

St. Cloud OLL Clone/Rootstock Demonstration Planting

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November 22, 2021 - Revised
July 22, 2020 - Posted
CREC Citrus Plant Improvement



St. Cloud OLL Clone/Rootstock Demonstration Planting - Description

At the suggestion of long-time cooperator, Orie Lee, a demonstration was planted to compare the performance of 8 OLL [Orie Lee Late] sweet orange clones on 18 rootstocks. Pathogen-free budwood was not available for most of the OLL clones at the time of tree propagation, thus, a permit was obtained from FL Department of Agriculture, Division of Plant Industry [DPI] to propagate the trees using budwood from the original OLL somaclone trees, located on the Lee property. The DPI permit limited this project to 2 acres, so it was designed with one, 2-tree, plot per scion/rootstock combination. Trees were planted in June 2013 with rootstocks in rows running in one direction with OLL clones in perpendicular rows. Propagation took place on the Lee property with the assistance of Britleaf Nursery. Trees received standard imidacloprid treatments the first two years, but no psyllid control thereafter. Diaprepes weevils were observed in the trial block. By year 3, all trees in the trial showed HLB symptoms. Trees have received the Lee Groves standard 4 soluble dry fertilizer treatments per year, and since year 4 have received supplemental treatments of CRF (controlled release fertilizer) with an enhanced micronutrient package two times per year.

This small trial is remarkable for multiple reasons. The soluble solids being produced in the fruit across most of the scion/rootstock combinations are exceptionally high, and would be considered high for young trees even for trees before the HLB endemic. Yields of some combinations are also quite good, even though psyllid control has not been employed, and the grove is under high psyllid/HLB pressure. Finally, it is quite interesting that so many of the trees are testing negative by PCR for an active *CLas* infection, suggesting a positive effect from the combination of good genetics and constant enhanced micronutrient availability.

St. Cloud OLL Clone/Rootstock Demonstration Planting - Summary

- Location: St. Cloud Florida, Block 13-W
- Scions: 8 OLL (Orie Lee Late) somaclones
- Rootstocks: Swingle, Carrizo, x639 and 15 tetraploid rootstocks from the UF breeding program
- Date planted: June 2013
- Design:
 - One, 2-tree, plot per scion/rootstock combination; rootstocks planted in east/west rows; OLL clones in perpendicular north/south rows
 - Spacing: 12.5 x 25 ft. or 140 trees/acre
- Data:
 - 2018/19: Yield, juice quality, cumulative Yield, PS/tree, HLB PCR Ct values
 - 2019/20: Yield, juice quality, cumulative Yield, PS/tree, HLB PCR Ct values
 - 2020/21: Juice Quality
- TRIAL STATUS: ACTIVE

Table 1. Trial rootstock identification

Diploid commercial controls	
Rootstock	Parentage*
Carrizo	Washington navel orange x trifoliolate orange
Swingle	Swingle citrumelo
x639	x-639 Cleopatra x Rubidoux TF

Tetraploid rootstocks	
Rootstock	Parentage*
AMB+Carrizo	Amblycarpa+Carrizo
Green 7	[Nova+HBPummelo] x [sour orange+Carrizo]
Orange 13	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
Orange 14	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
Orange 16	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
Orange 2	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
UFR-1 [Orange 3]	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
UFR-17 [Green 2]	[Nova+HBPummelo] x [sour orange+Carrizo]
UFR-2 [Orange 4]	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
UFR-3 [Orange 15]	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
UFR-4 [Orange 19]	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]
UFR-5 [White 4]	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]
UFR-6 [Chang+50-7]	Changsha mandarin+trifoliolate orange 50-7
White 1	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]
White 3	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]

(*) + indicates somatic hybrid; x indicates sexual hybrid

Table 2. St. Cloud Demonstration Planting: Yield [box/tree] and cumulative yield for seasons 2018/19 and 2019/20.

Yield [Box/Tree]	SCION																								
	OLL4			OLL5			OLL7			OLL8			OLL9			OLL10			OLL6			OLL 20			
	2018/19	2019/20	cum																						
ROOTSTOCK																									
Orange 14	1.8	1.6	3.4	1.3	2.3	3.5	2.0	2.3	4.3	2.2	2.6	4.8	1.0	1.5	2.5	1.8	1.5	3.3	1.8	2.1	3.9	0.9	1.5	2.4	
UFR 2: Orange 4	0.5	1.8	2.3	1.0	2.1	3.1	1.5	1.5	3.0	1.8	2.1	3.9	0.4	0.5	0.9	1.3	1.5	2.8	1.6	2.4	4.0	1.8	2.3	4.1	
UFR 5: White 4	1.5	1.6	3.1	1.8	2.4	4.1	1.5	1.3	2.8	2.5	1.9	4.4	0.8	1.3	2.0	2.1	1.4	3.5	1.3	1.5	2.8	0.6	0.6	1.3	
Orange 16	2.3	2.0	4.3	1.6	1.9	3.5	1.4	1.4	2.8	2.0	1.6	3.6	0.5	0.8	1.3	1.5	1.8	3.3	1.8	1.3	3.0	0.6	0.8	1.4	
White 1	2.0	1.8	3.8	1.5	2.1	3.6	1.5	2.0	3.5	1.8	1.6	3.4	0.4	0.9	1.3	1.0	1.5	2.5	1.1	1.3	2.4	1.1	1.4	2.5	
UFR 4: Orange 19	1.9	1.8	3.6	1.3	2.4	3.6	2.0	2.0	4.0	1.3	1.6	2.9	0.1	0.3	0.4	0.6	1.6	2.3	0.9	1.5	2.4	1.9	1.0	2.9	
UFR 1: Orange 3	1.8	1.9	3.6	1.0	2.4	3.4	1.8	1.9	3.7	2.0	1.8	3.8	0.5	0.9	1.4	1.5	0.9	2.4	1.0	1.3	2.3	0.5	0.9	1.4	
UFR-6: Chang+50-7	1.3	1.6	2.9	1.3	1.4	2.6	1.8	1.5	3.3	1.3	1.1	2.4	0.9	1.3	2.1	1.0	1.0	2.0	0.6	0.8	1.4	0.9	1.0	1.9	
x639	1.5	1.8	3.3	1.5	1.8	3.3	1.8	1.5	3.3	1.3	1.3	2.5	0.1	0.5	0.6	1.0	1.5	2.5	0.7	1.0	1.7	0.7	0.5	1.2	
UFR 17: Green 2	1.3	1.3	2.5	1.8	0.8	2.5	2.9	1.6	4.5	1.0	0.9	1.9	0.1	0.8	0.9	0.8	1.6	2.4	0.6	1.3	1.9	0.6	0.8	1.4	
Orange 13	0.8	1.1	1.9	0.8	1.9	2.6	1.0	1.4	2.4	1.0	0.9	1.9	0.8	0.4	1.1	1.5	1.3	2.8	0.6	0.8	1.4	0.7	1.0	1.7	
UFR 3: Orange 15	0.9	1.5	2.4	0.5	1.6	2.1	0.9	1.3	2.1	0.9	1.0	1.9	0.9	1.0	1.9	1.4	0.3	1.6	0.8	0.8	1.5	0.6	1.3	1.9	
Carrizo	1.3	1.0	2.3	0.6	1.1	1.8	1.8	1.8	3.6	1.3	0.9	2.1	0.3	0.5	0.8	0.6	0.8	1.4	0.3	0.5	0.8	0.6	0.8	1.4	
Green 7	1.3	1.1	2.4	1.1	1.4	2.5	1.5	1.0	2.5	0.5	0.0	0.5	0.5	0.6	1.1	1.5	1.1	2.6	0.6	0.8	1.4	0.4	0.4	0.8	
White 3	1.0	1.5	2.5	0.9	1.1	2.0	1.1	1.3	2.4	0.8	1.1	1.9	0.4	0.8	1.1	0.6	0.8	1.4	0.6	0.6	1.3	0.8	0.3	1.0	
AMB+Carrizo	1.0	1.0	2.0	1.5	1.3	2.8	0.9	1.4	2.2	0.5	0.5	1.0	0.3	0.6	1.0	1.0	1.3	2.3	0.5	0.6	1.1	0.4	0.3	0.6	
Swingle	1.0	1.3	2.3	0.5	1.3	1.8	1.0	1.0	2.0	1.0	1.3	2.3	0.0	1.3	1.3	0.0	0.8	0.8	0.5	1.0	1.5	0.5	0.5	1.0	
Orange 2	0.8	0.8	1.5	1.4	0.0	1.4	0.9	0.0	0.9	1.3	1.0	2.3	0.8	1.0	1.8	0.1	0.0	0.1	0.6	0.0	0.6	0.8	0.3	1.0	

* Note that the original OLL-20 tree was the first among the somaclones to become infected with *Clas*, showing strong symptoms before the other clones; thus the budwood used to propagate the trial trees probably had a higher titer of Clas to start with.

Fig. 1. St. Cloud Demonstration Planting: Mean yield and cumulative yield [box/tree] by scion across all rootstocks over 2 seasons, sorted by cum yield.

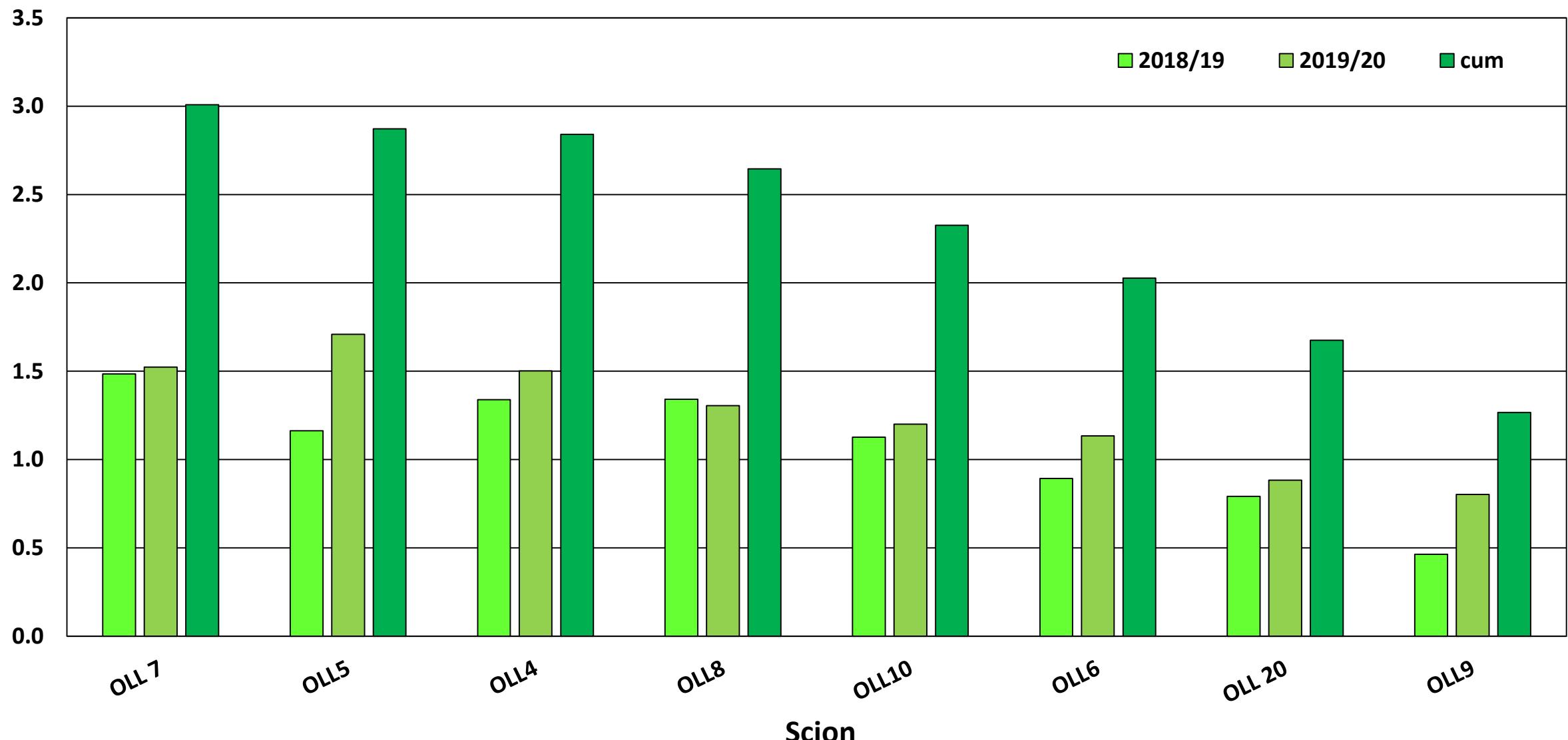


Fig. 2. St. Cloud Demonstration Planting: Mean yield and cumulative yield [box/tree] by rootstock across all scions. Sorted by cumulative yield.

