

Scion-Rootstock Trial, Fellsmere

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CREC Citrus Plant Improvement*

Scion-Rootstock trial, Fellsmere - Description

This cooperative trial, located in Fellsmere, Indian River County, was planted in April 2010 as a preliminary examination of 4 scions on various rootstocks in an Indian River site. The number of trees was uneven, thus, only a few trees to as many as 10/scion-rootstock combination of Sugar Belle, Lane Late navel, Vernia sweet orange and Furr [hybrid of Murcott x Clementine mandarin] were planted on double-row beds previously in citrus. In October 2011, 43 trees of Furr on Willits citrange were added to the trial. Overall, there were 67 rootstocks not equally distributed among the scions leading to 107 scion-rootstock combinations [Table 1].

Scion-Rootstock trial, Fellsmere - Summary

- Location: Fellsmere, Indian River County.
- Scion: Sugar Belle, Lane Late navel, Vernia, Furr mandarin
- Rootstocks: 67 unequally divided among the scions
- Date planted: April 2010
- Design: Randomized complete-block; 0 – 4 replications
 - Plot size: Mostly 2-4 trees
 - Spacing: 10 x 25 ft.
- Data:
 - 2017/18: Juice quality for Furr mandarin.
 - 2018/19: Juice quality for Sugar Belle, Lane Late.
 - 2018/19: HLB rating.
 - 2019/20: HLB rating.
 - 2020/21: HLB rating; % dead trees.
 - 2020/21: Yield; Juice quality for Sugar Belle, Lane Late and Vernia

- Trial Status: **TERMINATED AFTER 2020/21 SEASON**

Table 1. Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Furr Mandarin.

Furr Mandarin		
Rootstock	Parentage	Number of Trees
11-5-7	Flying Dragon x Obovoidea	5
RB24-24	Sanford sweet orange x Argentine trifoliate orange	2
6-5-94	Nakon pummelo x Page mandarin	4
UFR 5: White 4	[Nova+HBPummelo] x [Succari+Argentine trifoliate orange]	5
6-11-129	Thong Dee pummelo x Minneola tangelo	7
Willits	Ruby swt. x TF	50
6-6-29	Nakon x Page	1
SO+50-7	Sour orange+trifoliate orange 50-7	3
SRXSH99-11	tetrazygs SO+Rangpur, Sour orange+rangpur, open pollinated	2
UFR 4: Orange 19	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliate orange]	3

Table 1 (cont'd.). Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Lane Late.

Lane Late		
Rootstock	Parentage	Number of Trees
21-4-26	DPI Flying Dragon x LB 1-21	5
11-7-17	17-47 x Obovoidea	7
11-6-85	17-47 x Obovoidea	3
6-18-34	Tahiti Swt x Argentine TO	3
6-5-56	Nakon pum x Page	3
21-1-2	Sunki x Swingle TF	4
21-1-4	Duncan grapefruit x DPI 9-6 trifoliolate orange	6
6-11-129	Thong Dee pummelo x Minneola tangelo	6
SRXSH99-11	tetrazygs SO+Rangpur, Sour orange+rangpur, open pollinated	5
UFR 4: Orange 19	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	5
6-5-94	Nakon pummelo x Page mandarin	6
UFR 5: White 4	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]	6
WGFT+50-7	White grapefruit+trifoliolate orange	14
ES-1	Cleo x Poncirus trifoliata (Spain)	8
21-1-11	Duncan x DPI 9-6	1
Blue 3	[Nova+HBPummelo] x [sour orange+Palestine sweet lime]	4
CSHA+BEN	Changsha mandarin+Benton citrange	2
RB24-24	Sanford sweet orange x Argentine trifoliolate orange	8
SO+50-7	Sour orange+trifoliolate orange 50-7	6
White 1	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]	5
ES-2	Cleo x Poncirus trifoliata (Spain)	5
21-3-23	DPI FD x LB 1-21	4
11-5-7	Flying Dragon x Obovoidea	9

Table 1 (cont'd.). Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Sugar Belle.

Sugar Belle		
Rootstock	Parentage	Number of Trees
11-1-71A	Siamese Sweet x 9-6 TO	10
11-5-66		2
21-1-11	Duncan x DPI 9-6	3
Amb+HBJL-2B	C. amblycarpa+HBJL-2B pummelo	1
21-1-4	Duncan grapefruit x DPI 9-6 trifoliolate orange	8
11-5-7	Flying Dragon x Obovoidea	23
11-7-17	17-47 x Obovoidea	3
Orange 13	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	6
11-4-86	Duncan x 9-6 TO	12
6-18-34	Tahiti Swt x Argentine TO	7
SO+50-7	Sour orange+trifoliolate orange 50-7	19
11-5-51	Flying Dragon x Ridge Pineapple	16
11-6-104	Flying Dragon x sour orange	6
6-5-94	Nakon pummelo x Page mandarin	2
Orange 16	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	4

Table 1 (cont'd.). Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Sugar Belle.

Sugar Belle		
Rootstock	Parentage	Number of Trees
Orange 16	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	4
UFR 4: Orange 19	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	23
ES-2	Cleo x Poncirus trifoliata (Spain)	10
C-57: PLN1830	Sunki x Swingle TF	16
6-6-37	Nakon pummelo x Page mandarin	5
ES-1	Cleo x <i>Poncirus trifoliata</i>	22
UFR 5: White 4	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]	8
21-2-16	DPI Flying Dragon x LB 1-21	18
11-1-56	Duncan x 9-6 TO	4
21-2-26	DPI Flying Dragon x LB 1-21	4
C-54: PLN1829	Sunki x Swingle TF	8
RB24-24	Sanford sweet orange x Argentine trifoliolate orange	5
WGFT+50-7	White grapefruit+trifoliolate orange	7
3-12-27	Cleo x Swingle	14
21-4-26	DPI Flying Dragon x LB 1-21	2

Table 1 (cont'd.). Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Vernia

Vernia		
Rootstock	Parentage	Number of Trees
11-2-43	US 17-47 x Ponderosa Lem.	1
11-6-104	Flying Dragon x sour orange	1
11-6-85	17-47 x Obovoidea	1
21-10-26	LB 6-1 (Clem x Hamlin) x DPI 9-6 TO	1
21-2-10	Duncan x DPI 9-6	1
SRxSH99-11	tetrazygs SO+Rangpur	1
21-3-26	DPI Flying Dragon x LB 1-21	3
UFR 6: Changsha+TF 50-7	Changsha mandarin+trifoliolate orange 50-7	3
11-5-7	Flying Dragon x Obovoidea	5
21-1-18	DPI 9-6 x LB-1-21 (Clem x Duncan)	10
Amb+HBJL-2B	C. amblycarpa+HBJL-2B pummelo	2
Csha+Bent	Changsha mandarin+Benton citrange	4
21-1-11	Duncan x DPI 9-6	9
21-4-26	DPI Flying Dragon x LB 1-21	5
3-12-27	Cleo x Swingle	3
11-6-2	17-47 x Obovoidea	4
Green 7	[Nova+HBPummelo] x [sour orange+Carrizo]	5
11-5-36	Flying Dragon x Duncan	2
11-5-62	Flying Dragon x Ridge Pineapple	4
11-5-64	Flying Dragon x Ridge Pineapple	2
11-7-17	17-47 x Obovoidea	4
21-1-6	Duncan x DPI Dundee 9-6 TO	1

Table 1 (cont'd.). Scion-Rootstock trial, Fellsmere – List of rootstocks, parentage and number of trees for Vernia

Vernia		
Rootstock	Parentage	Number of Trees
21-2-16	DPI Flying Dragon x LB 1-21	10
21-2-21	DPI Flying Dragon x LB 1-21	4
21-2-26	DPI Flying Dragon x LB 1-21	2
21-3-23	DPI Flying Dragon x LB 1-21	4
6-11-129	Thong Dee pummelo x Minneola tangelo	3
6-18-5	Sanford sweet orange x Argentine TO	8
6-5-94	Nakon pummelo x Page mandarin	4
6-6-92	Pink Java x Page	1
Blue 3	[Nova+HBPummelo] x [sour orange+Palestine sweet lime]	3
Orange 2	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	1
PLN1833	Shekwasha mandarin x English Small trifoliolate org	1
RB24-24	Sanford sweet orange x Argentine trifoliolate orange	6
SO+50-7	Sour orange+trifoliolate orange 50-7	3
SRxSH99-1	SO+Rangpur x Cleo+Trifol. Or	1
UFR 1: Orange 3	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	4
UFR 2: Orange 4	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	1
UFR 4: Orange 19	[Nova+HBPummelo] x [Cleopatra+Argentine trifoliolate orange]	8
UFR 5: White 4	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]	6
White 1	[Nova+HBPummelo] x [Succari+Argentine trifoliolate orange]	1
WGFT+50-7	White grapefruit+trifoliolate orange	8
SRxSH99-6	tetrazygs SO+Rangpur	2

Scion-Rootstock trial, Fellsmere – Interpretative summary [as of December 2020]:

The following summaries are the result of a combination of data collected during the 10-year period after planting and observations by the investigators and the grower-cooperator generally made in December in 2014, 2016 and 2018 when the trees were 4, 6 and 8 years old, respectively.

Sugar Belle mandarin hybrid. As is consistent throughout Florida, this variety showed little effect of HLB. Fruit were typically bell-shaped with a prominent neck and well-colored by late December with good juice quantity and flavor. Low-seeded. Among all *rootstocks*, those that were generally among the better performing ones given consistent yield and tree and fruit appearance were Orange 13, C-57, FA-5 and a Flying Dragon trifoliolate orange hybrid.

Lane Late navel. Overall, this variety was disappointing in that, while the trees grew off ok and showed few HLB symptoms, they were late coming into bearing. The trees were low-yielding and the poor-quality fruit were large and dried out quickly. *Rootstocks*: SO + TF 50-7 and an unnamed citrumelo and citrange.

Vernia sweet orange. These trees were visibly affected by HLB, but their smaller than expected size may have resulted mostly from their heavy and consistent cropping. As elsewhere in field trials and commercial plantings, bearing was precocious, and fruit were typically egg-shaped with excellent juice quality. *Rootstocks*: Orange 19 [UFR 4] and an unnamed citrange.

Furr mandarin hybrid. The overall rating of this variety at this site would be GOOD. Tree vigor and size were moderate. HLB symptoms were apparent, but the trees were tolerant. Cropping was inconsistent, but when fruit was produced, fruit size was smallish, but acceptable and fruit juiciness and flavor were excellent. *Rootstocks*: Willits citrange, Orange 19 [UFR 4] and SO + TF 50-7.

Fig. 1. Scion-Rooststock trial, Fellsmere – juice quality, Furr mandarin [February 2018].

