194	194	17,602	263
Blue 9	7.9	8.9	9 x 20	242	16,750	300	300	17,234	308
SO+RPxSH99-5	7.3	7.8	9 x 20	242	14,583	235	235	16,994	273
UFR 2: Orange 4	6.8	8.7	12 x 20	182	12,000	172	172	16,794	241
Amb+HB JL-2B	6.5	8	12 x 20	182	11,057	223	223	16,631	335
White 1801	7.3	10	12 x 20	182	13,297	190	190	15,972	228
SO+CZO	7	8.4	9 x 20	242	13,709	230	230	14,786	248
Orange 2	7.5	11	12 x 20	182	13,044	230	230	14,230	251
Cleo	8	10.4	15 x 25	116	7,787	126	126	14,145	228
Rough lemon	7.3	10.5	15 x 25	116	7,833	159	159	14,026	285
Pink1802	6.4	7.6	12 x 20	182	8,425	156	156	13,461	249

(\*) Measured.

(\*\*) Calculated using measured averaged width and hypothetical 20 ft. between all rows.

Table 7. St. Helena Rootstock Survey Trial – Vernia & Valquarius – Cumulative PS/acre (PS=pounds solids) and box/acre for actual and optimum trees/acre. Trees planted in 2010.

Scion	Rootstock	Tree height* [ft.]	Tree width* [ft.]	Actual Spacing [ft.]*	Actual no. trees/acre*	Actual Cum PS/acre 2013/14 to 2020/21*	Actual Yearly Average box/acre 2013/14 to 2020/21*	Optimum trees/acre**	Estimated Cum PS/acre 2013/14 to 2020/21**	Estimated Yearly Average box/acre 2013/14 to 2020/21**
Vernia	UFR 16: 46x31-02-13	8.3	9.5	9 x 20	242	15,508	371	230	14,739	343
	46x31-02-S3	8.0	8.8	9 x 20	242	13,401	300	251	13,899	297
	Amb+Volk	6.7	9.1	15 x 25	116	6,235	135	240	12,882	277
	Nova+7-2-99-2	6.6	8.5	15 x 25	116	5,243	111	261	11,781	241
	UFR 17: Green 2	7.7	10.6	9 x 20	242	13,679	331	208	11,757	283
	A-Mac	6.8	9	15 x 25	116	5,301	118	244	11,136	237
	6058x2071-01-02	6.5	7.1	9 x 20	242	8,390	180	315	10,921	229
	6058x6056-002	7.8	10.2	15 x 25	116.2	5,837	145	215	10,804	255
	46x31-02-S9	7.2	9.5	10 x 20	230	10,255	225	232	10,349	220
	Amb + 5-1-99-2	7.0	7.75	12 x 20	182	6,097	136	281	9,441	221
	SO+RPxSH99-4	7.3	8.3	9 x 20	242	7,262	171	271	8,133	169
	Nova+7-3-99-1	7.0	10	15 x 25	116	4,071	90	219	7,676	158
	N+HBP-SS-9	6.8	8.2	9 x 20	242	6,860	140	270	7,654	150
	Wmur+HBJL-7	6.3	9.3	15 x 25	116	3,703	87	236	7,523	177
	SR+SH-99-11	6.5	6.5	9 x 20	242	4,579	94	336	6,358	133
Valquarius	6058x2071-01-02	7.1	8	12 x 20	182	8,180	210	277	12,484	313
	White 1	8.5	11.5	15 x 25	116	7,264	189	190	11,881	294
	SO+RPxSH99-4	6.5	7.3	9 x 20	242	7,628	163	304	9,583	209

(\*) Measured.

(\*\*) Calculated using measured average width and hypothetical 20 ft. between all rows.