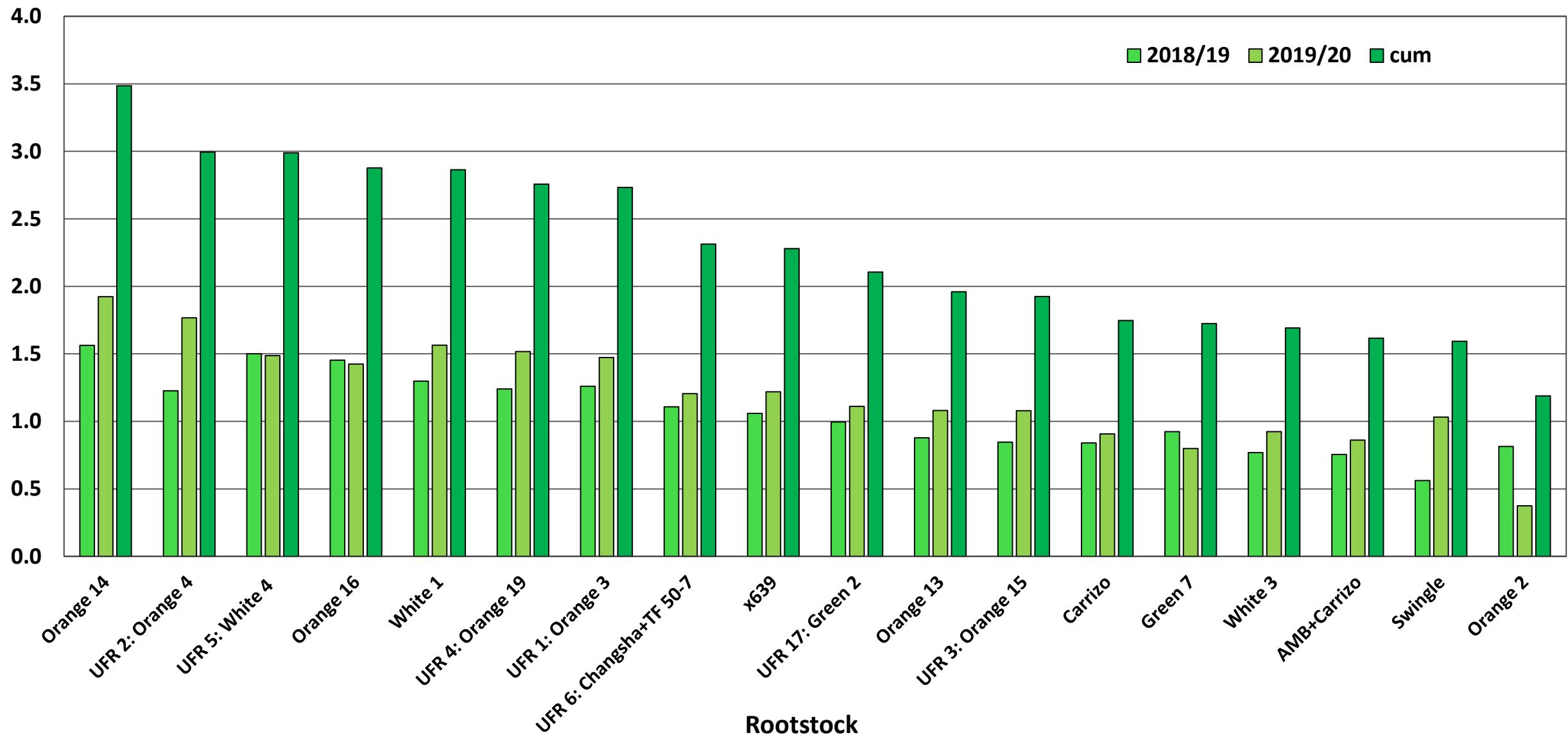


Fig. 3. St. Cloud Demonstration Planting – 2018/19 & 2019/20 cumulative yield [box/tree] by rootstock for all scions

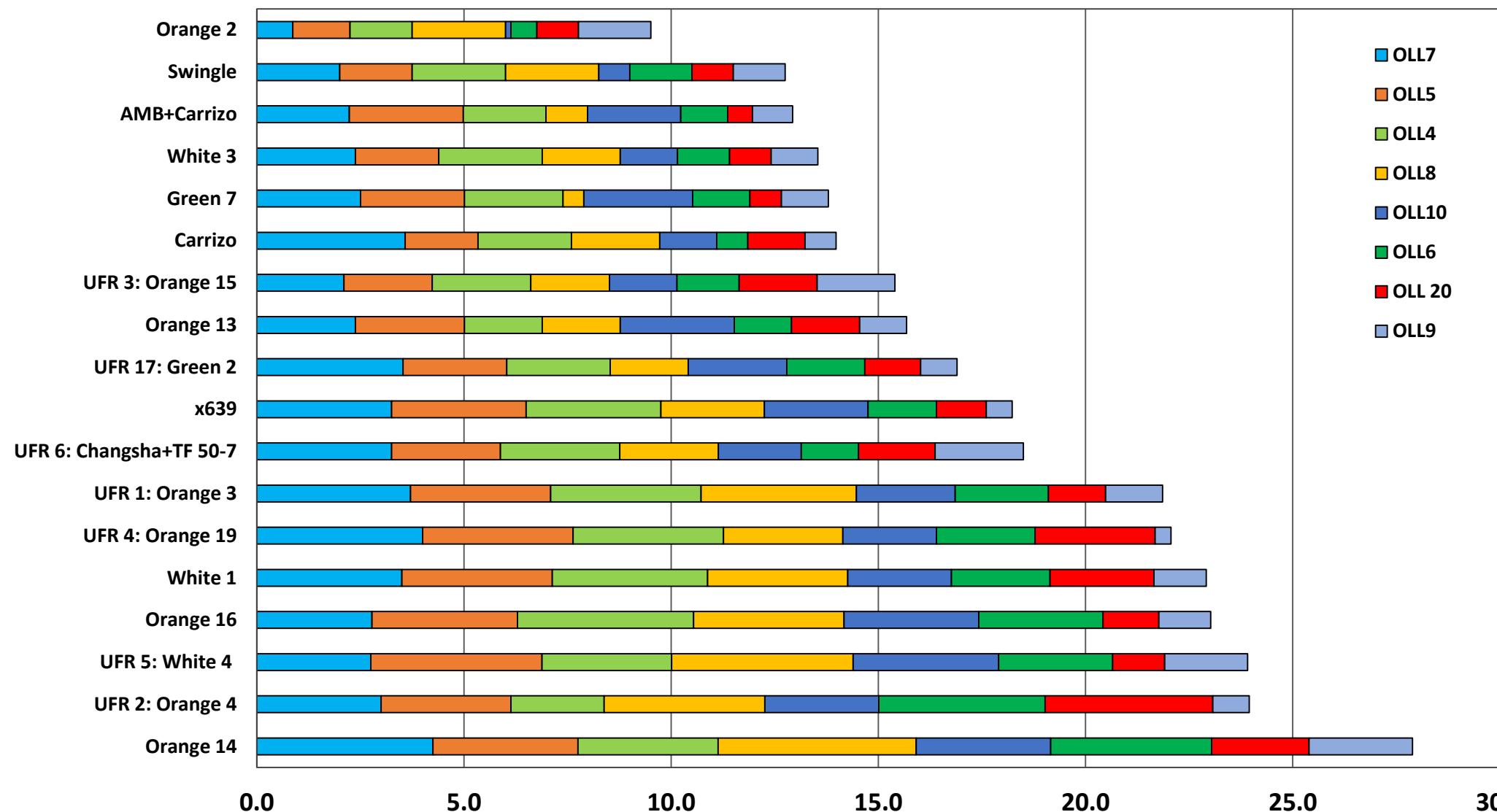


Table 3. St. Cloud Demonstration Planting – 2018/19 & 2019/20 PS/tree and 2-year cumulative yield by rootstock for OLL 8.

ROOTSTOCK	PS/Tree		
	2018/19	2019/20	Cum
Orange 14	13.1	17.0	30.1
UFR 5: White 4	17.1	12.9	30.1
UFR 1: Orange 3	13.2	12.3	25.6
UFR 2: Orange 4	11.4	13.9	25.4
Orange 16	13.3	11.2	24.5
White 1	11.6	11.1	22.7
UFR 4: Orange 19	8.6	11.6	20.1
UFR 6: Changsha+TF 50-7	9.6	8.3	17.9
x639	8.7	7.9	16.6
Carrizo	9.3	6.2	15.5
Orange 2	8.5	6.8	15.3
Swingle	6.9	8.2	15.1
Orange 13	6.7	6.0	12.6
White 3	5.1	7.5	12.6
UFR 3: Orange 15	5.9	6.6	12.4
UFR 17: Green 2	6.5	5.6	12.0
AMB+Carrizo	3.2	3.5	6.7
Green 7	3.5	NA	3.5

NA – data not available

Fig. 4. St. Cloud Demonstration Planting – 2018/19 & 2019/20 PS/tree and 2-year cumulative PS/tree for OLL 8 sorted by cum PS/tree.

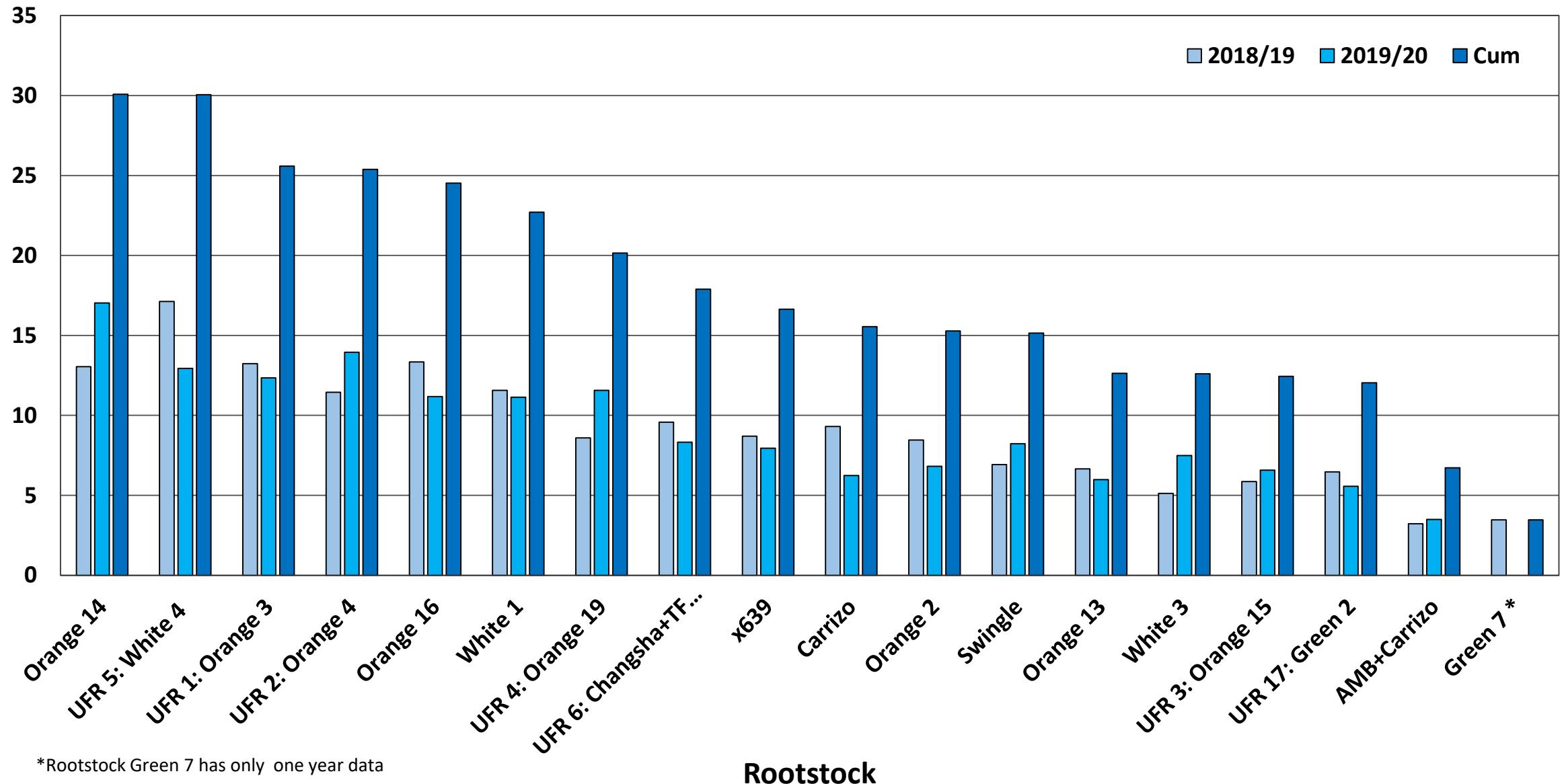


Table 4. St. Cloud Demonstration Planting – 2018/19 & 2019/20 PS/tree and 2-year cumulative by scion for rootstock UFR-5 [White 4].

Scion	PS/tree		
	2018/19	2019/20	2-year Cum
OLL4	10.6	11.8	22.3
OLL5	11.6	15.6	27.2
OLL6	9.1	10.3	19.4
OLL7	9.9	8.2	18.0
OLL8	17.1	12.9	30.1
OLL9	5.0	8.5	13.5
OLL10	14.9	9.9	24.8
OLL20	4.2	3.6	7.8

Fig. 5. St. Cloud Demonstration Planting – 2018/19 & 2019/20 PS/tree and 2-year cumulative by scion for rootstock UFR-5 [White 4].