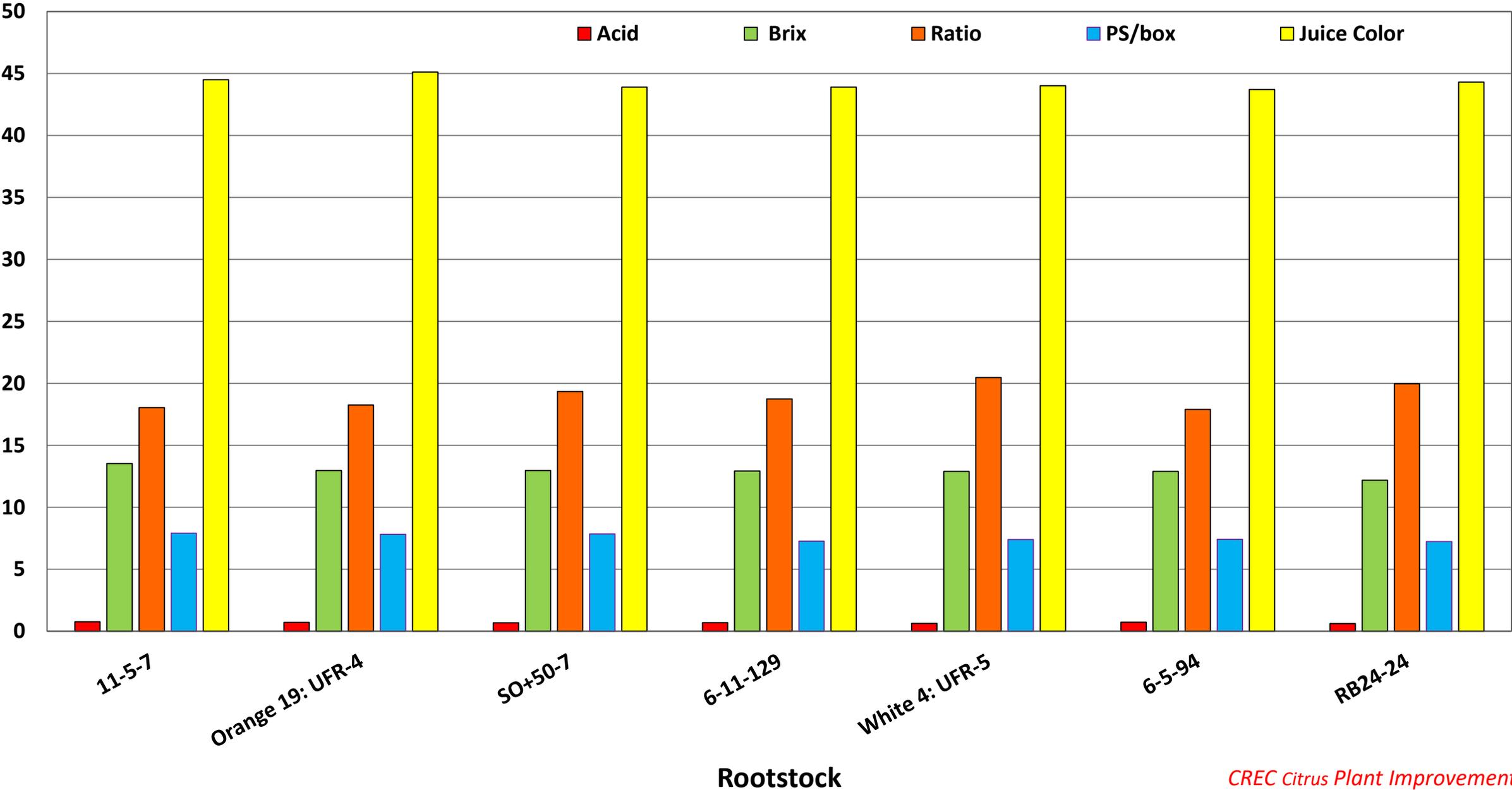


Fig. 2. Scion-Rootstock trial, Fellsmere – juice quality, Lane Late [December 2018].

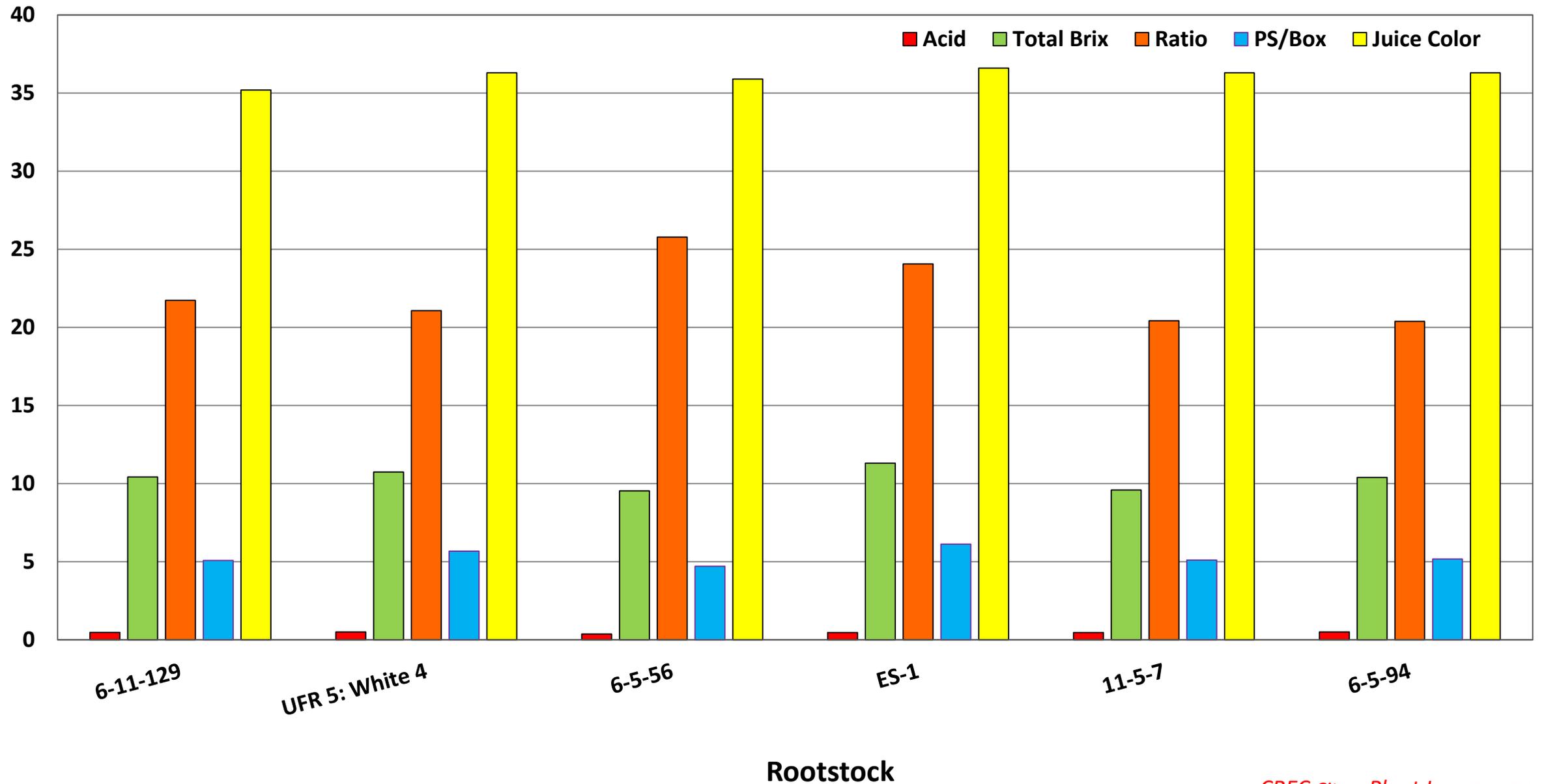


Fig. 3. Scion-Rootstock trial, Fellsmere – juice quality, Sugar Belle [December 2018].

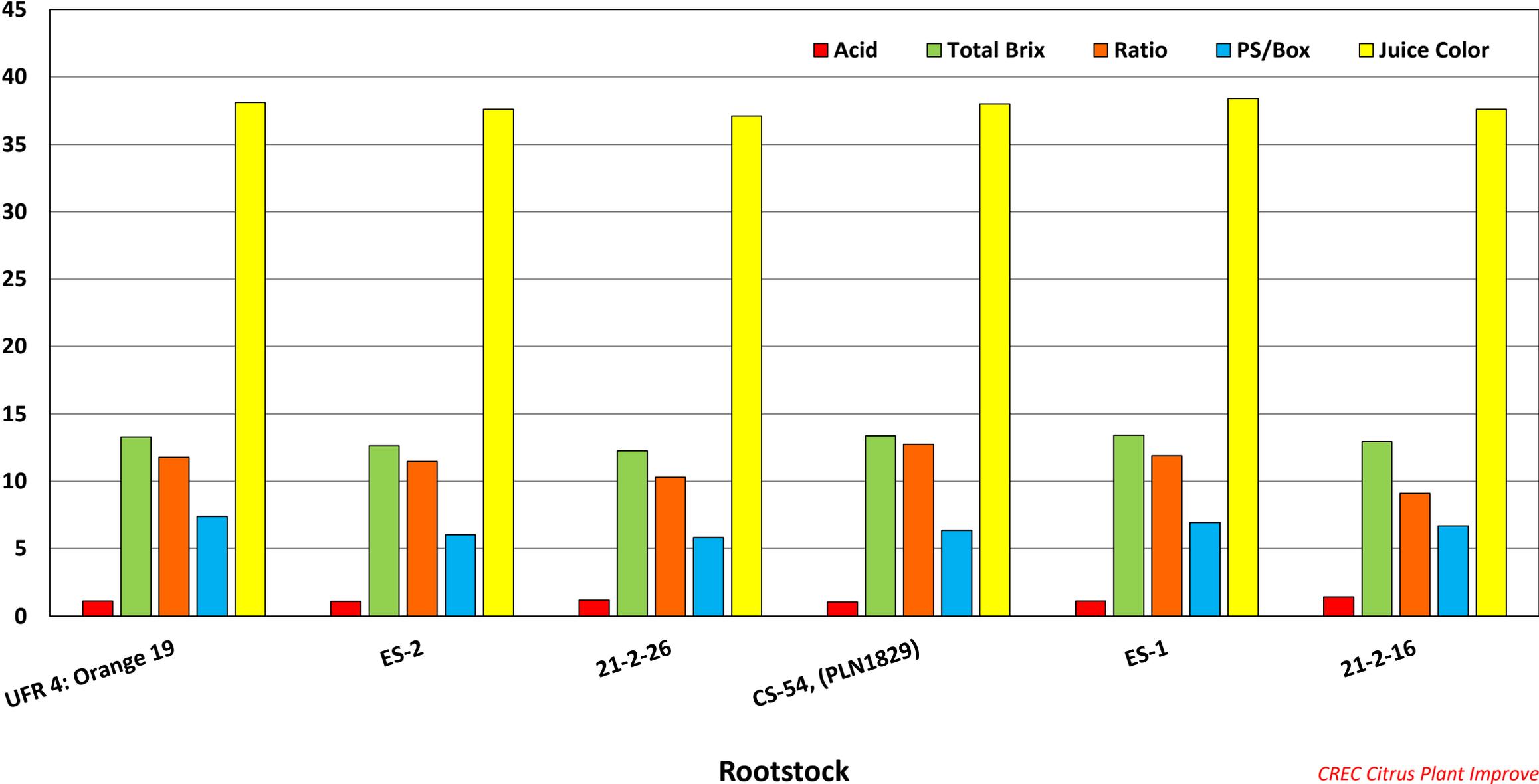


Fig. 4. Scion-Rootstock trial, Fellsmere – juice quality, Sugar Belle [December 2020].