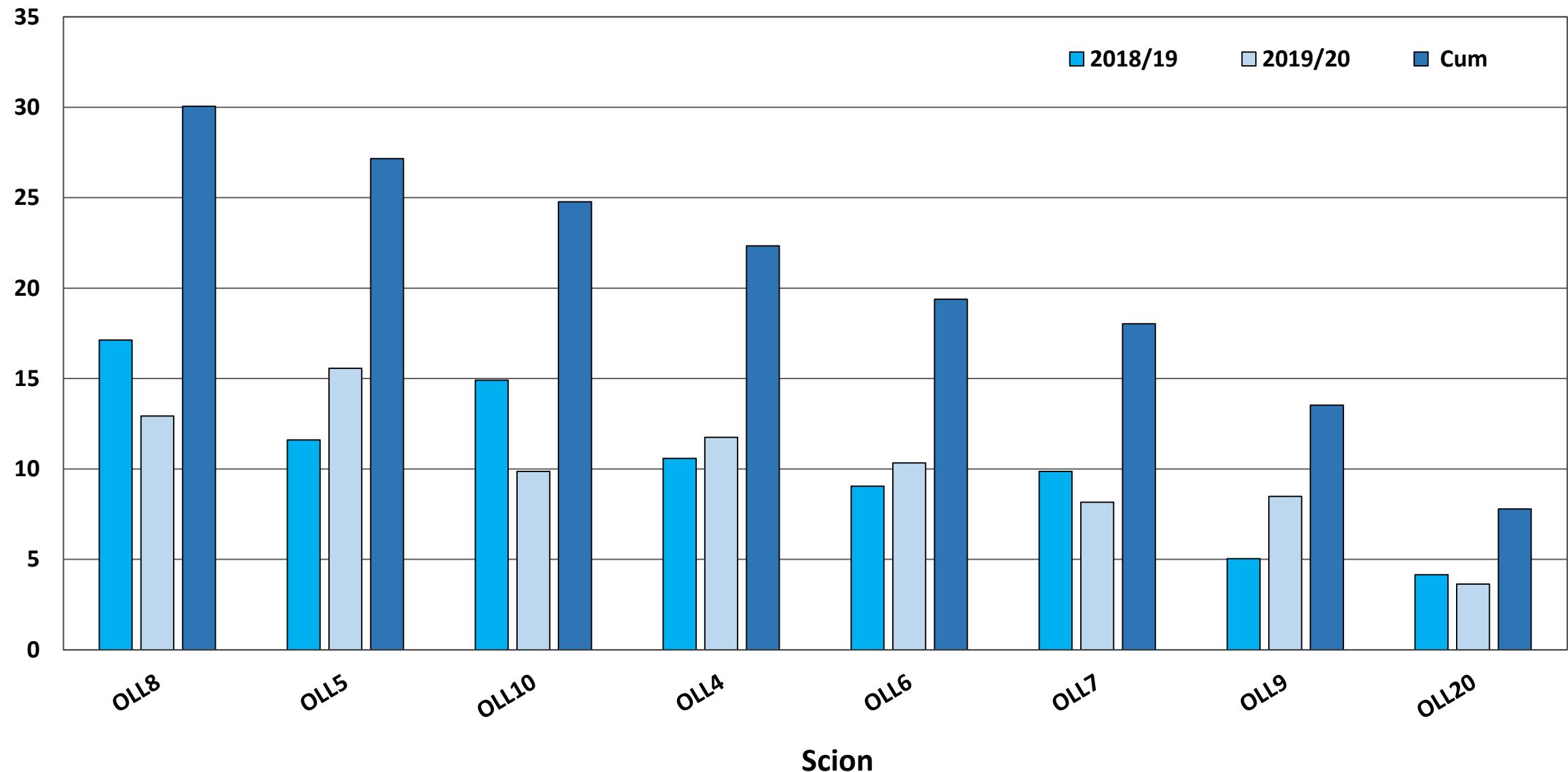


Table 5. St. Cloud Demonstration Planting – 2018/19 & 2019/20 Juice quality data by scion and rootstock

Scion	Rootstock	Brix		Acid		Ratio		Color	
		2018/19	2019/20	2018/19	2019/20	2018/19	2019/20	2018/19	2019/20
OLL8	AMB+Carrizo	12.0	11.8	0.9	0.8	13.6	15.1	38.6	38.9
	Carrizo	13.9	13.1	1.0	0.9	14.2	14.7	37.5	39.2
	UFR 17: Green 2	11.7	11.2	0.9	0.8	12.6	13.7	38.2	39.0
	Green 7	13.6		0.9		14.4		37.6	
	Orange 13	12.2	11.9	0.9	0.9	14.4	14.1	38.5	39.7
	Orange 14	11.2	11.4	0.9	0.7	12.0	15.4	37.8	38.8
	Orange 16	11.9	11.9	0.9	0.8	13.5	14.7	38.0	38.6
	Orange 2	12.3	12.3	0.8	0.8	15.6	16.3	37.8	39.2
	Swingle	12.6	11.8	1.0	0.8	12.7	15.7	38.2	39.2
	UFR 1: Orange 3	11.9	12.7	0.9	0.8	12.9	15.4	38.2	39.5
	UFR 2: Orange 4	11.9	11.7	0.8	0.8	14.6	15.6	39.1	39.8
	UFR 3: Orange 15	11.4	11.8	0.8	0.8	14.3	15.5	38.4	38.6
	UFR 4: Orange 19	12.5	12.7	0.9	0.7	14.5	17.2	38.3	39.1
	UFR 5: White 4	12.4	12.0	1.0	1.0	13.0	12.4	38.6	38.7
	UFR 6: Changsha+TF 50-7	13.5	12.9	1.0	0.9	14.1	14.4	38.7	40.6
OLL20	White 1	11.9	12.3	0.9	0.9	13.2	14.4	38.6	39.4
	White 3	12.3	11.9	0.9	0.8	13.8	14.1	38.5	39.1
	x639	12.8	11.8	0.9	0.7	14.4	16.1	38.0	40.0
	AMB+Carrizo	13.1		0.7		18.7		40.0	
	UFR 6: Changsha+TF 50-7	14.0		1.0		14.6		38.1	

Scion	Rootstock	Brix		Acid		Ratio		Color	
		2018/19	2019/20	2018/19	2019/20	2018/19	2019/20	2018/19	2019/20
OLL4	x639	11.0		1.1		10.3		38.6	
	AMB+Carrizo	12.7		0.9		14.5		38.1	
	Carrizo	12.9		0.9		13.7		38.2	
	Green 7	12.4		1.0		12.7		37.8	
	Orange 13	11.8		0.9		13.7		37.7	
	Orange 14	11.1		0.8		13.8		37.8	
	Orange 16	11.7		0.9		13.0		38.1	
	Orange 2	13.2		0.9		14.2		38.6	
	Swingle	12.8		1.1		12.1		38.5	
	UFR 1: Orange 3	12.4		1.0		13.1		38.2	
	UFR 17: Green 2	11.6		1.0		12.0		38.2	
	UFR 2: Orange 4	10.5		0.8		13.1		38.1	
	UFR 3: Orange 15	10.7		0.8		13.0		38.1	
	UFR 4: Orange 19	11.7		0.9		13.7		37.8	
	UFR 5: White 4	13.0	12.6	1.0	0.8	12.8	15.4	37.8	39.6
OLL5	UFR 6: Changsha+TF 50-7	12.4		0.9		13.5		38.4	
	White 1	12.7		0.9		13.9		38.2	
	White 3	12.3		1.0		12.9		38.4	
	UFR 5: White 4	12.0	11.6	1.0	0.8	12.6	14.9	38.6	37.3
	UFR 5: White 4	12.9	12.1	1.0	0.8	12.4	14.6	38.1	39.7
OLL6	UFR 5: White 4	11.9	11.4	0.9	0.8	13.2	15.2	38.3	40.1
	UFR 5: White 4	12.5	12.0	1.1	0.9	11.6	13.8	36.0	37.1
	UFR 5: White 4	12.5	12.5	0.9	0.9	13.4	14.3	38.1	38.6
OLL7	UFR 5: White 4	12.0	11.6	1.0	0.8	12.6	14.9	38.6	37.3
	UFR 5: White 4	12.9	12.1	1.0	0.8	12.4	14.6	38.1	39.7
	UFR 5: White 4	11.9	11.4	0.9	0.8	13.2	15.2	38.3	40.1
OLL9	UFR 5: White 4	12.5	12.0	1.1	0.9	11.6	13.8	36.0	37.1
	UFR 5: White 4	12.5	12.5	0.9	0.9	13.4	14.3	38.1	38.6
OLL10	UFR 5: White 4	12.5	12.5	0.9	0.9	13.4	14.3	38.1	38.6

Table 5 (cont'd.). St. Cloud Demonstration Planting – 2018/19 & 2019/20 & 2020/21 Juice quality data by scion and rootstock

Scion	Rootstock	Brix			Acid			Ratio			Color		
		2018/19	2019/20	2020/21	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
OLL8	AMB+Carrizo	12.0	11.8	10.2	0.9	0.8	0.8	13.6	15.1	12.3	38.6	38.9	37.7
	Carrizo	13.9	13.1	14.2	1.0	0.9	1.1	14.2	14.7	13.0	37.5	39.2	36.9
	UFR 17: Green 2	11.7	11.2	10.5	0.9	0.8	0.9	12.6	13.7	12.4	38.2	39.0	37.1
	Green 7	13.6		10.9	0.9		0.7	14.4		15.4	37.6		37.6
	Orange 13	12.2	11.9	11.0	0.9	0.9	0.8	14.4	14.1	13.6	38.5	39.7	37.5
	Orange 14	11.2	11.4	11.9	0.9	0.7	0.9	12.0	15.4	13.5	37.8	38.8	37.5
	Orange 16	11.9	11.9	11.0	0.9	0.8	0.8	13.5	14.7	13.4	38.0	38.6	38.2
	Orange 2	12.3	12.3	11.7	0.8	0.8	0.8	15.6	16.3	15.0	37.8	39.2	36.4
	Swingle	12.6	11.8	11.4	1.0	0.8	0.8	12.7	15.7	14.9	38.2	39.2	37.3
	UFR 1: Orange 3	11.9	12.7	12.1	0.9	0.8	0.8	12.9	15.4	14.4	38.2	39.5	37.0
	UFR 2: Orange 4	11.9	11.7	11.1	0.8	0.8	0.8	14.6	15.6	14.4	39.1	39.8	37.5
	UFR 3: Orange 15	11.4	11.8	11.7	0.8	0.8	0.8	14.3	15.5	15.2	38.4	38.6	37.9
	UFR 4: Orange 19	12.5	12.7	12.7	0.9	0.7	0.9	14.5	17.2	14.9	38.3	39.1	37.6
	UFR 5: White 4	12.4	12.0	12.5	1.0	1.0	0.9	13.0	12.4	13.5	38.6	38.7	38.2
	UFR 6: Changsha+TF 50-7	13.5	12.9	13.1	1.0	0.9	1.0	14.1	14.4	13.8	38.7	40.6	37.8
	White 1	11.9	12.3	12.2	0.9	0.9	1.0	13.2	14.4	12.8	38.6	39.4	37.7
	White 3	12.3	11.9	12.4	0.9	0.8	0.8	13.8	14.1	14.9	38.5	39.1	37.8
	x639	12.8	11.8	11.4	0.9	0.7	0.9	14.4	16.1	13.4	38.0	40.0	37.0
OLL20	AMB+Carrizo		13.1	12.2		0.7	0.8		18.7	15.6		40.0	38.3
	UFR 6: Changsha+TF 50-7		14.0	12.5		1.0	0.9		14.6	14.3		38.1	37.6
	Carrizo		14.0	15.1		0.9	1.0		16.0	14.9		36.6	34.7
	UFR 17: Green 2		11.2	9.3		0.7	0.8		15.1	12.2		38.1	36.1
	Green 7		14.3	13.3		0.7	0.7		19.8	19.3		36.1	36.5
	UFR 5: White 4		11.9	10.2		0.9	0.8		13.8	12.4		38.6	38.4
	Orange 13		12.2	12.2		0.7	0.7		18.0	17.4		36.8	36.0
	Orange 14		12.5	12.1		0.7	0.6		18.9	19.9		35.6	34.5
	UFR 3: Orange 15		13.4	12.7		0.8	0.7		17.4	18.7		36.8	35.2
	Orange 16		13.0	12.3		0.9	0.7		15.1	17.0		38.9	37.6
	UFR 4: Orange 19		11.7	11.3		0.8	0.7		15.4	16.0		36.9	37.3
	Orange 2		13.6	11.6		0.9	0.8		15.9	14.3		40.4	36.9
	UFR 1: Orange 3		12.1	11.6		0.7	0.7		18.0	15.7		38.2	37.2
	UFR 2: Orange 4		12.2	10.8		0.7	0.7		17.7	16.4		38.5	36.9
	Swingle		11.8	10.8		0.7	0.8		16.6	14.3		37.8	36.4
	White 1		12.6	13.0		0.9	0.8		14.9	15.7		37.9	36.4
	x639		11.5	12.4		0.7	0.8		15.9	15.8		36.4	35.4
	White 3		13.8	12.4		0.8	0.7		17.5	17.3		37.2	37.0

Table 5 (cont'd.). St. Cloud Demonstration Planting – 2018/19 & 2019/20 & 2020/21 Juice quality data by scion and rootstock