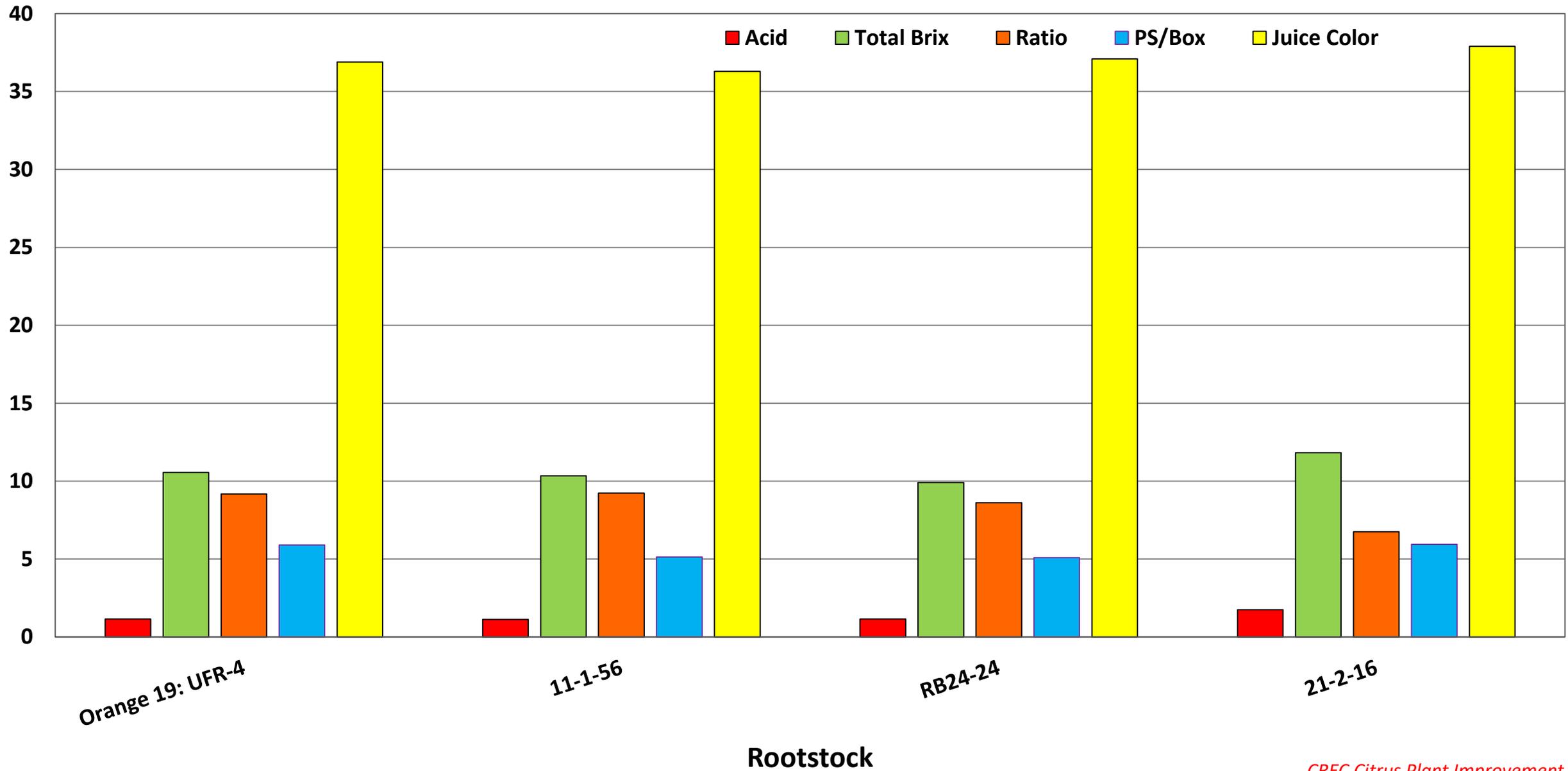


Fig. 5. Scion-Rootstock trial, Fellsmere – juice quality, Lane Late [December 2020].

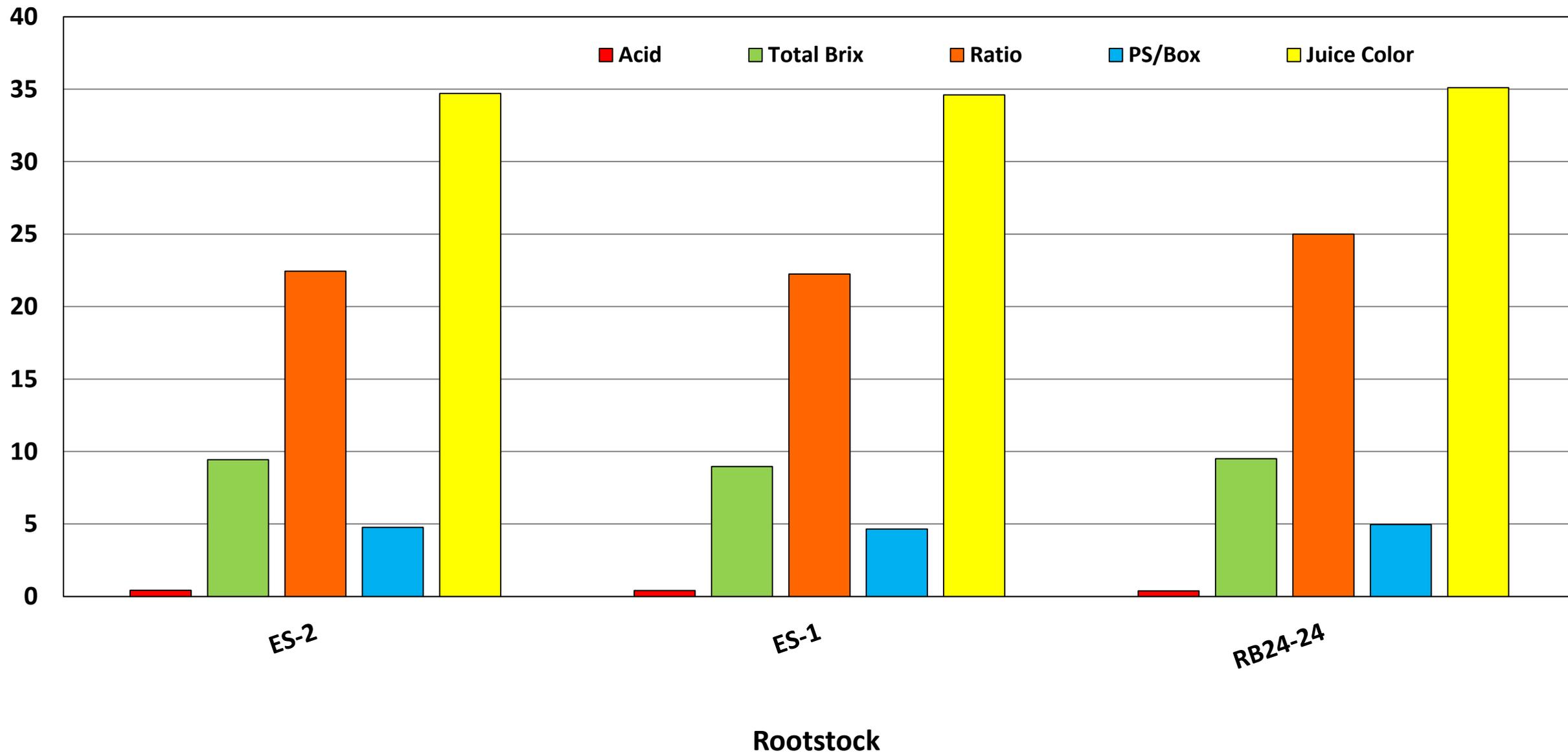


Fig. 6. Scion-Rootstock trial, Fellsmere – juice quality, Vernia [December 2020].

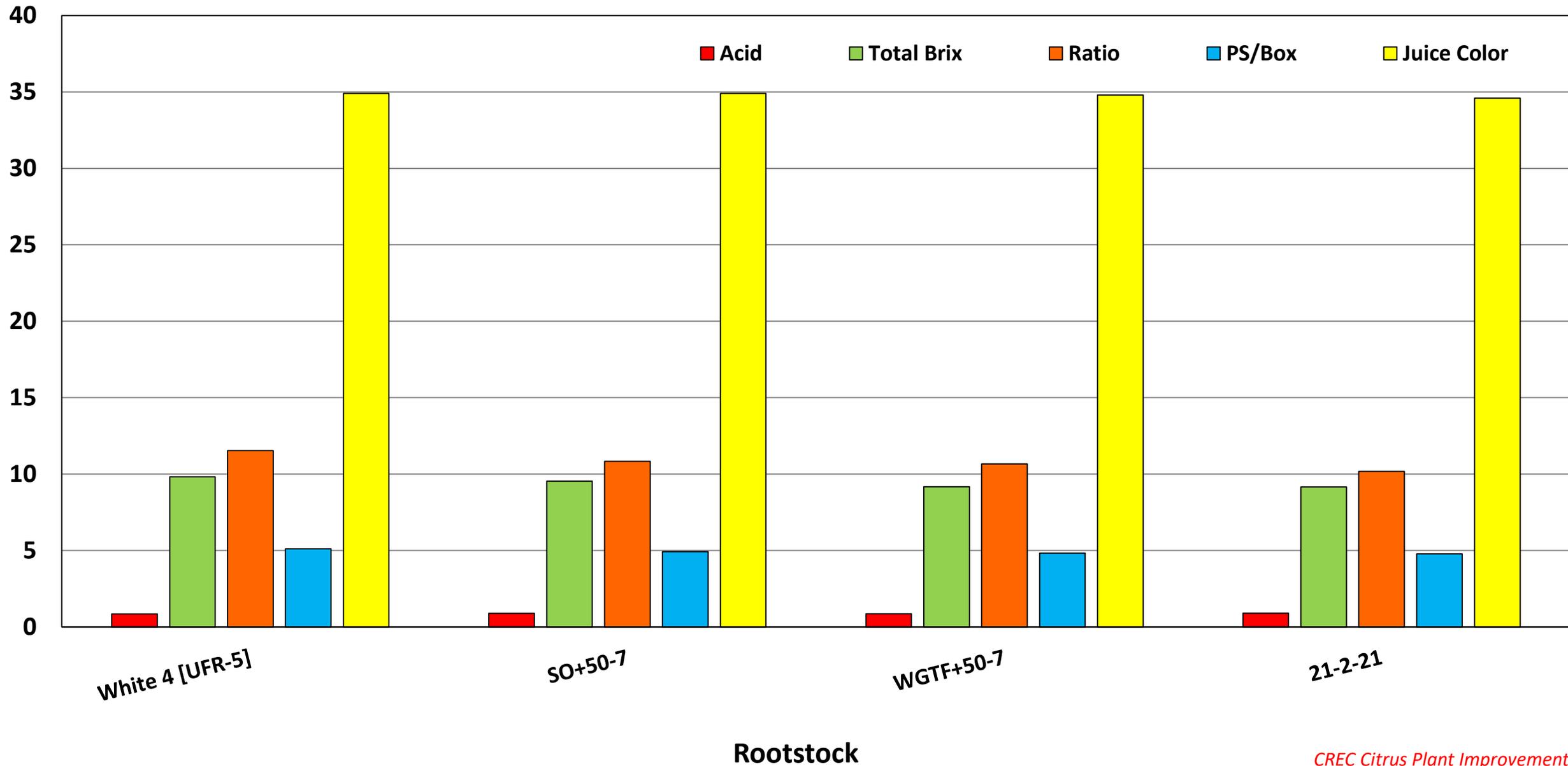


Fig. 7. Scion-Rootstock trial, Fellsmere – juice quality: Acid by scion – rootstock [February 2018, December 2018 & 2020].

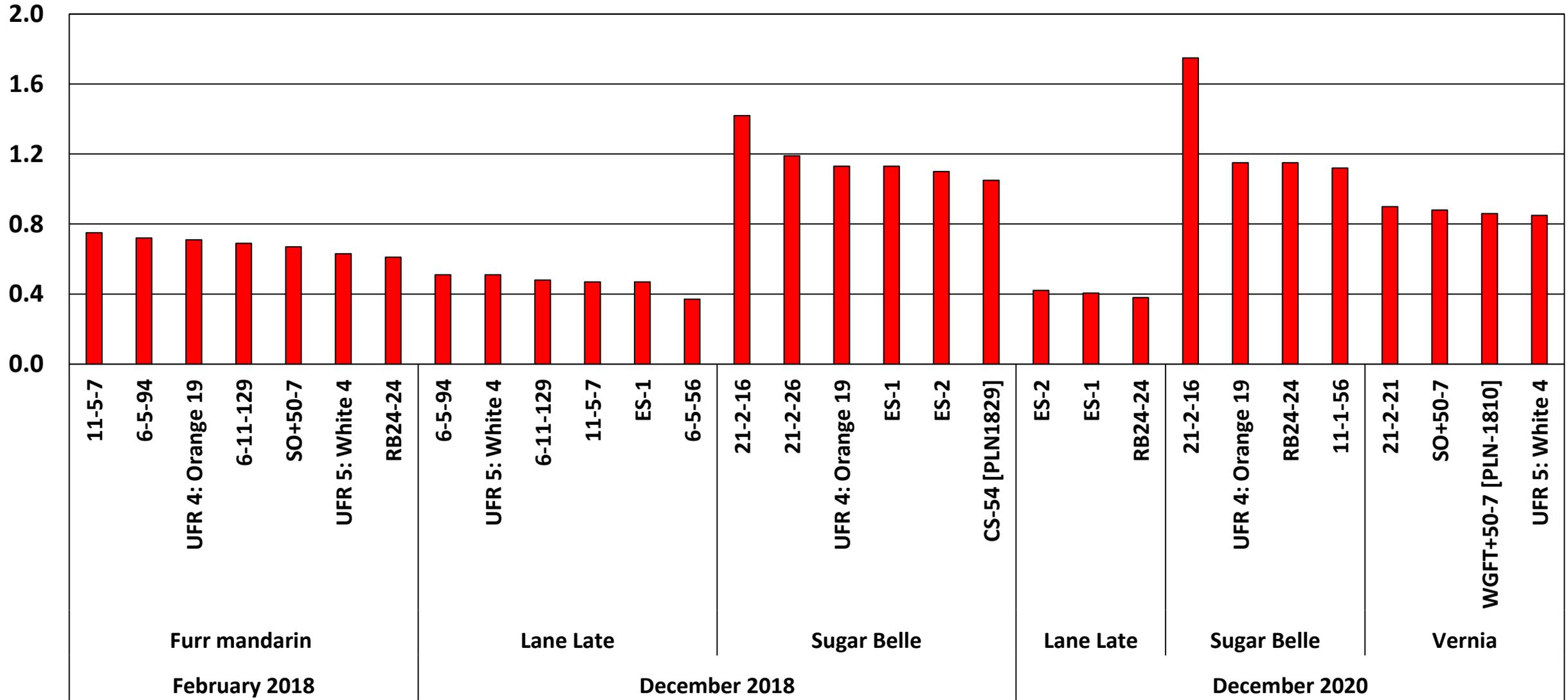


Fig. 8. Scion-Rootstock trial, Fellsmere – juice quality, Acid by scion [February 2018, December 2018 & 2020].

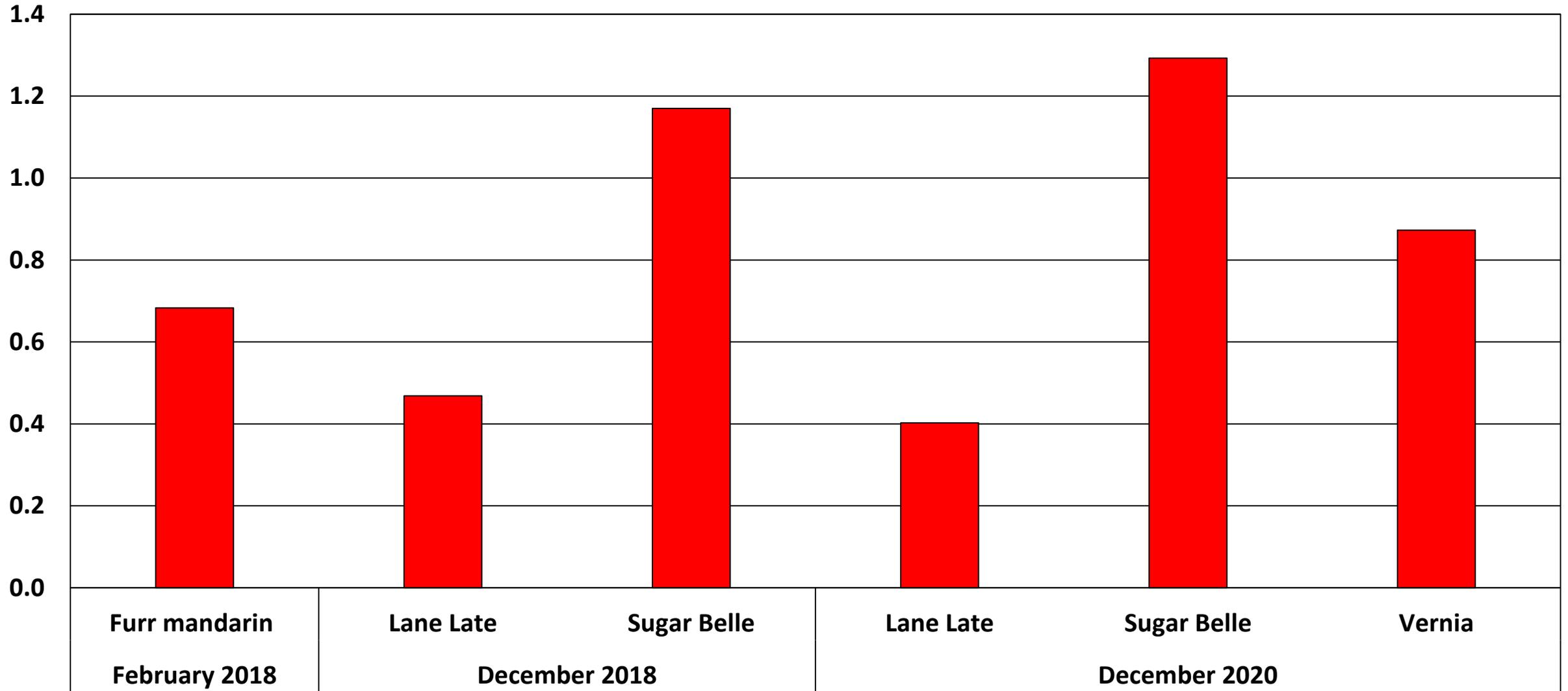


Fig. 9. Scion-Rootstock trial, Fellsmere – juice quality, Brix by scion - rootstock [February 2018, December 2018 & 2020].

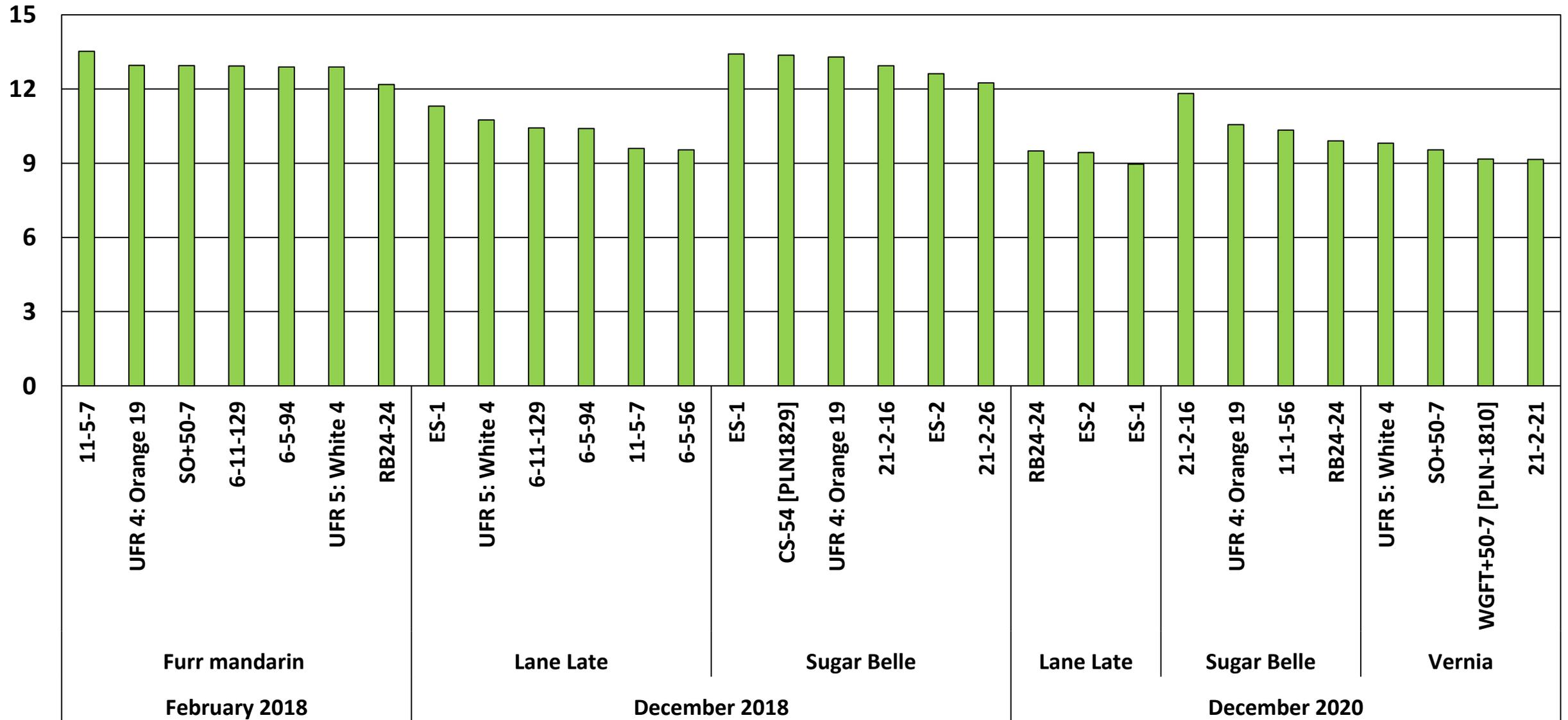


Fig. 10. Scion-Rootstock trial, Fellsmere – juice quality, Brix by scion [February 2018, December 2018 & 2020].

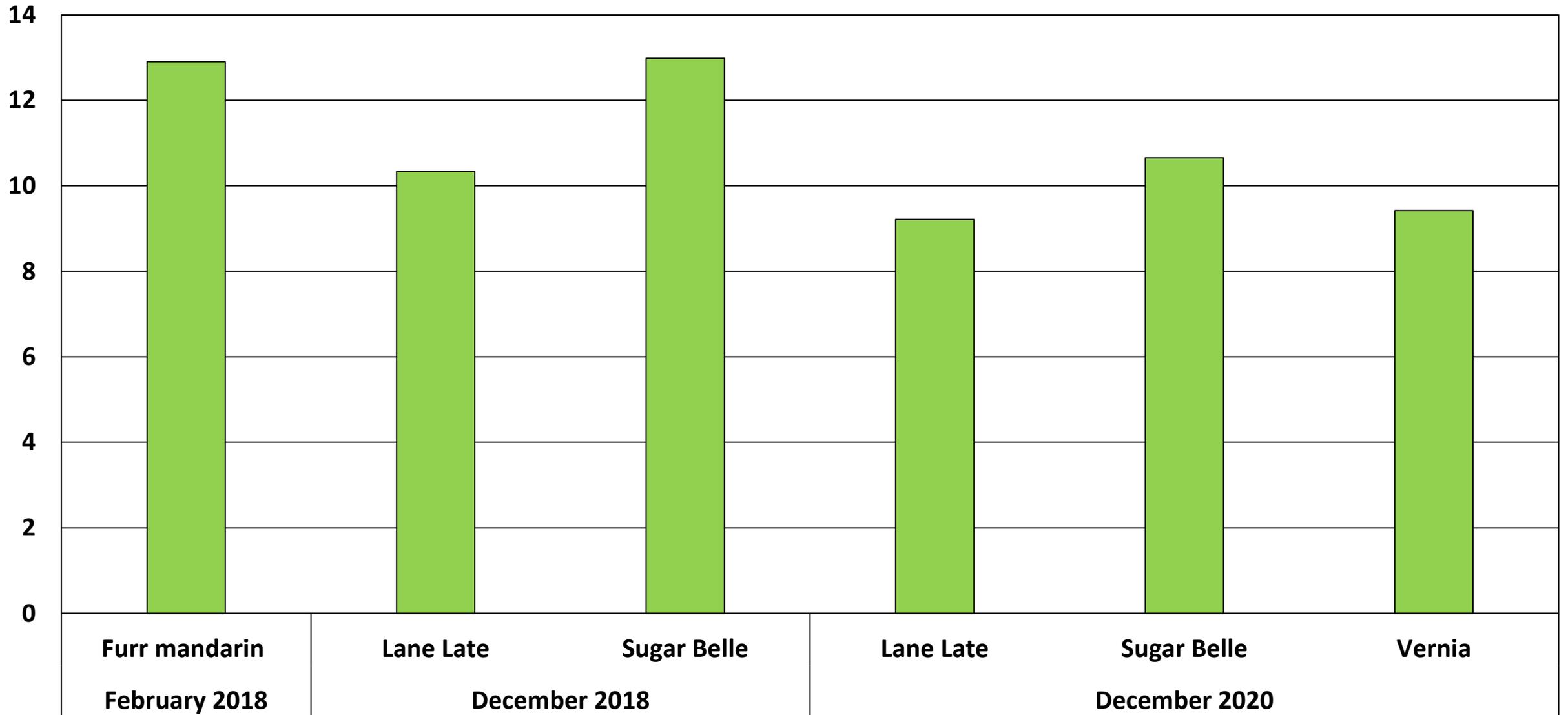


Fig. 11. Scion-Rootstock trial, Fellsmere – juice quality, Ratio by scion – rootstock [February 2018, December 2018 & 2020].