Scion	Rootstock	Brix			Acid			Ratio			Color		
		2018/19	2019/20	2020/21	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21	2018/19	2019/20	2020/21
OLL4	x639	11.0		10.5	1.1		0.9	10.3		12.3	38.6		37.9
	AMB+Carrizo	12.7		9.4	0.9		0.8	14.5		11.9	38.1		38.1
	Carrizo	12.9		11.7	0.9		0.9	13.7		12.6	38.2		38.3
	Green 7	12.4		10.0	1.0		0.9	12.7		11.2	37.8		36.7
	Orange 13	11.8		10.5	0.9		0.7	13.7		14.5	37.7		37.8
	Orange 14	11.1		10.7	0.8		0.7	13.8		14.8	37.8		38.2
	Orange 16	11.7		11.0	0.9		0.7	13.0		15.0	38.1		38.8
	Orange 2	13.2		12.0	0.9		1.1	14.2		10.7	38.6		37.8
	Swingle	12.8		11.2	1.1		0.8	12.1		13.8	38.5		38.1
	UFR 1: Orange 3	12.4		10.4	1.0		0.8	13.1		13.5	38.2		37.8
	UFR 17: Green 2	11.6		10.7	1.0		0.8	12.0		13.4	38.2		38.1
	UFR 2: Orange 4	10.5		9.5	0.8		0.7	13.1		14.7	38.1		37.8
	UFR 3: Orange 15	10.7		10.0	0.8		0.6	13.0		15.6	38.1		38.2
	UFR 4: Orange 19	11.7		10.6	0.9		0.7	13.7		15.8	37.8		38.9
	UFR 5: White 4	13.0	12.6	12.1	1.0	0.8	0.9	12.8	15.4	14.0	37.8	39.6	37.5
	UFR 6: Changsha+TF 50-7	12.4		11.6	0.9		0.8	13.5		13.9	38.4		39.6
	White 1	12.7		12.0	0.9		0.9	13.9		13.0	38.2		37.7
	White 3	12.3		11.3	1.0		0.9	12.9		13.3	38.4		38.4
OLL5	UFR 5: White 4	12.0	11.6	11.8	1.0	0.8	0.8	12.6	14.9	15.6	38.6	37.3	37.7
OLL6	UFR 5: White 4	12.9	12.1	11.7	1.0	0.8	0.9	12.4	14.6	13.3	38.1	39.7	37.3
OLL7	UFR 5: White 4	11.9	11.4	11.2	0.9	0.8	0.8	13.2	15.2	14.4	38.3	40.1	39.2
OLL9	UFR 5: White 4	12.5	12.0	11.4	1.1	0.9	0.8	11.6	13.8	14.4	36.0	37.1	35.9
OLL10	UFR 5: White 4	12.5	12.5	12.4	0.9	0.9	0.9	13.4	14.3	14.1	38.1	38.6	38.0

Table 6. St. Cloud Demonstration Planting – 2018/19 & 2019/20 and 2-year cumulative PS/box by scion and rootstock.

Scion	Rootstock	2018/19	2019/20	2-year cum	Scion	Rootstock	2018/19	2019/20	2-year cum	Scion	Rootstock	2018/19	2019/20	2-year cum
OLL8	AMB+Carrizo	6.4	7.0	13.4	OLL20	AMB+Carrizo		7.0		OLL4	x639	6.1		
	Carrizo	7.4	7.1	14.5		UFR 6: Chang+50-7		7.7			AMB+Carrizo	6.9		
	UFR 17: Green 2	6.5	6.3	12.8		Carrizo		6.6			Carrizo	6.9		
	Green 7	6.9		6.9		Green 2		5.8			Green 7	6.6		
	Orange 13	6.7	6.8	13.4		Green 7		7.0			Orange 13	6.4		
	Orange 14	6.1	6.5	12.5		UFR 5: White 4	6.6	5.8	12.4		Orange 14	6.1		
	Orange 16	6.7	6.9	13.5		Orange 13		6.1			Orange 16	6.2		
	Orange 2	6.8	6.8	13.6		Orange 14		5.6			Orange 2	7.3		
	Swingle	6.9	6.6	13.5		UFR 3: Orange 15		6.9			Swingle	7.1		
	UFR 1: Orange 3	6.6	7.1	13.7		Orange 16		7.0			UFR-1 [Orange 3]	6.8		
	UFR 2: Orange 4	6.5	6.5	13.1		UFR 4: Orange 19		6.4			Green 2	6.3		
	UFR 3: Orange 15	6.5	6.6	13.1		Orange 2		7.5			UFR 2: Orange 4	5.6		
	UFR 4: Orange 19	6.9	7.1	14.0		UFR 1: Orange 3		6.6			UFR 3: Orange 15	5.9		
	UFR 5: White 4	6.9	6.9	13.7		UFR 2: Orange 4		6.2			UFR 4: Orange 19	6.3		
	UFR 6: Chang+50-7	7.7	7.4	15.0		Swingle		6.5			UFR 5: White 4	7.1	7.2	14.3
	White 1	6.6	6.8	13.4		White 1		7.0			UFR 6: Chang+50-7	6.8		
	White 3	6.8	6.6	13.5		x639		5.6			White 1	6.9		
	x639	7.0	6.4	13.3		White 3		7.3			White 3	6.8		

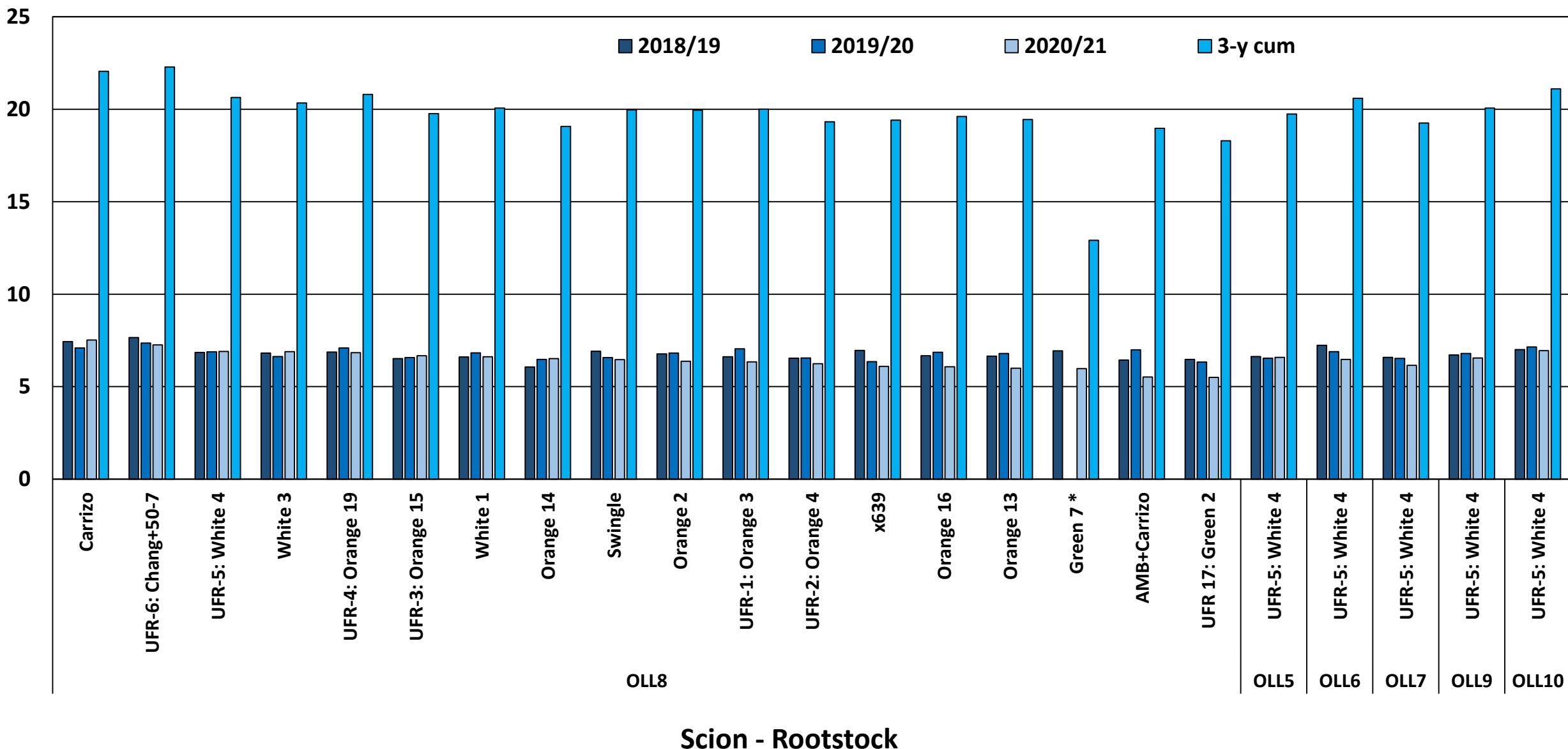
Scion	Rootstock	2018/19	2019/20	2-year cum
OLL5	UFR 5: White 4	6.6	6.5	13.2
OLL6	UFR 5: White 4	7.2	6.9	14.1
OLL7	UFR 5: White 4	6.6	6.5	13.1
OLL9	UFR 5: White 4	6.7	6.8	13.5
OLL10	UFR 5: White 4	7.0	7.1	14.1

Table 6 (cont'd.). St. Cloud Demonstration Planting – 2018/19 & 2019/20 & 2010/21 and 3-year cumulative PS/box by scion and rootstock.

Scion	Rootstock	2018/19	2019/20	2020/21	3-y cum	Scion	Rootstock	2018/19	2019/20	2020/21	3-y cum	Scion	Rootstock	2018/19	2019/20	2020/21	3-y cum
OLL8	AMB+Carrizo	6.4	7.0	5.5	24.5	OLL20	AMB+Carrizo		7.0	6.3	19.6	OLL4	x639			5.6	17.4
	Carrizo	7.4	7.1	7.5	29.6		UFR-6: Chang+50-7		7.7	6.7	21.1		AMB+Carrizo		6.9	5.1	17.1
	UFR-17: Green 2	6.5	6.3	5.5	23.8		Carrizo		6.6	6.7	20.0		Carrizo		6.9	6.3	19.6
	Green 7	6.9		6.0	18.9		UFR-17: Green 2		5.8	4.4	14.7		Green 7		6.6	5.2	17.0
	Orange 13	6.7	6.8	6.0	25.4		Green 7		7.0	6.2	19.3		Orange 13		6.4	5.9	18.1
	Orange 14	6.1	6.5	6.5	25.6		UFR-5: White 4		6.6	5.8	12.4		Orange 14		6.1	5.8	17.6
	Orange 16	6.7	6.9	6.1	25.7		Orange 13		6.1	5.6	17.3		Orange 16		6.2	5.9	17.9
	Orange 2	6.8	6.8	6.4	26.3		Orange 14		5.6	5.4	16.3		Orange 2		7.3	6.7	20.6
	Swingle	6.9	6.6	6.5	26.4		UFR-3: Orange 15		6.9	6.1	19.1		Swingle		7.1	6.3	19.7
	UFR-1: Orange 3	6.6	7.1	6.3	26.4		Orange 16		7.0	6.2	19.5		UFR-1: Orange 3		6.8	5.6	18.0
	UFR-2: Orange 4	6.5	6.5	6.2	25.6		UFR-4: Orange 19		6.4	6.3	19.0		UFR-17: Green 2		6.3	5.7	17.6
	UFR-3: Orange 15	6.5	6.6	6.7	26.4		Orange 2		7.5	6.3	20.2		UFR-2: Orange 4		5.6	5.0	15.6
	UFR-4: Orange 19	6.9	7.1	6.8	27.6		UFR-1: Orange 3		6.6	6.2	19.1		UFR-3: Orange 15		5.9	5.5	16.8
	UFR-5: White 4	6.9	6.9	6.9	27.5		UFR-2: Orange 4		6.2	5.1	16.4		UFR-4: Orange 19		6.3	5.8	17.9
	UFR-6: Chang+50-7	7.7	7.4	7.3	29.5		Swingle		6.5	5.6	17.7		UFR-5: White 4		7.1	7.2	27.7
	White 1	6.6	6.8	6.6	26.7		White 1		7.0	6.7	20.3		UFR-6: Chang+50-7		6.8	6.2	19.2
	White 3	6.8	6.6	6.9	27.2		x639		5.6	5.8	17.3		White 1		6.9	6.5	19.8
	x639	7.0	6.4	6.1	25.5		White 3		7.3	6.6	20.4		White 3		6.8	6.3	19.3

Scion	Rootstock	2018/19	2019/20	2020/21	3-y cum
OLL5	UFR-5: White 4	6.6	6.5	6.6	26.3
OLL6	UFR-5: White 4	7.2	6.9	6.5	27.1
OLL7	UFR-5: White 4	6.6	6.5	6.2	25.4
OLL9	UFR-5: White 4	6.7	6.8	6.6	26.6
OLL10	UFR-5: White 4	7.0	7.1	7.0	28.0

Fig. 6. St. Cloud Demonstration Planting – PS/box and 3-year cumulative PS by scion/rootstock with 3 seasons of data [2018/19, 2019/20 & 2020/21], sorted by 2020/21 data.



Scion - Rootstock

Fig. 7. St. Cloud Demonstration Planting – PS/box and 2-year cumulative PS by scion/rootstock with 2 seasons of data available.

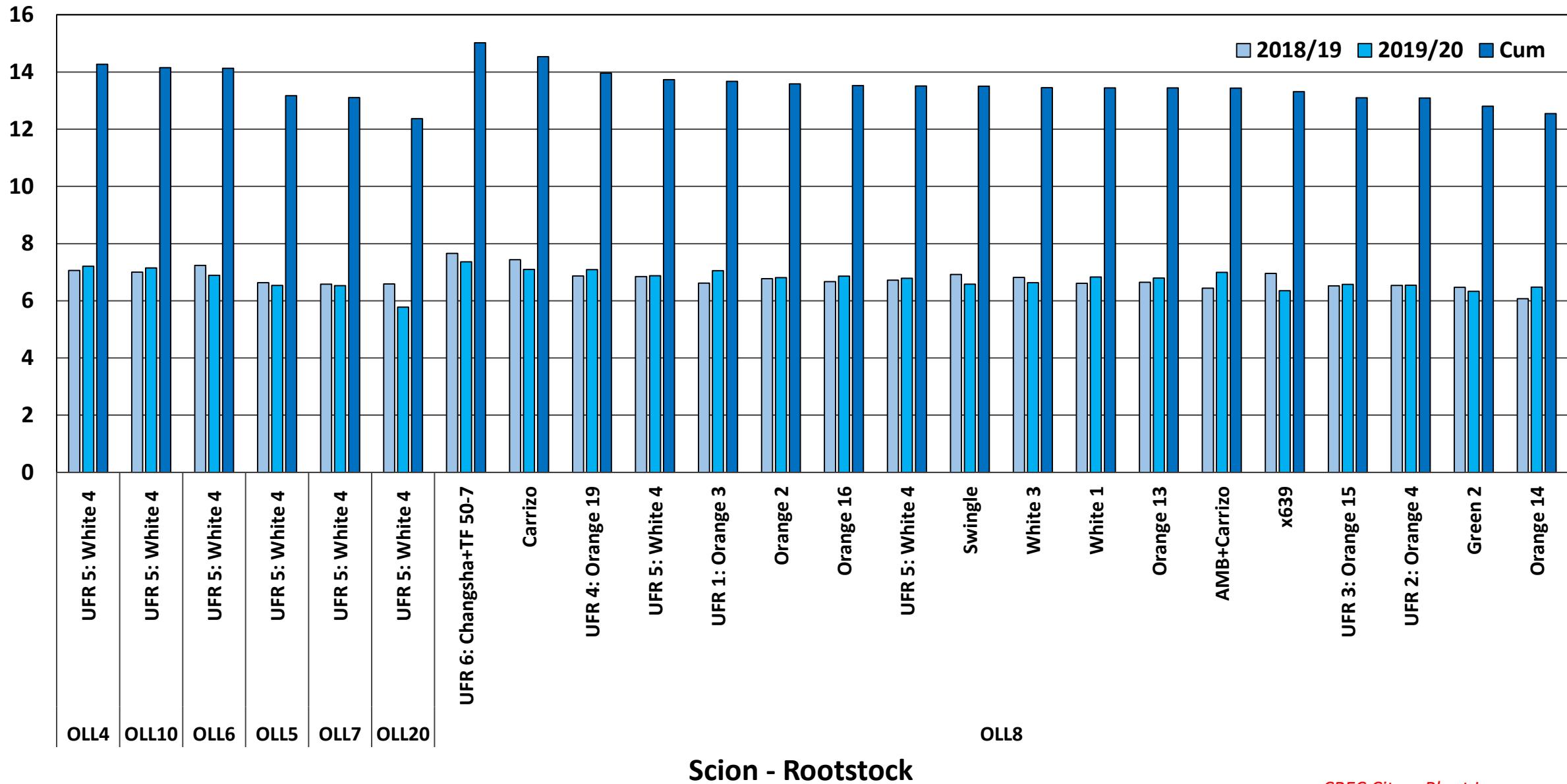


Fig. 8. St. Cloud Demonstration Planting – PS/box by scion/rootstock combination with one season of data available.

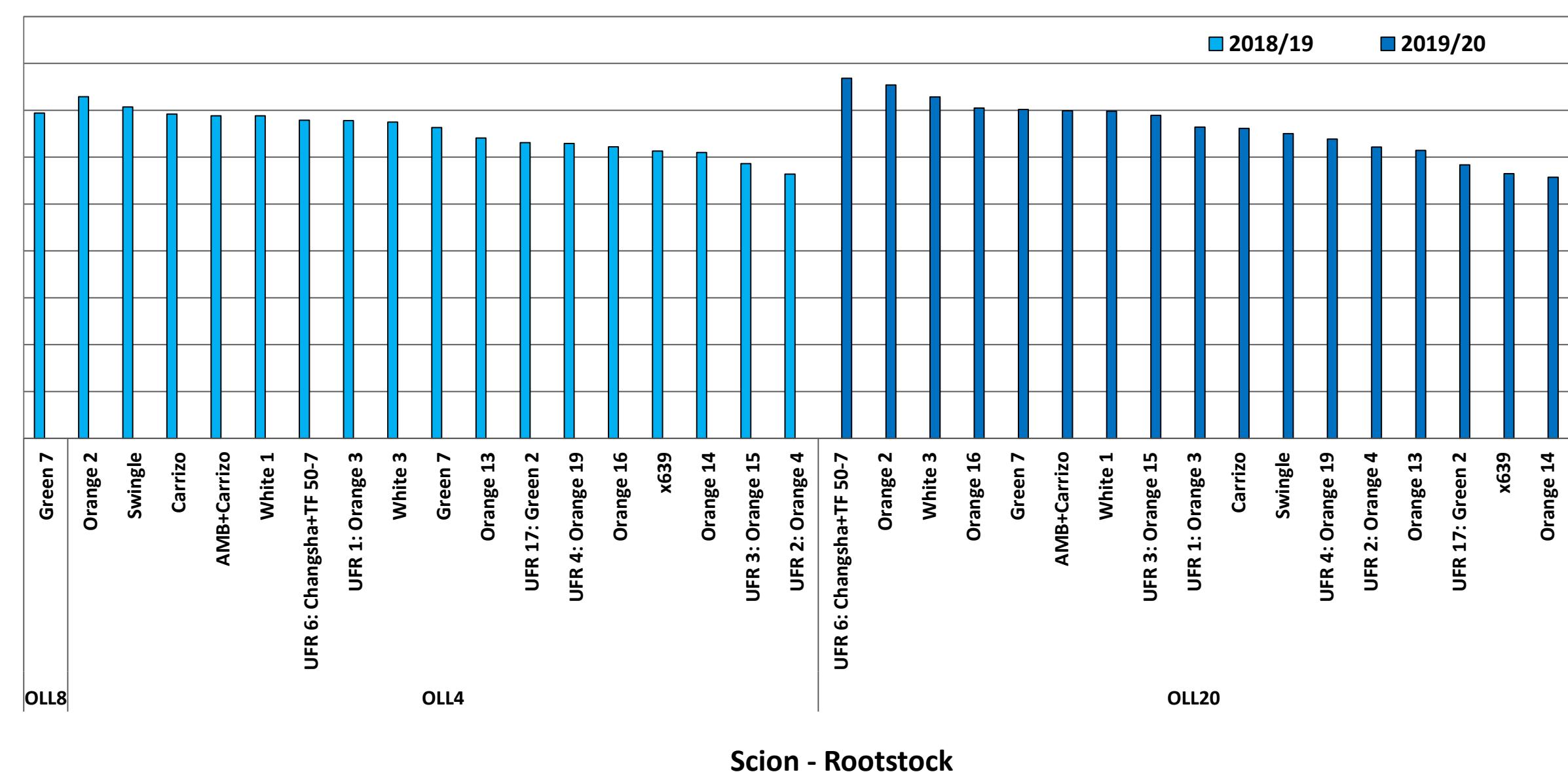
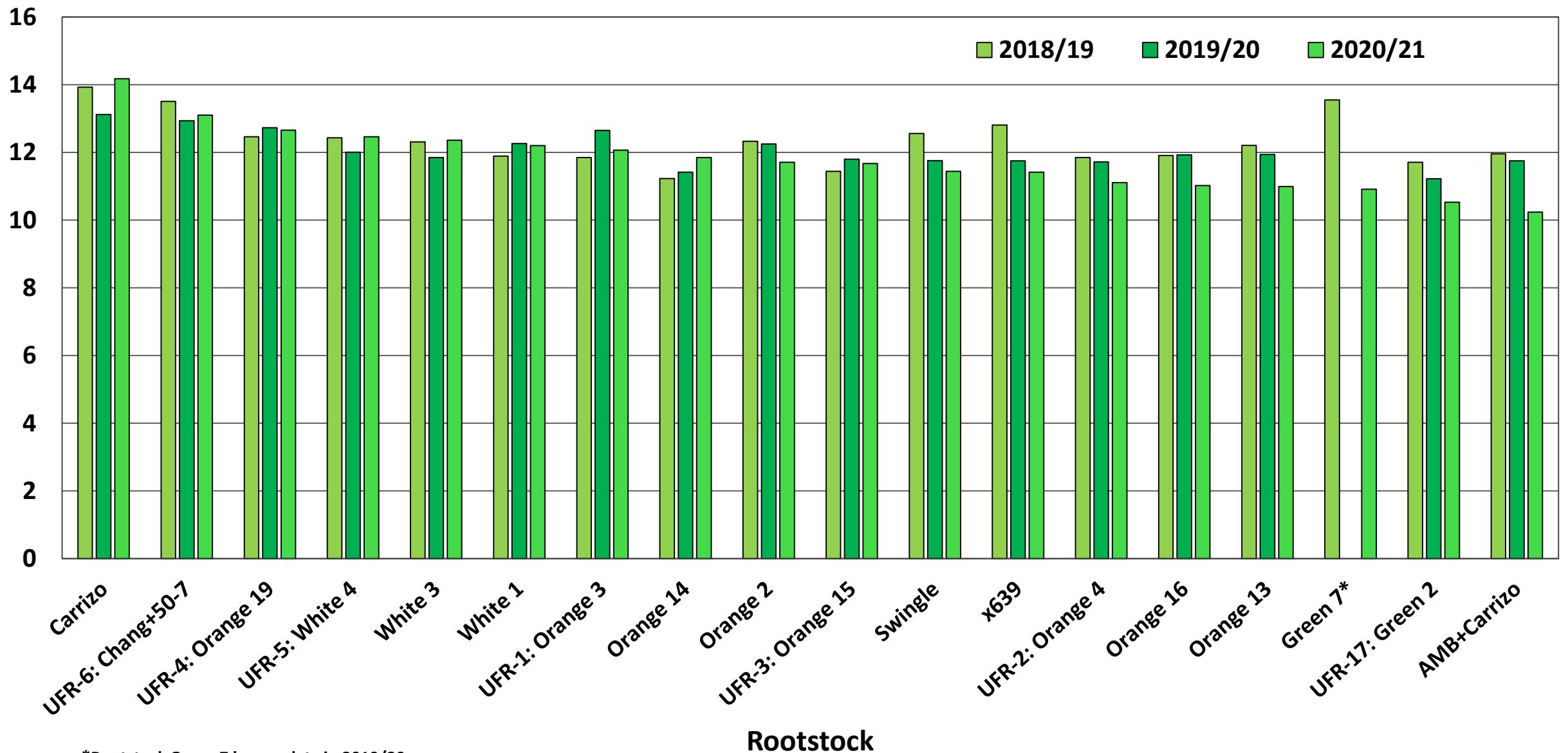
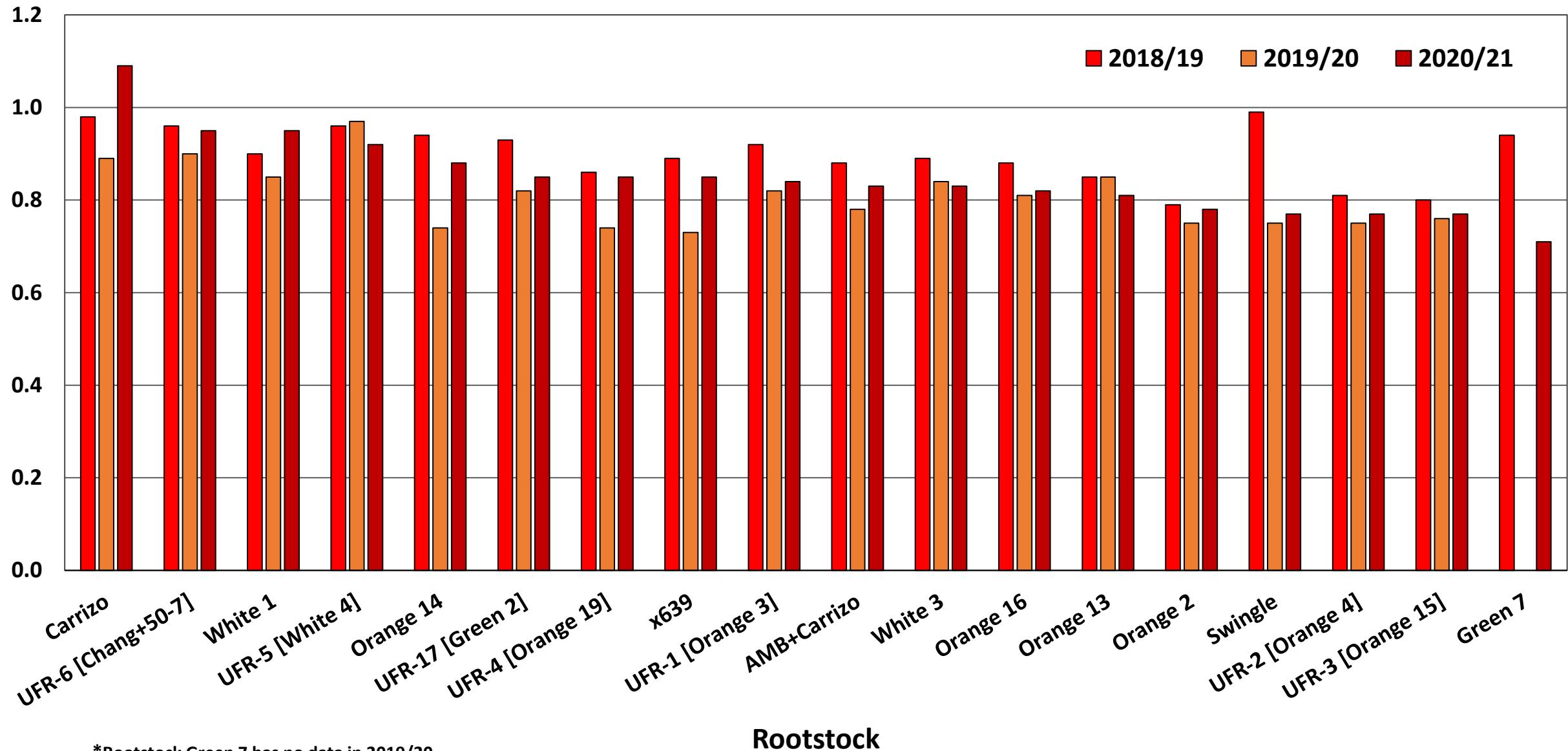


Fig. 9. St. Cloud Demonstration Planting – Juice Brix for OLL 8 by all rootstocks; [seasons: 2018/19, 2019/20 & 2020/21], sorted by 2020/21 data.