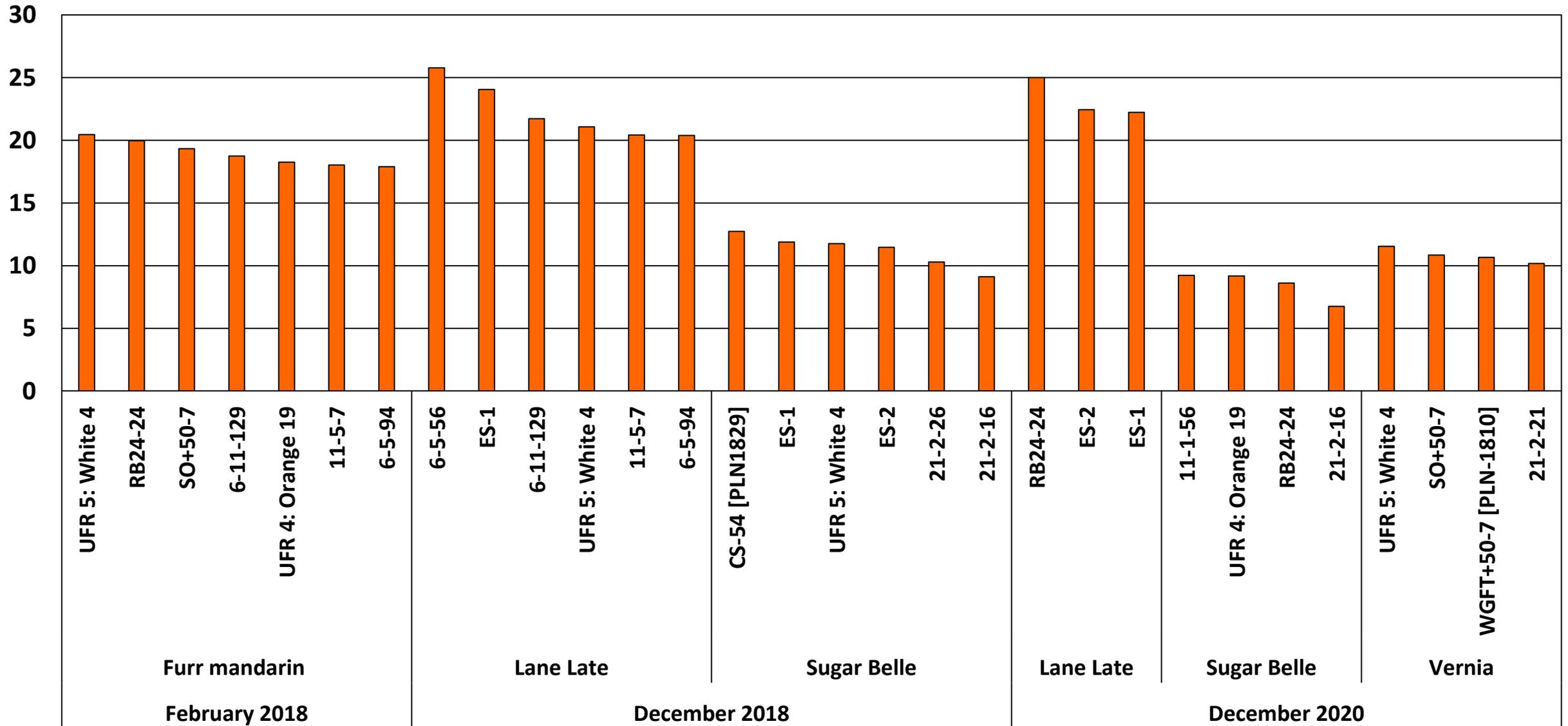


Fig. 12. Scion-Rootstock trial, Fellsmere – juice quality, Ratio by scion [February 2018, December 2018 & 2020].

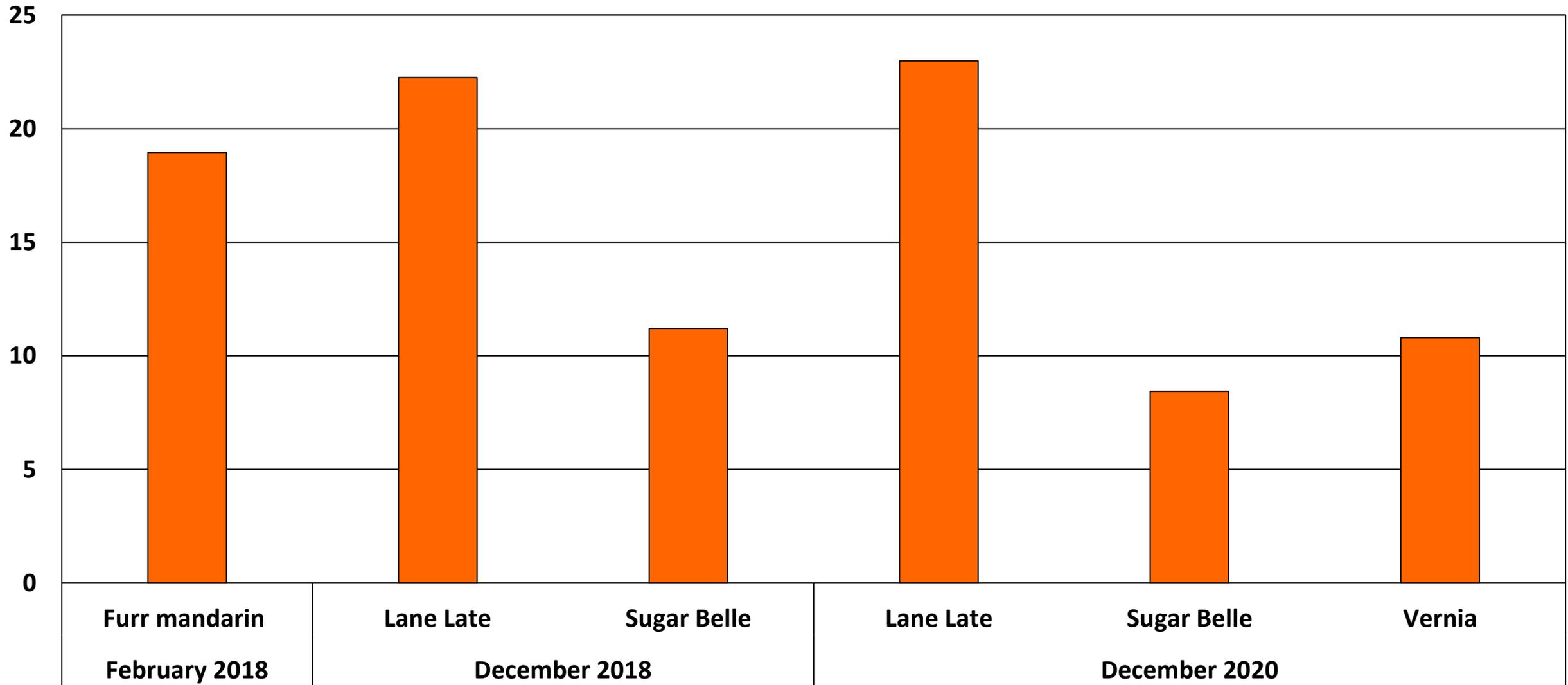


Fig. 13. Scion-Rootstock trial, Fellsmere – juice quality, PS/Box by scion - rootstock [February 2018, December 2018 & 2020].

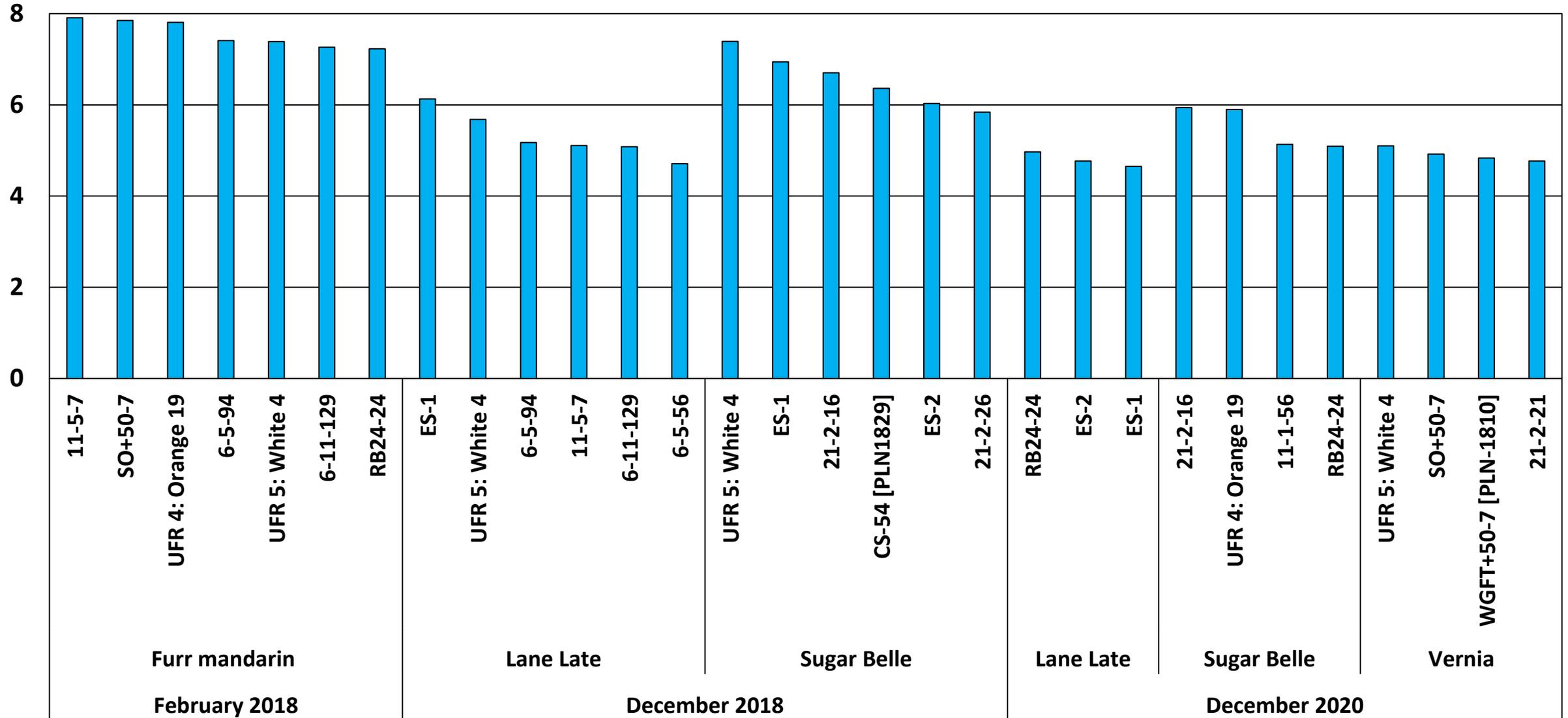


Fig. 14. Scion-Rootstock trial, Fellsmere – juice quality, PS/Box by scion [February 2018, December 2018 & 2020].