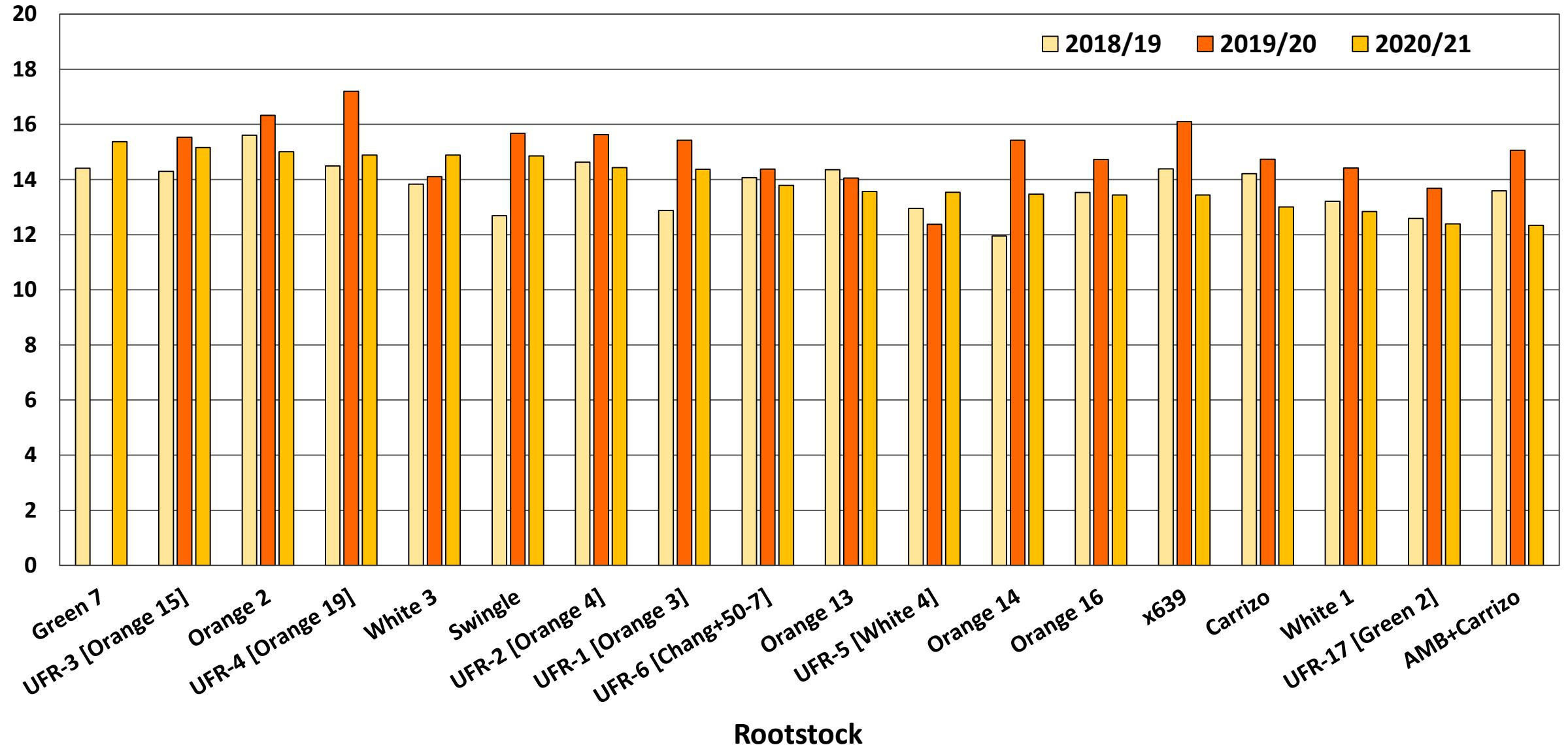
*Rootstock Green 7 has no data in 2019/20

Fig. 10. St. Cloud Demonstration Planting – Juice Acid for OLL 8 by all rootstocks; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



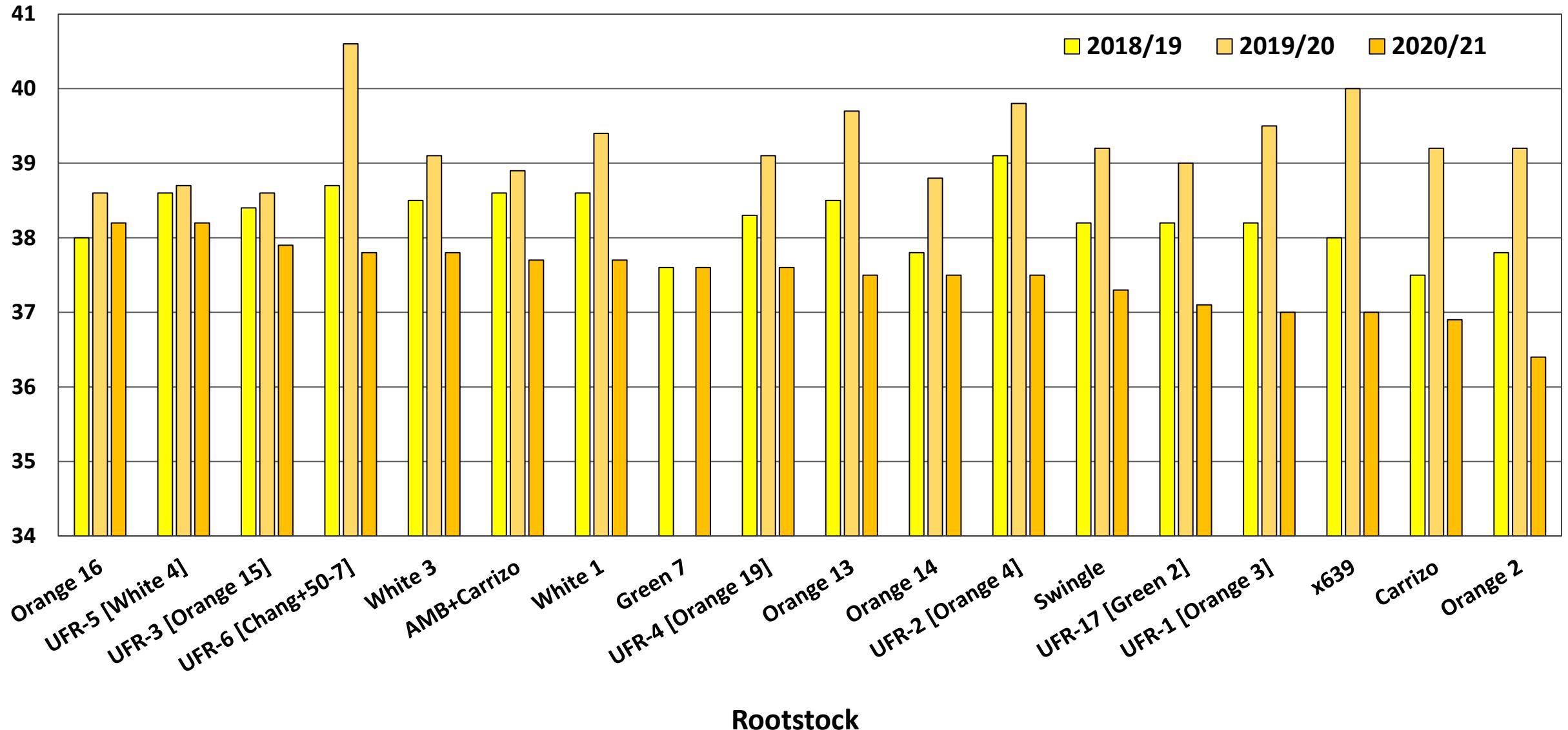
Rootstock

Fig. 11. St. Cloud Demonstration Planting – Juice Ratio for OLL 8 by all rootstocks; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



*Rootstock Green 7 has no data in 2019/20

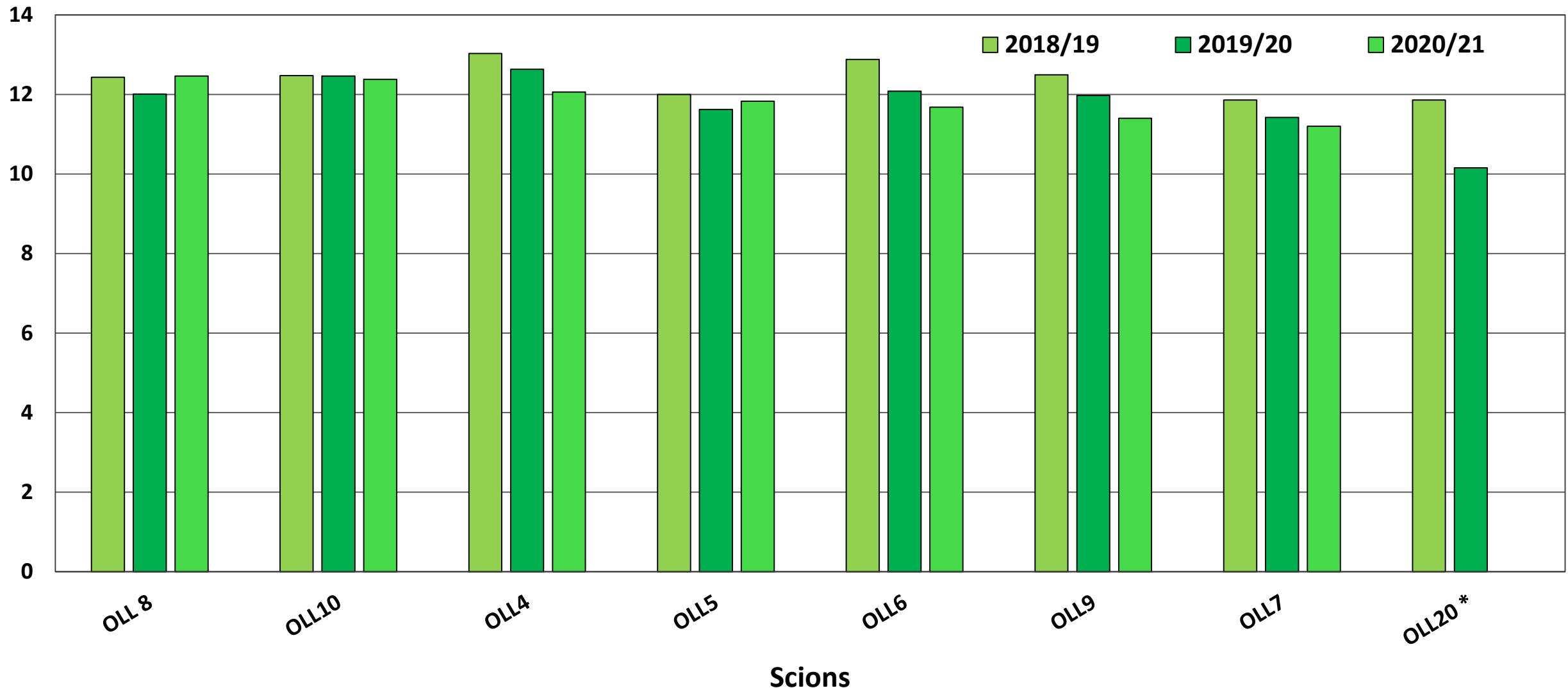
Fig. 12. St. Cloud Demonstration Planting – Juice Color for OLL 8 by all rootstocks; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



*Rootstock Green 7 has no data in 2019/20

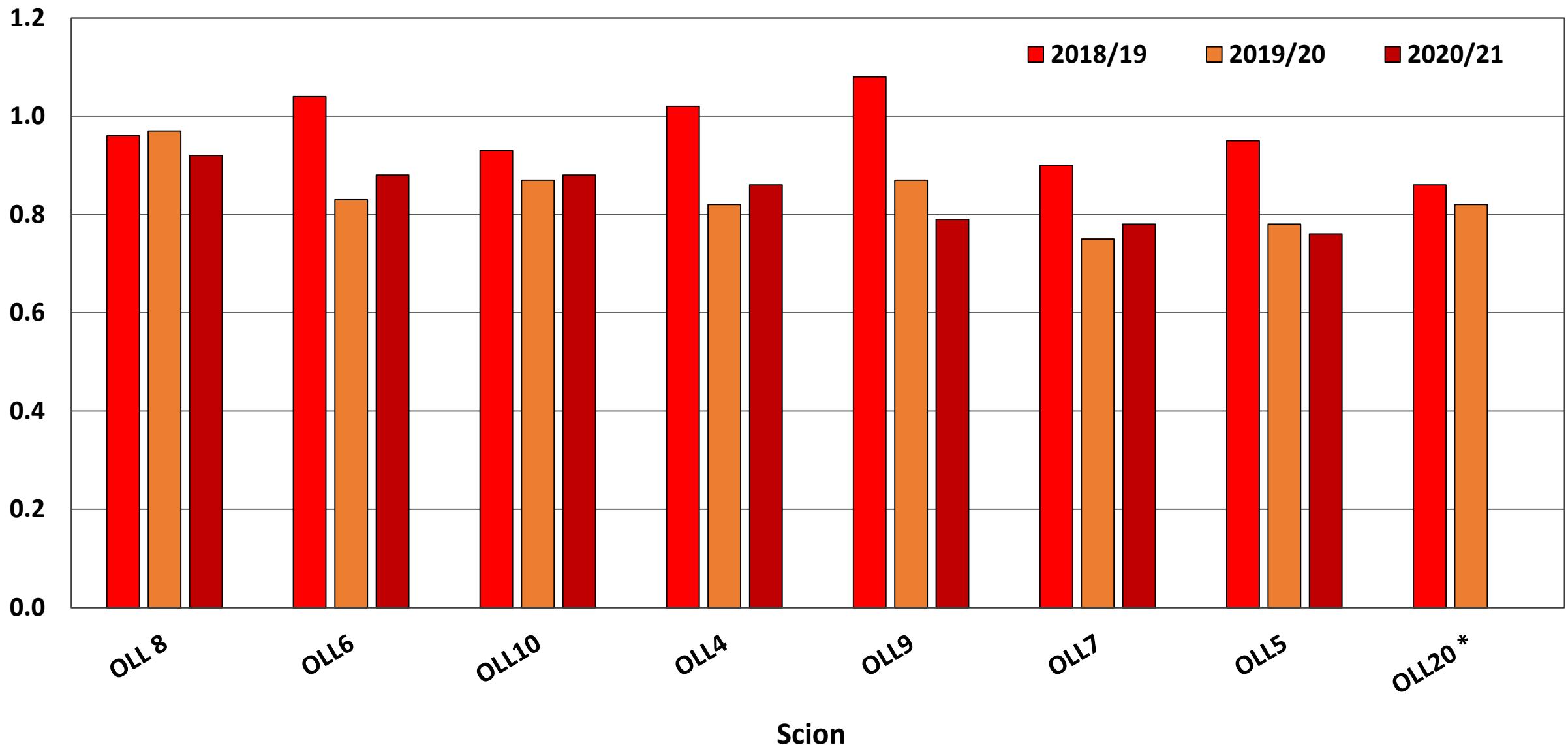
Rootstock

Fig. 13. St. Cloud Demonstration Planting – Juice Brix for UFR-5 [White 4] for all scions; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



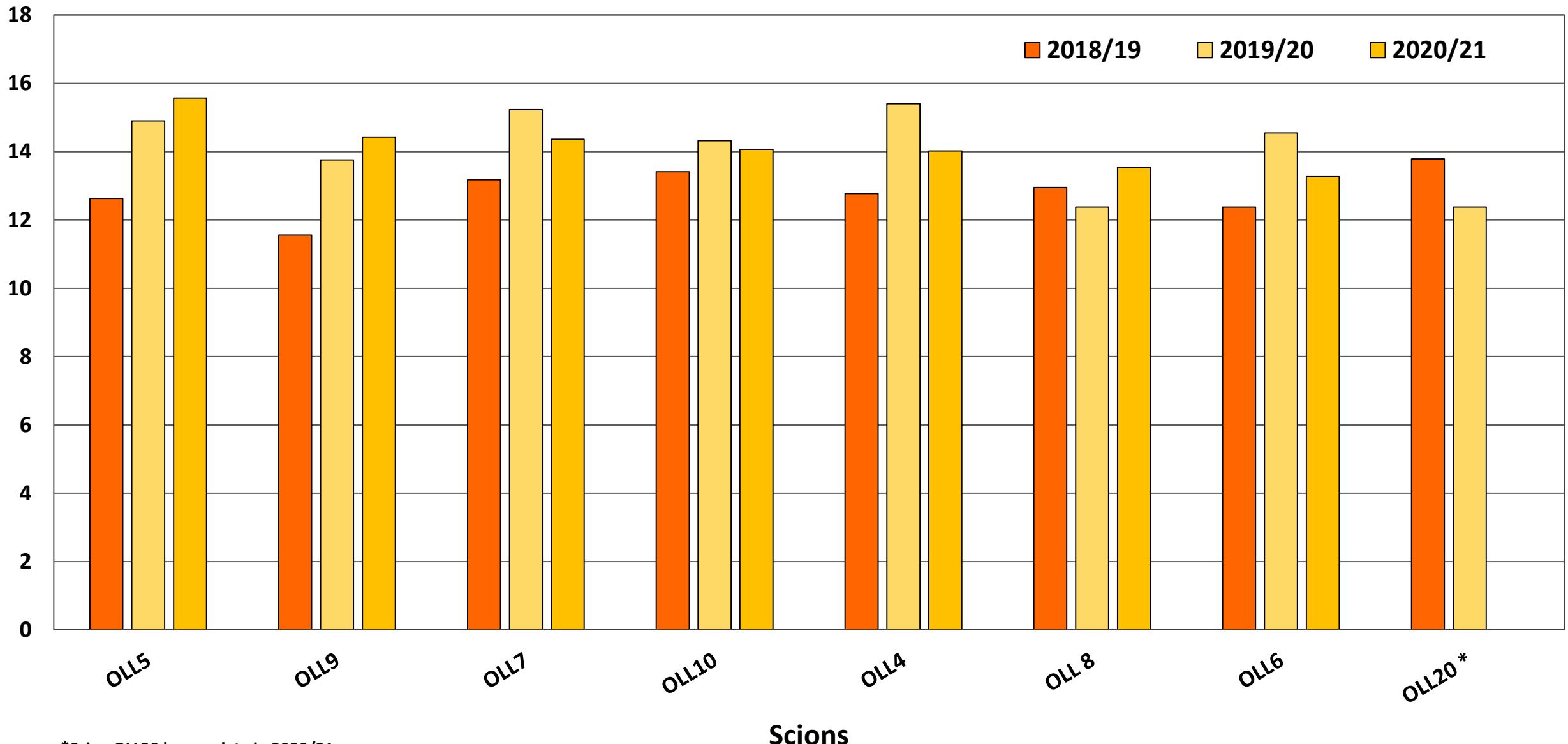
*Scion OLL20 has no data in 2020/21

Fig. 14. St. Cloud Demonstration Planting – Juice Acid for UFR-5 [White 4] for all scions; [Seasons: 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



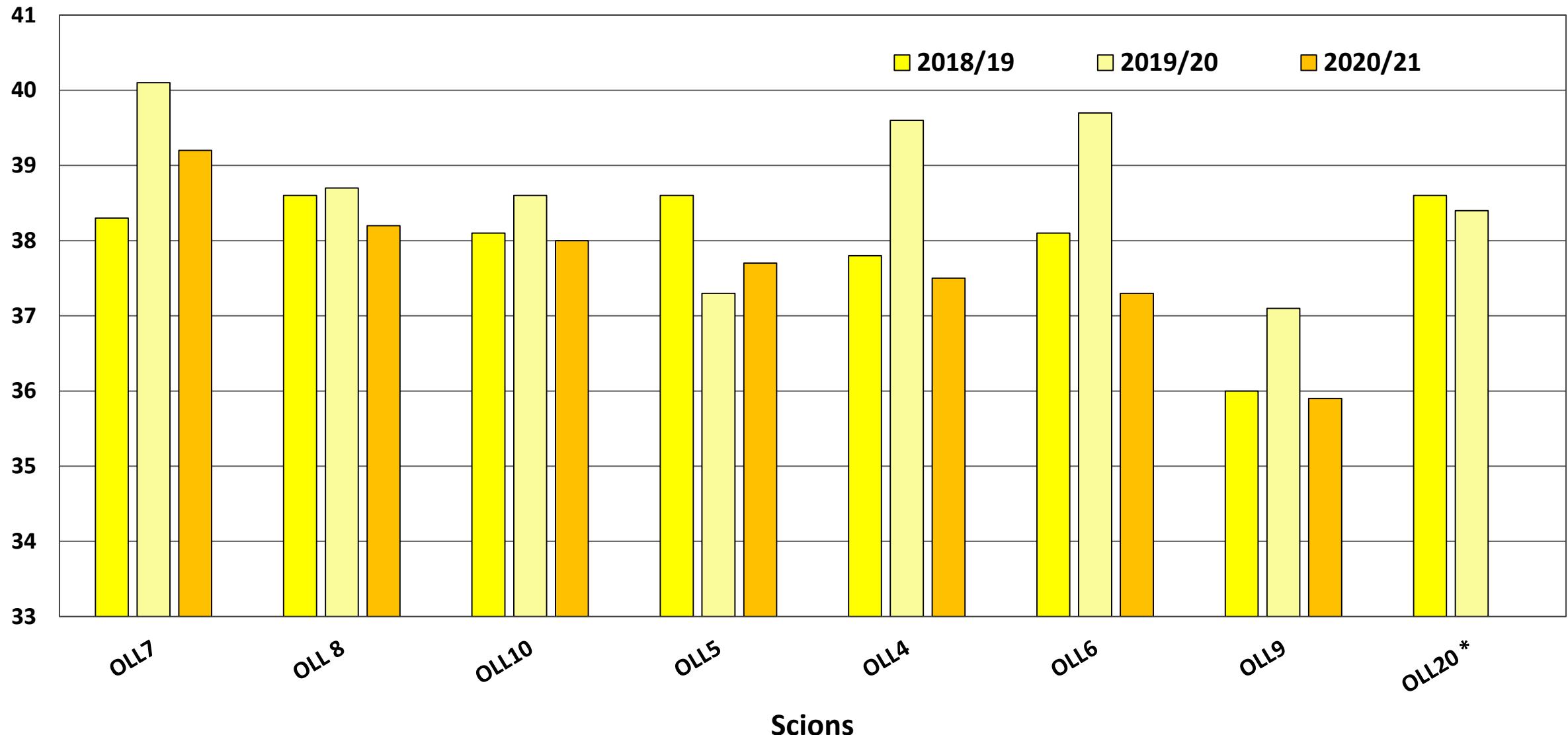
*Scion OLL20 has no data in 2020/21

Fig. 15. St. Cloud Demonstration Planting – Juice Ratio for UFR-5 [White 4] for all scions; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



*Scion OLL20 has no data in 2020/21

Fig. 16. St. Cloud Demonstration Planting – Juice Color for UFR-5 [White 4] for all scions; [Seasons 2018/19, 2019/20 & 2020/21], sorted by 2020/21 season.



*Scion OLL20 has no data in 2020/21

Table 7. St. Cloud Demonstration Planting- 2018/19 & 2019/20 Ct Value** by scion for all rootstocks [table is color coded according to the Ct value diagnosis table].

Scion/RSTK	OLL 20		OLL 10		OLL 05		OLL 04		OLL 07		OLL 06		OLL 08		OLL 09		Overall			
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	SD	2018-19	2019-20
	Mean	Mean	SD	Mean																
UFR 3: Orange 15	27	40	30	40	28	38	33	37	29	30	33	31	27	30	27	35	29	3	35	4
Orange 2	27	37	29	33	NA*	40	27	29	32	NA	26	NA	26	31	24	37	27	10	34	16
Orange 13	26	38	39	36	28	37	30	31	34	32	33	30	31	26	29	34	31	4	33	4
UFR 4: Orange 19	37	36	35	33	40	36	35	36	37	32	33	30	40	28	35	28	36	2	32	3
Orange 16	33	35	39	34	36	34	29	39	26	30	28	26	31	27	32	34	32	4	32	4
Orange 14	27	35	24	31	30	36	28	33	25	36	26	28	34	30	26	27	27	3	32	4
White 1	33	33	27	32	25	31	28	38	32	37	26	28	39	31	29	27	30	5	32	4
White 3	31	34	27	37	26	36	32	33	28	33	25	28	25	27	29	28	28	3	32	4
UFR 17: Green 2	27	30	24	37	27	32	31	28	25	33	29	37	31	29	29	27	28	3	32	4
UFR 2: Orange 4	33	37	32	32	24	30	40	31	33	30	40	30	33	30	40	32	34	5	32	3
Green 7	36	34	36	28	40	29	37	30	32	36	35	32	40	34	35	29	36	3	31	3
UFR 5: White 4	29	30	25	33	26	34	33	32	29	36	26	33	26	28	26	25	28	3	31	4
UFR 1: Orange 3	31	30	27	36	32	37	26	33	30	33	27	35	30	27	27	30	3	31	4	
AMB + Carrizo	30	31	27	31	33	29	27	31	26	32	32	29	24	35	29	30	29	3	31	2
X639	40	32	39	31	38	36	40	35	40	35	25	40	27	35	27	38	2	30	4	
Carrizo	31	37	28	35	30	30	39	30	28	27	26	27	28	28	33	28	30	4	30	4
UFR 6: Chang+50-7	29	30	32	34	32	30	33	32	39	29	31	28	40	30	28	27	33	4	30	2
Swingle	40	29	40	37	40	28	40	28	40	32	32	28	40	27	35	27	38	3	29	4
Mean	31	34	31	34	32	33	33	33	31	32	31	29	33	29	30	29	31	4	32	4

(*) NA: no data available

(**) Southern Gardens diagnostic lab, PCR analysis, mean of 2 trees, for each scion/rootstock combination.