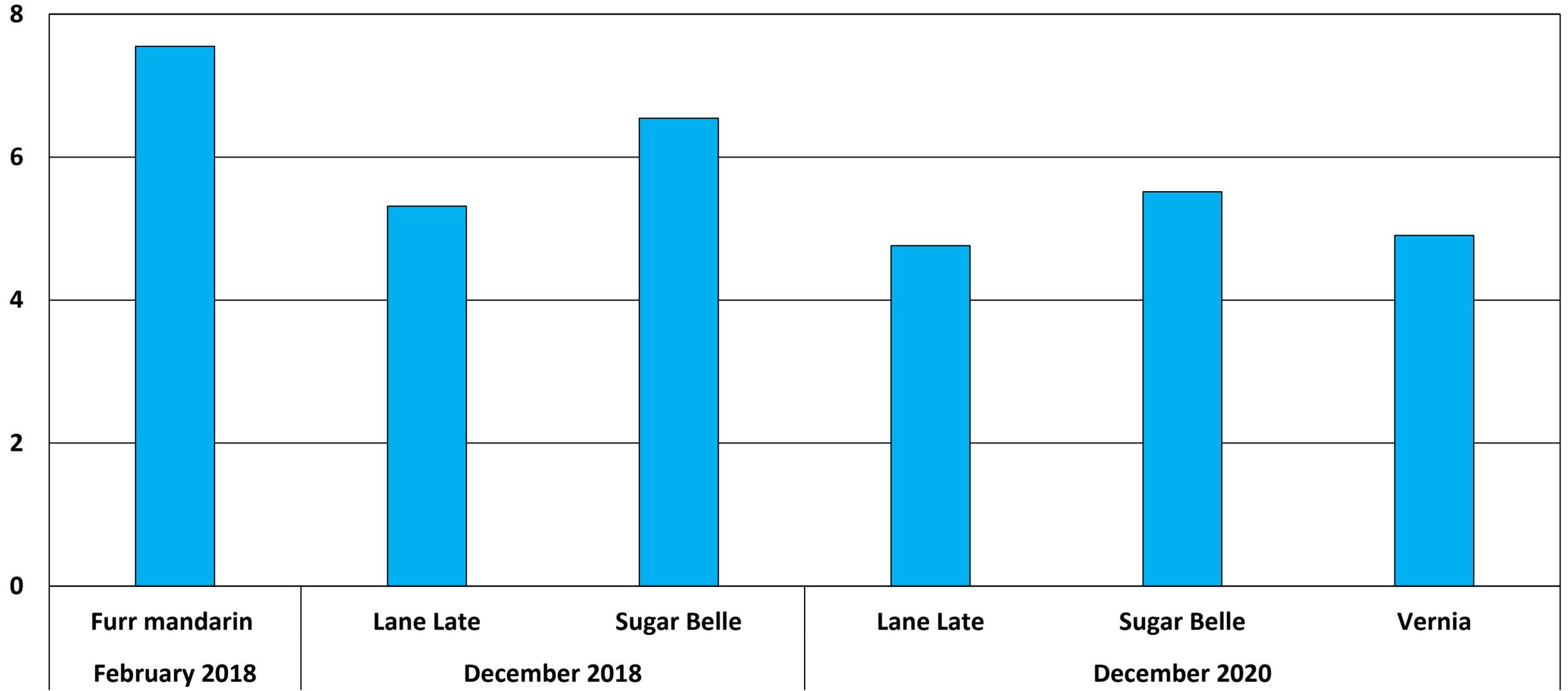


Fig. 15. Scion-Rootstock trial, Fellsmere – juice quality, Color by scion - rootstock [February 2018, December 2018 & 2020].

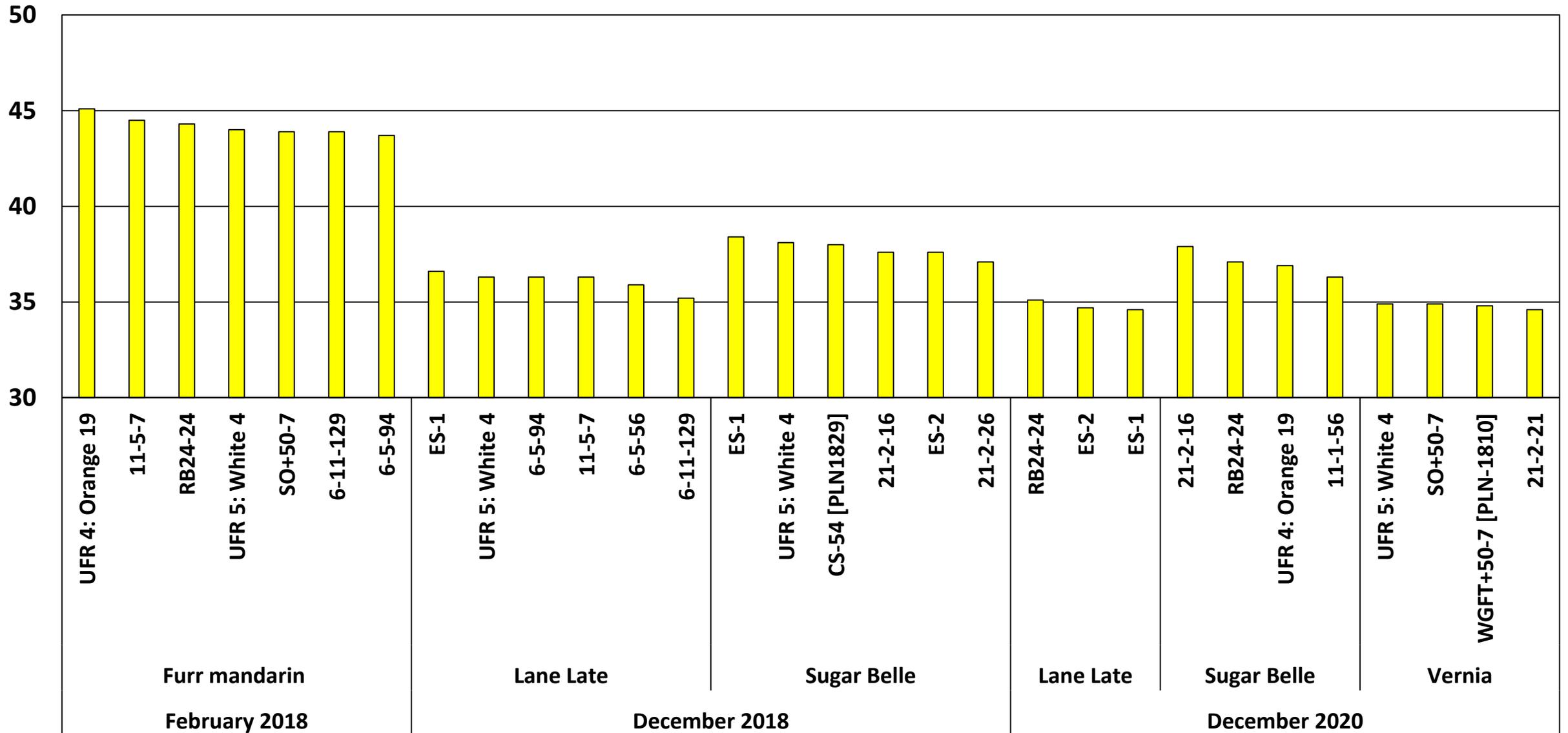


Fig. 16. Scion-Rootstock trial, Fellsmere – juice quality, Color by scion [February 2018, December 2018 & 2020].

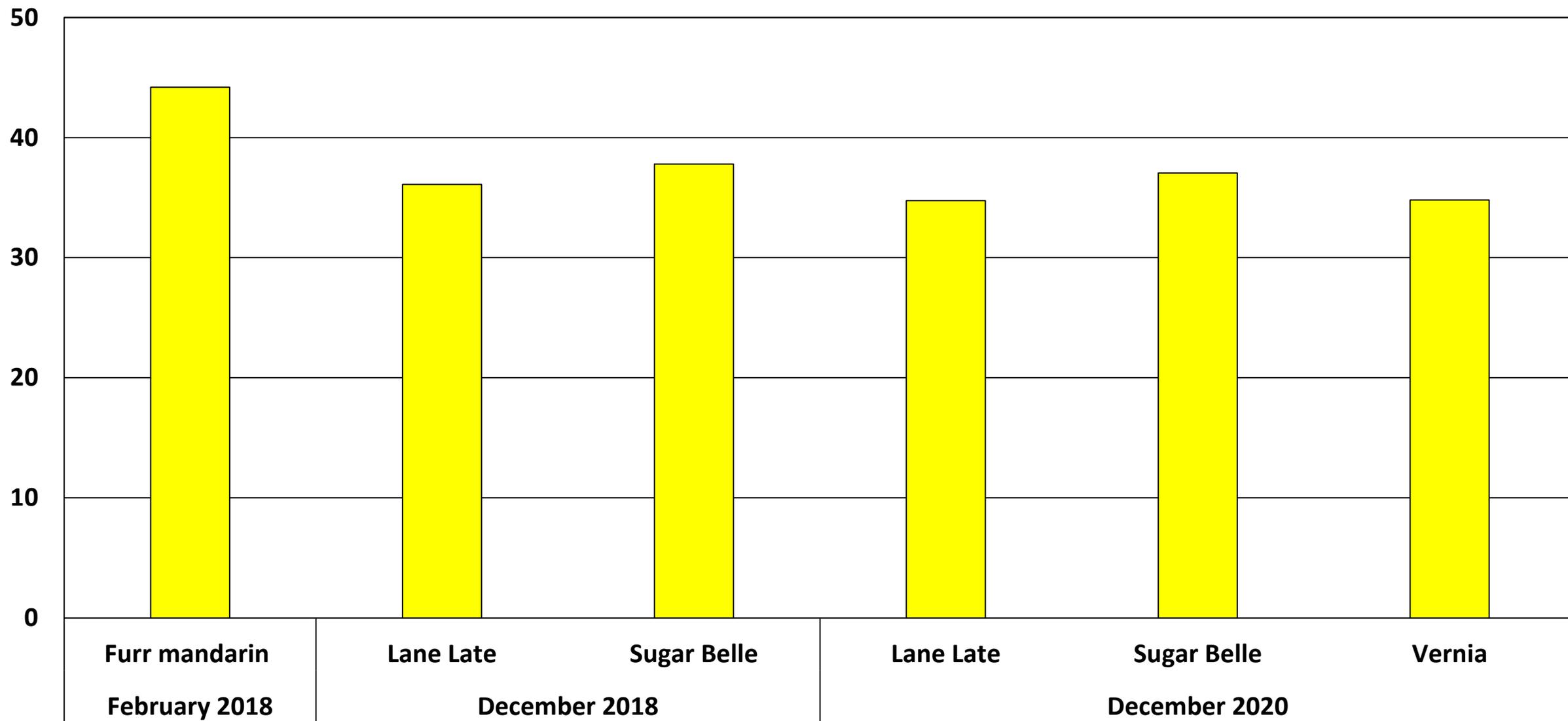


Fig. 17. Scion-Rootstock trial, Fellsmere – HLB rating for Ray Ruby and Furr mandarin: mean + std. dev. [October 2018, January 2020 & October 2020].