Ct Value	Diagnosis
< 30	HLB Positive
30-32	Questionable
> 32	HLB Negative

Fig 17. St. Cloud Demonstration Planting - Ct Value by Rootstock for 2018/19 & 2019/20 seasons [Ct values > 32 are HLB negative], sorted by 2019/20 values.

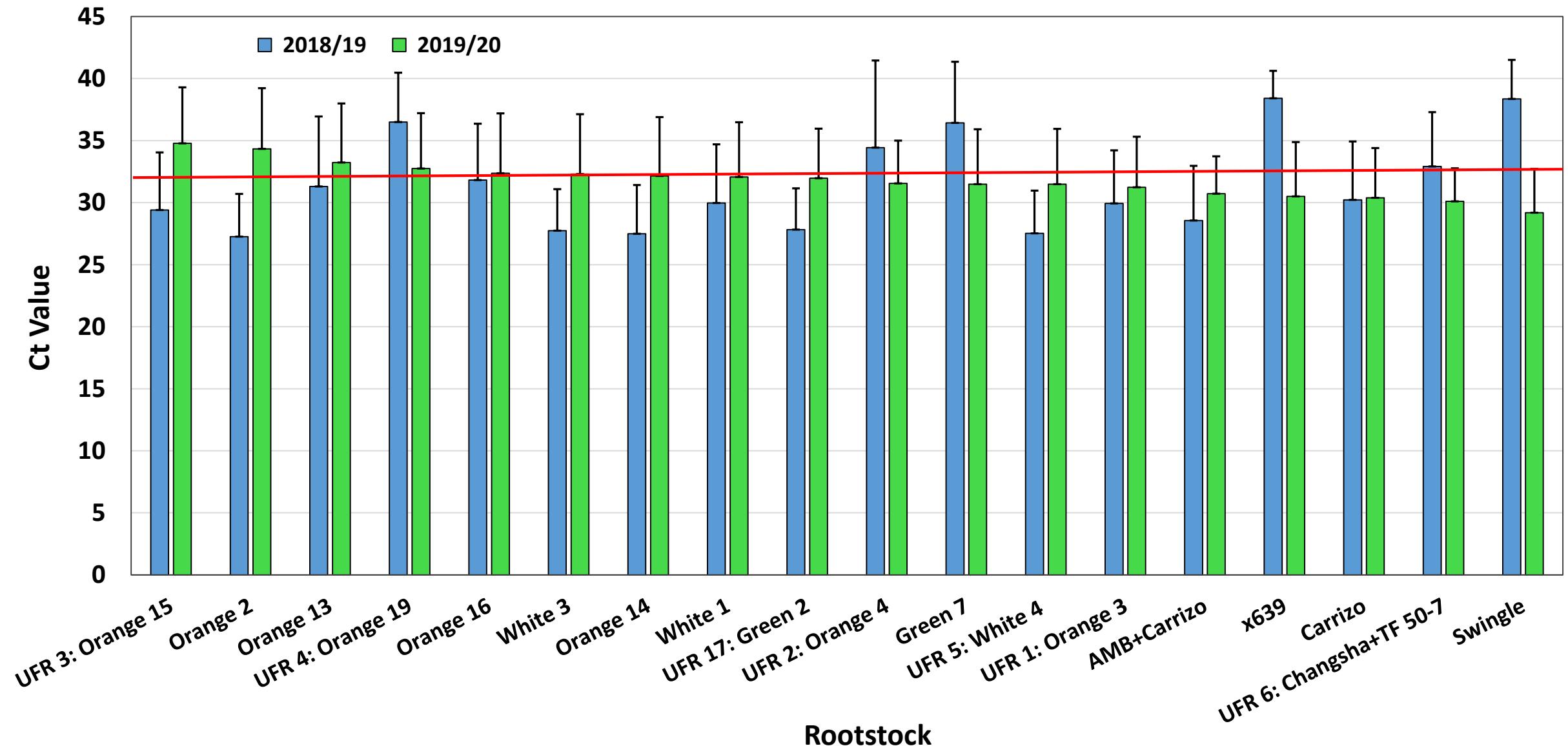


Fig 18. St. Cloud Demonstration Planting - Ct Value by Scion for 2018/19 & 2019/20 seasons [Ct values > 32 are HLB negative].

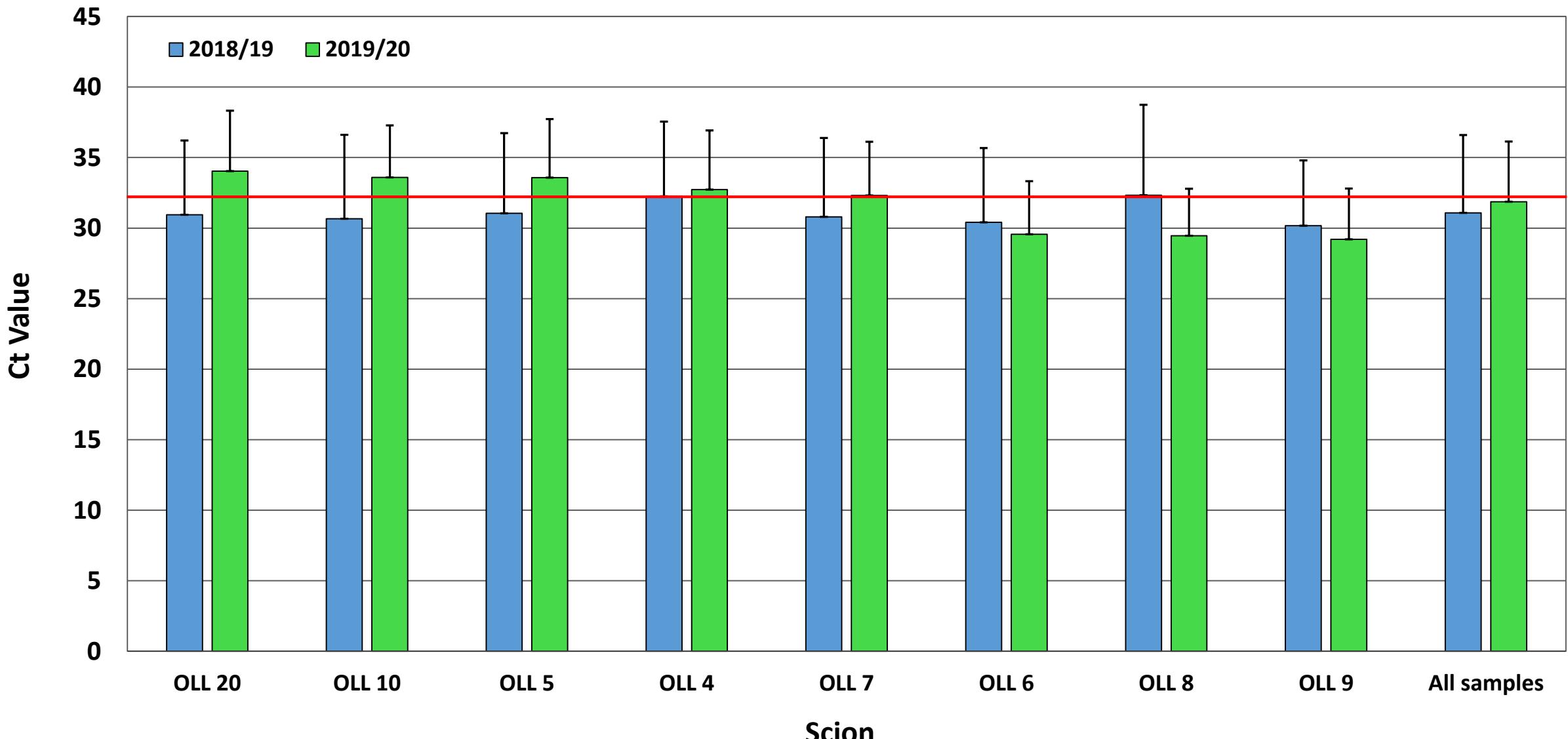
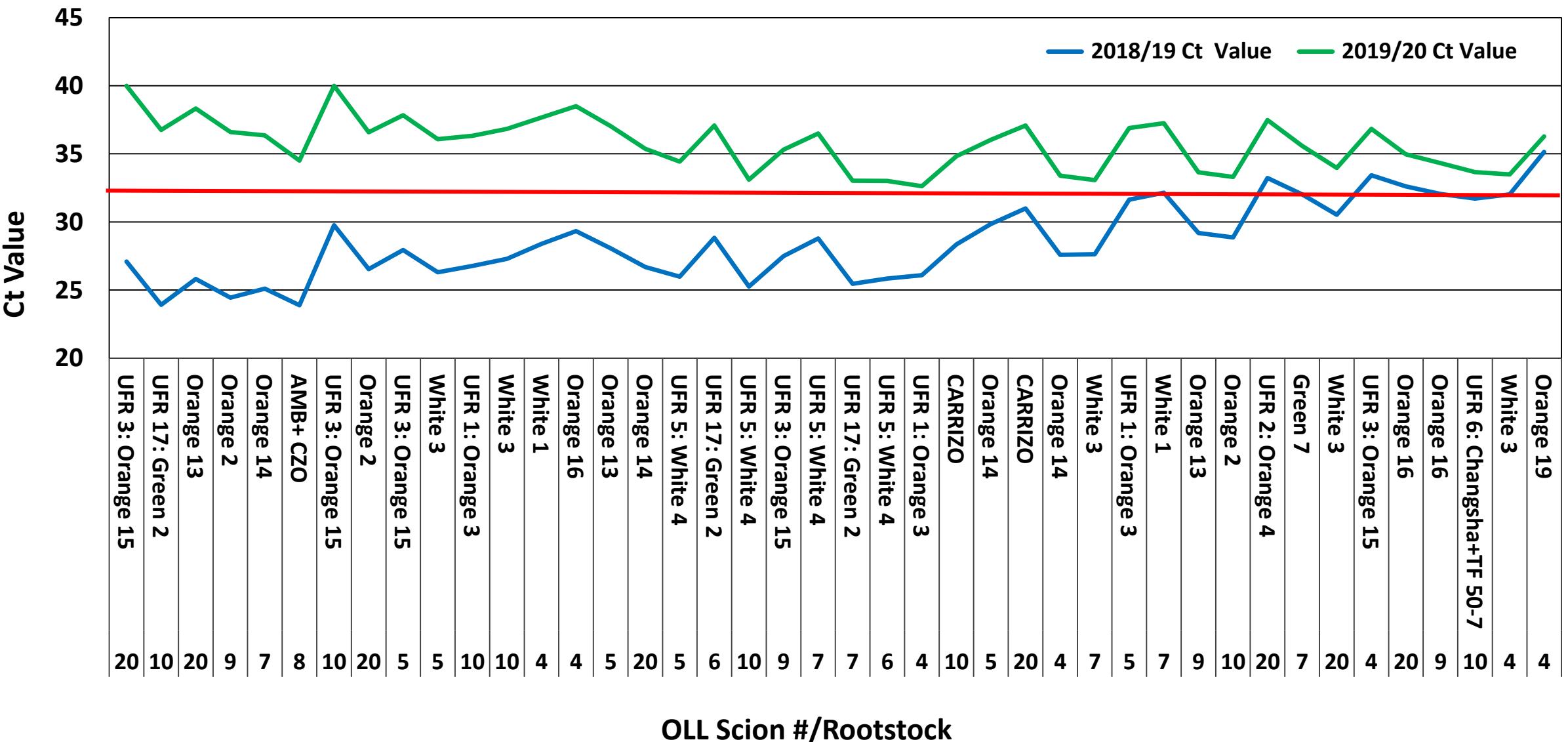


Fig 19. St. Cloud Demonstration Planting – Scion/Rootstock combination with improved Ct Value [> 32] from 2018/19 to 2019/20.



Acknowledgement and Publication

The authors acknowledge Mike Irey and the Southern Gardens Diagnostic Laboratory for running the PCR tests

*Huang, L, J.W. Grosser, F.G. Gmitter, C.A. Sims and Y. Wang.
2020. Effects of Scion/Rootstock Combination on Flavor
Quality of Orange Juice from Huanglongbing (HLB)-
Affected Trees: A Two-Year Study of the Targeted
Metabolomics. J. Agric. Food Chem. 2020, 68, 10, 3286*