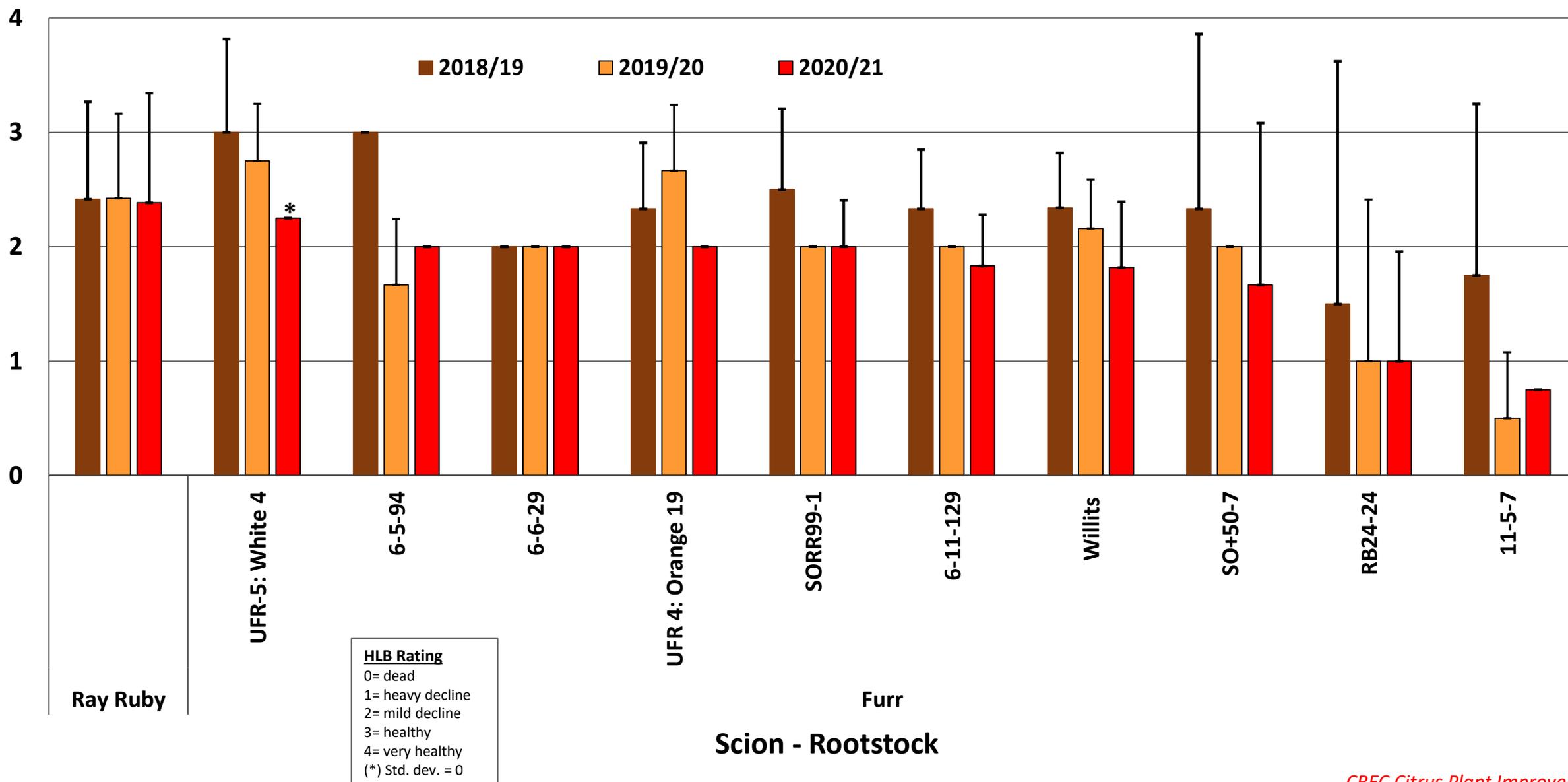


Fig. 18. Scion-Rootstock trial, Fellsmere – HLB rating for Lane Late: mean + std. dev. [October 2018, January 2020 & October 2020].

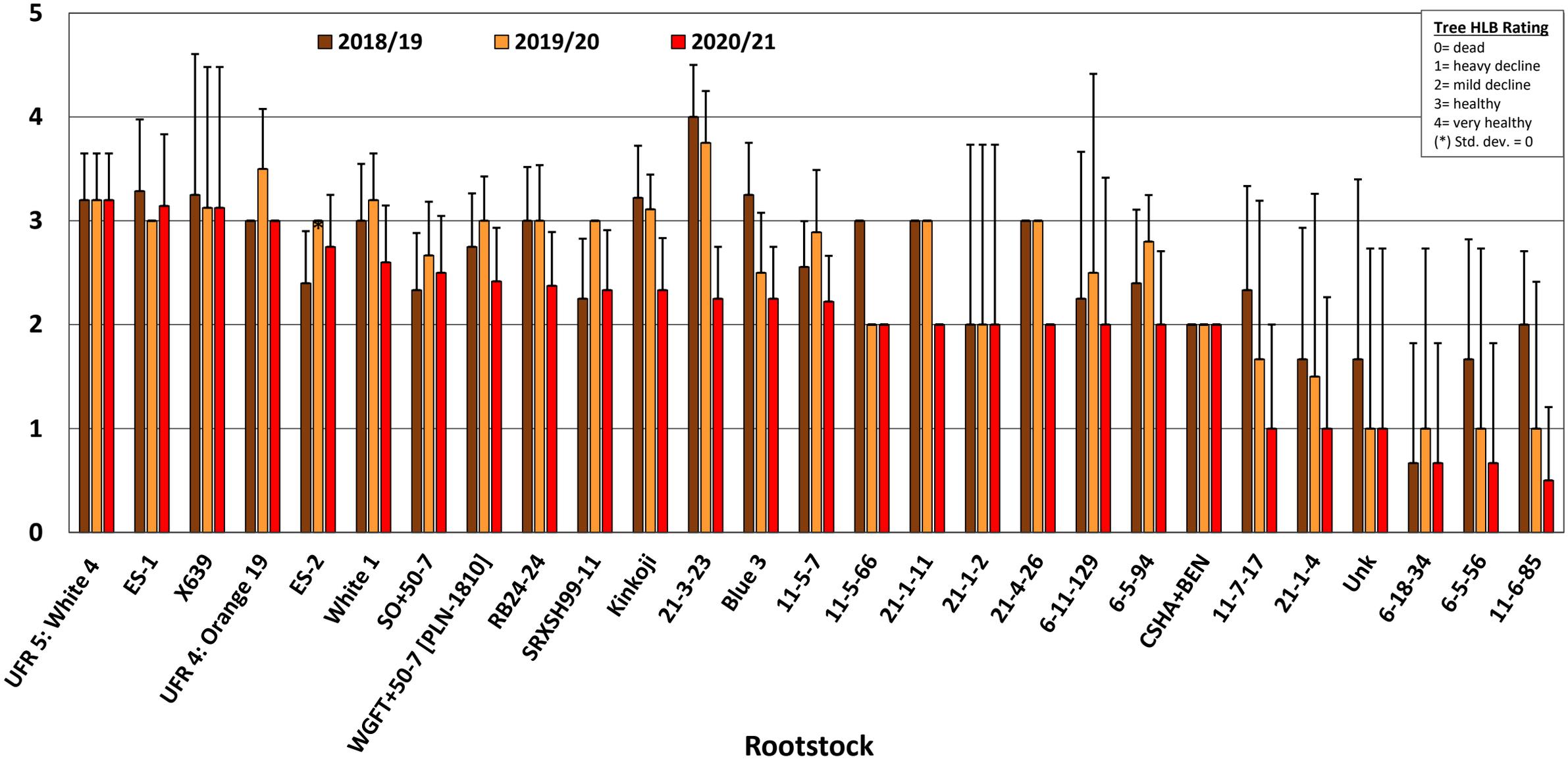


Fig. 19. Scion-Rootstock trial, Fellsmere – HLB rating for Sugar Belle: mean + std. dev. [October 2018, January & October 2020].

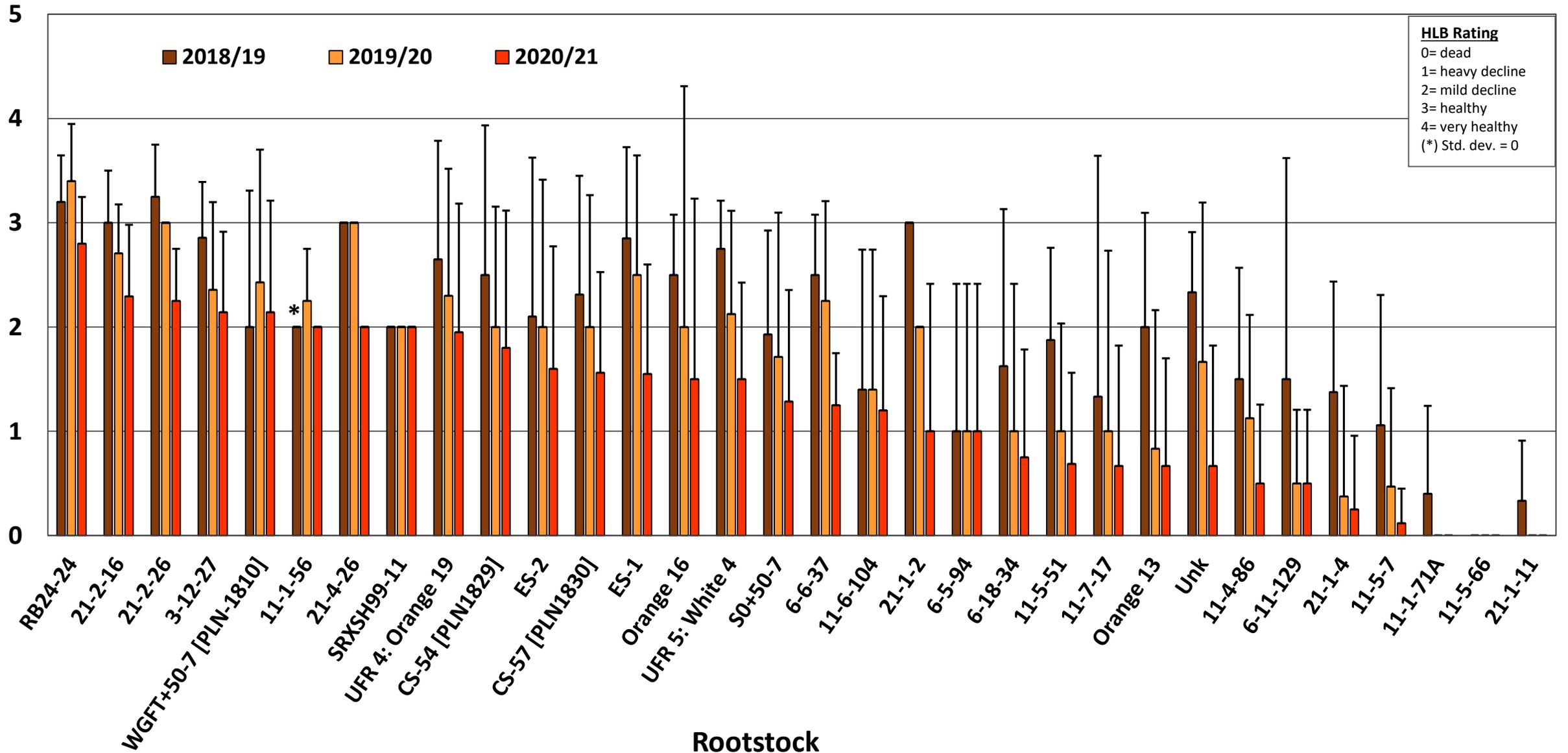


Fig. 20. Scion-Rootstock trial, Fellsmere – HLB rating for Vernia: mean + std. dev. [October 2018, January 2020 & October 2020].

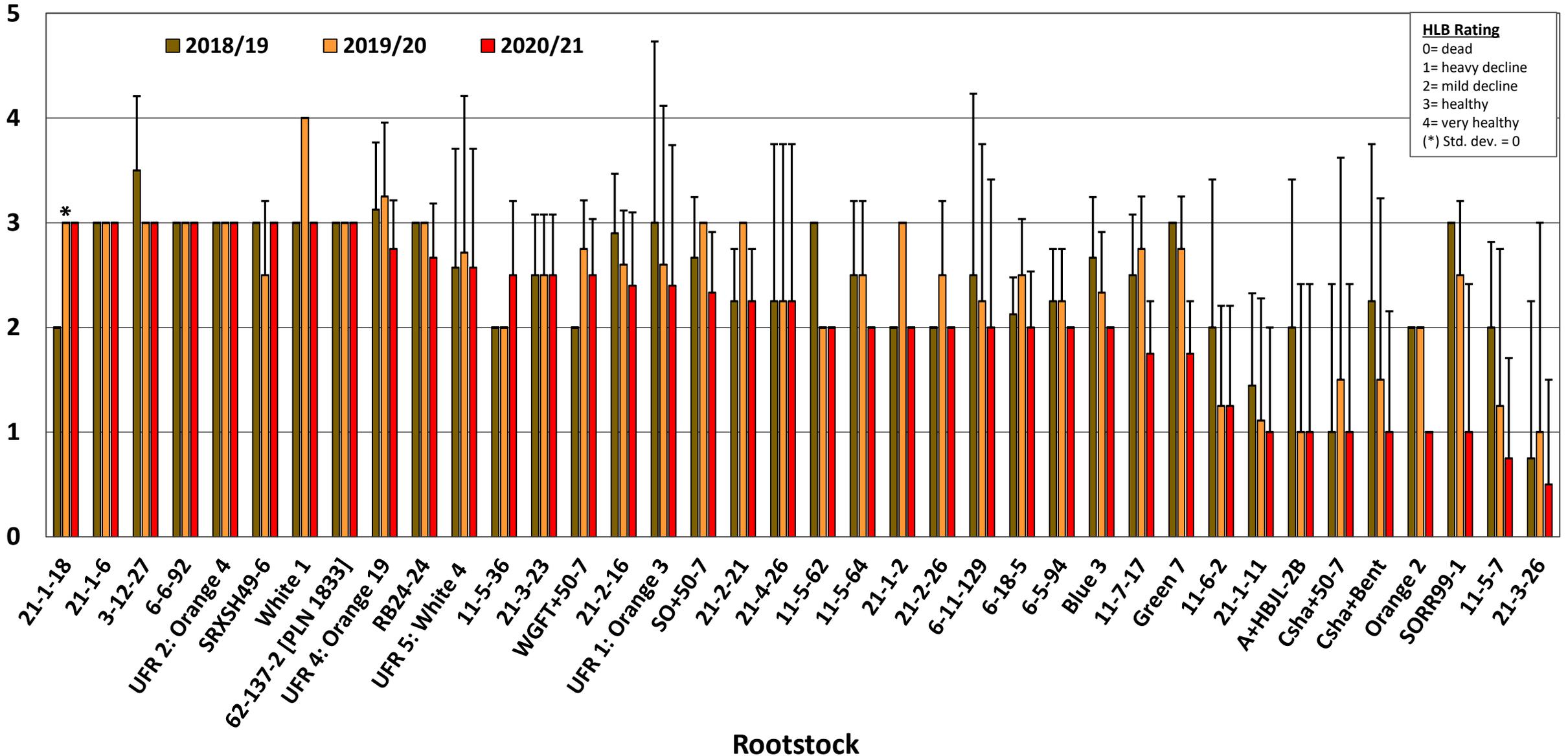


Fig. 21. Scion-Rootstock trial, Fellsmere – Yield [boxes/tree]: mean by scion-rootstock [December 2020].

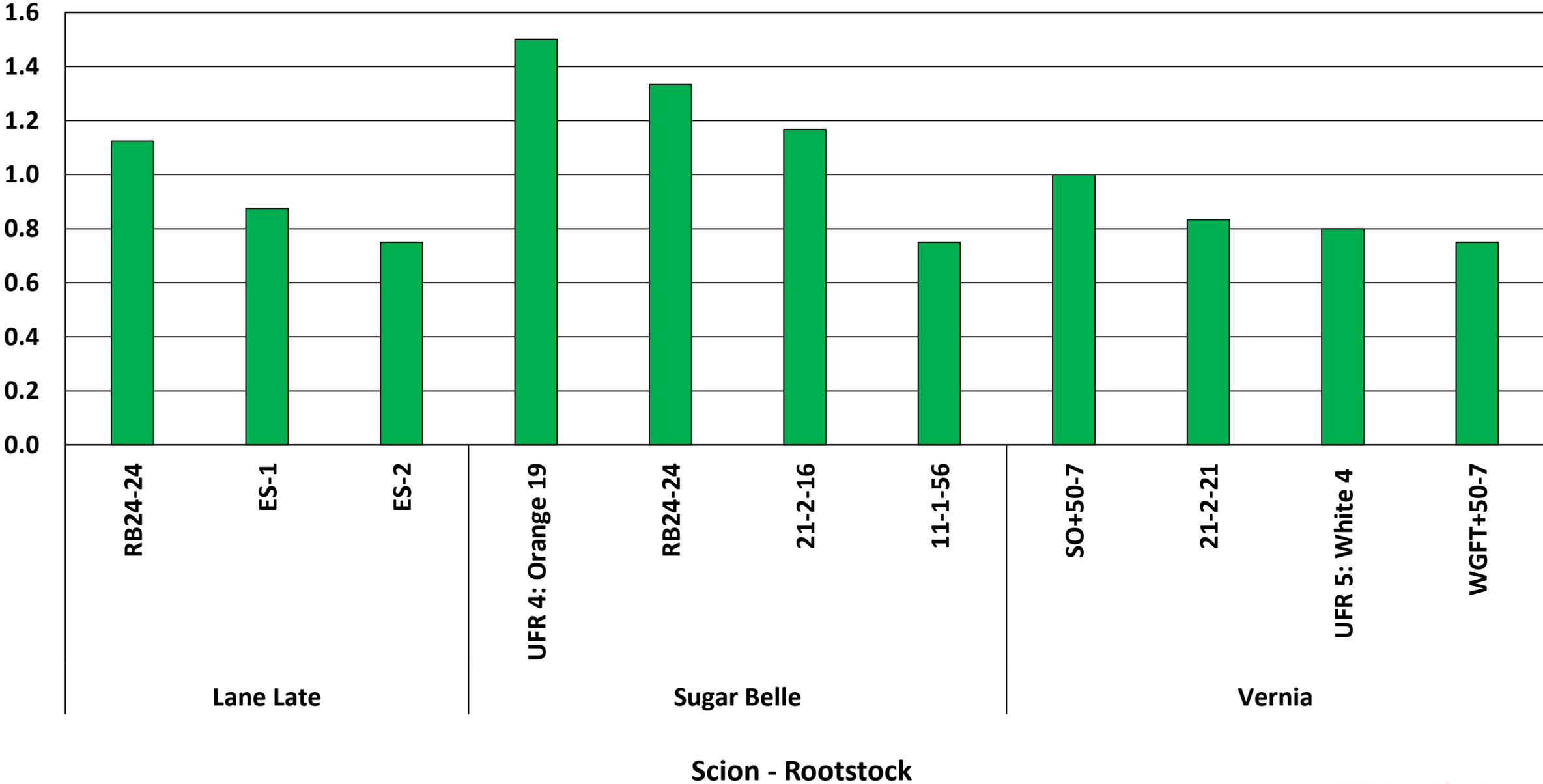


Table 2. Scion-Rootstock trial, Fellsmere - Total number of trees and % survival.

Scion	Rootstock	Total Trees Planted	October 2018	January 2020	October 2020
Furr	6-6-29	1	100	100	100
	SO+50-7	3	100	100	100
	SRXSH99-11	2	100	100	100
	UFR 4: Orange 19	3	100	100	100
	Willits	50	88	88	86
	6-11-129	7	86	86	86
	UFR 5: White 4	5	80	80	80
	6-5-94	4	75	75	75
	RB24-24	2	50	50	50
	11-5-7	5	60	40	40
Ray Ruby		116	84	83	83

Table 2 (cont'd). Scion-Rootstock trial, Fellsmere - Total number of trees and % survival.

Scion	Rootstock	Total Trees Planted	October 2018	January 2020	October 2020
Lane Late	21-1-11	1	100	100	100
	Blue 3	4	100	100	100
	CSHA+BEN	2	100	100	100
	RB24-24	8	100	100	100
	SO+50-7	6	100	100	100
	White 1	5	100	100	100
	ES-2	5	100	100	100
	21-3-23	4	100	100	100
	11-5-7	9	100	100	100
	ES-1	8	88	88	88
	WGFT+50-7	14	86	86	86
	6-5-94	6	83	83	83
	UFR 5: White 4	6	83	83	83
	SRXSH99-11	5	60	80	80
	UFR 4: Orange 19	5	80	80	80
	21-1-2	4	50	50	50
	21-1-4	6	83	50	50
	6-11-129	6	50	50	50
	11-6-85	3	67	33	33
	6-18-34	3	33	33	33
	6-5-56	3	67	33	33
	11-7-17	7	43	29	29
	21-4-26	5	20	20	20

Table 2 (cont'd). Scion-Rootstock trial, Fellsmere - Total number of trees and % survival.

Scion	Rootstock	Total Trees Planted	October 2018	January 2020	October 2020
Sugar Belle	11-1-56	4	100	100	100
	21-2-26	4	100	100	100
	C-54: PLN1829	8	100	100	100
	RB24-24	5	100	100	100
	WGFT+50-7	7	86	100	100
	21-4-26	2	100	100	100
	21-2-16	18	94	94	94
	3-12-27	14	100	93	93
	UFR 5: White 4	8	100	88	88
	ES-1	22	86	82	82
	6-6-37	5	80	80	80
	C-57: PLN1830	16	88	75	75
	ES-2	10	70	70	70
	UFR 4: Orange 19	23	78	70	70
	11-5-51	16	88	50	50
	11-6-104	6	50	50	50
	6-5-94	2	50	50	50
	Orange 16	4	100	50	50
	S0+50-7	19	63	47	47
	6-18-34	7	71	43	43
	11-4-86	12	50	42	42
	11-7-17	3	33	33	33
	Orange 13	6	83	33	33
	11-5-7	23	35	17	17
	21-1-4	8	75	13	13
	11-1-71A	10	20	0	0
	11-5-66	2	0	0	0
	21-1-11	3	33	0	0
	A-HBJL+2B	1	0	0	0

Table 2 (cont'd). Scion-Rootstock trial, Fellsmere - Total number of trees and % survival.

Scion	Rootstock	Total Trees Planted	October 2018	January 2020	October 2020
Vernia	11-5-36	2	100	100	100
	11-5-62	4	100	100	100
	11-5-64	2	100	100	100
	11-7-17	4	100	100	100
	21-1-6	1	100	100	100
	21-2-16	10	100	100	100
	21-2-21	4	100	100	100
	21-2-26	2	100	100	100
	21-3-23	4	100	100	100
	6-11-129	3	100	100	100
	6-18-5	8	100	100	100
	6-5-94	4	100	100	100
	6-6-92	1	100	100	100
	Blue 3	3	100	100	100
	Orange 2	1	100	100	100
	PLN1833	1	100	100	100
	RB24-24	6	100	100	100
	SO+50-7	3	100	100	100
	SORR99-1	1	100	100	100
	UFR 1: Orange 3	4	100	100	100
	UFR 2: Orange 4	1	100	100	100
	UFR 4: Orange 19	8	100	100	100
	UFR 5: White 4	6	100	100	100

Table 2 (cont'd). Scion-Rootstock trial, Fellsmere - Total number of trees and % survival.

Scion	Rootstock	Total Trees Planted	October 2018	January 2020	October 2020
Vernia	White 1	1	100	100	100
	WGFT+50-7	8	100	100	100
	SRXSH49-6	2	100	100	100
	Green 7	5	80	80	80
	11-6-2	4	75	75	75
	3-12-27	3	67	67	67
	21-4-26	5	60	60	60
	21-1-11	9	89	56	56
	A+HBJL-2B	2	100	50	50
	Csha+Bent	4	75	50	50
	11-5-7	5	80	40	40
	21-1-18	10	40	40	40
	21-3-26	3	33	33	33
	UFR 6: Changsha+TF 50-7	3	33	33	33
	11-2-43	1	100	0	0
	11-6-104	1	0	0	0
	11-6-85	1	100	0	0
	21-10-26	1	0	0	0
	21-2-10	1	100	0	0
	SRXSH99-11	1	0	0	0