

Postharvest Performance of Fast Track Selections

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Evaluated Selections by Year

Florida

Season	Number of selections	Mandarin	Orange	Grapefruit & Hybrid
2008-09	42	38	3	4
2009-10	32	25	5	2
2010-11	42	33	2	9
2011-12	47	12	15	20
2012-13	27	8	8	11
2013-14	14	3	3	8
2014-15	24	15	3	6
2015-16	25	10	7	8
2016-17	31	15	8	8
2017-18	48	19	12	14
Total	332	178	66	90

Objective

- Determine the ability of fruit from promising new fresh citrus selections to maintain excellent quality through harvest and postharvest handling:
 - **Degreening (when necessary)**
 - **Packingline operations (depending on fruit numbers)**
 - **Storage**
- With more fruit availability, will be able to run more extensive tests (e.g., LB8-9)



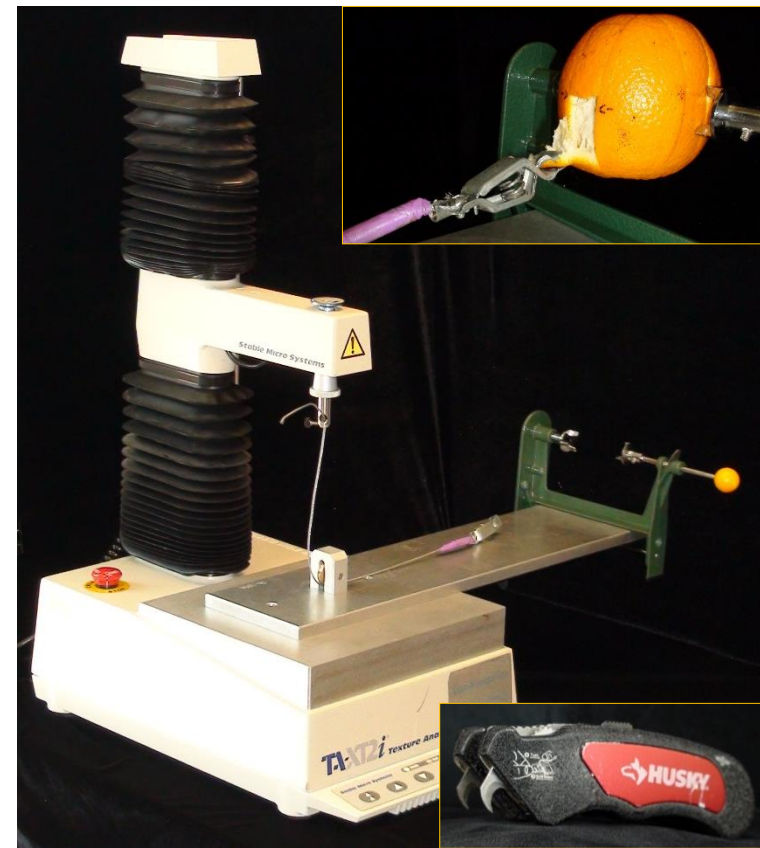
Postharvest Treatment

- Depending on the amount of available fruit, they may be degreened, washed, and waxed (carnauba) on the IRREC packingline
 - **NO fungicides applied**
 - **Degreening at 85F, 90% RH with 5 ppm Ethylene for 2 to 3 days**
 - **Mandarin and Orange selections stored at 40F**
 - **Grapefruit & hybrids stored at 50F**



Postharvest Evaluations

- External quality
 - **Peel color, peel puncture resistance, peelability, fruit size and weight (peel oil release pressures will be measured starting this season)**
- Internal quality
 - **Total soluble solids, titratable acidity, ratio**
- Shelf life during storage
 - **Development of decay & physiological disorders**



Postharvest Evaluations

- With greater numbers of fruit, more detailed studies will be conducted, such as:
 - **Harvest method (snap vs. clip)**
 - **Efficacy of fungicide drenches**
 - **Degreening duration and conditions**
 - Special treatments (cold shock & other colorants) & evaluations (predominance of chlorophyll a or b?) for problem selections/varieties
 - **Washing/waxing treatments (e.g., carnauba vs. shellac)**
 - Fruit weight loss
 - **Storage temperature (chilling injury)**



MANDARINES



LB8-9 (Sugar Belle)

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Effects of Growing Location, Storage Temperature, and Fruit Coating on Postharvest Quality and Quality Retention of ‘Sugar Belle’TM Mandarin

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ADDITIONAL INDEX WORDS. mandarin, peel color, shelf life, decay, physiological disorders, chilling injury, seed content

‘Sugar Belle’TM mandarin (previously known as LB8-9) was released to Florida citrus growers in 2009. Fruit were evaluated during the 2008–09 and 2009–10 seasons in terms of growing location and response to different postharvest coatings and storage temperatures to further refine their optimum postharvest handling practices. Fruit were obtained from blocks in Orange or Indian River (IR) Counties, washed and coated with either shellac or carnauba wax, and then stored at 1, 4, or 10 °C for up to 39 d and then transferred to ambient temperatures for an additional 7 d. In general, fruit from the Orange County block developed less postharvest decay and peel breakdown than fruit from the IR County block. Uncoated fruit or fruit stored at warmer temperatures developed better external color during storage. Use of coatings, especially carnauba, or storage at cooler temperatures inhibited fruit water loss most. Except for fruit from the IR block during the first season, the development of decay and physiological disorders during storage and subsequent transfer to ambient conditions was inhibited significantly more if stored at 1 or 4 °C than at 10 °C. Fruit from the IR block developed what appeared to be chilling injury (CI) when stored at 1 or 4 °C during the first season only. It is not clear if this different response is due to growing location, age of the block, or some other

LB8-9 (Sugar Belle) Results

Table 1. Peel color of 'Sugar Belle' fruit in 2008 from the Orange County block after 39 d of storage.

Treatment	a*/b*	Hue	Chroma
Coating			
Uncoated	1.22 a ^z	39.85 b	47.09 a
Shellac	1.15 b	41.28 a	46.05 b
Carnauba	1.13 b	41.73 a	44.92 c
Significance	***	***	***
Storage temperature			
1 °C	1.07 c	43.29 a	46.13 a
4 °C	1.11 b	42.08 b	46.43 a
10 °C	1.35 a	36.86 c	45.50 b
Significance	***	***	***
Trt × Temp	***	***	***

^zValues within each column followed by unlike letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.

NS, ***Nonsignificant or significant at $P \leq 0.001$.

LB8-9 (Sugar Belle) Results

Table 4. Percentage of 'Sugar Belle' fruit in 2008 from the Orange County block with decay or peel disorders after 39 d of cold storage plus an additional 7 d at room temperature (~23 °C).

Treatment	Healthy (%)	Diplodia (%)	Green mold (%)	Total decay (%)	Peel breakdown (%)
Coating					
Uncoated	60	5	32	38	1
Shellac	51	6	38	45	2
Carnauba	53	5	39	45	1
Significance	NS	NS	NS	NS	NS
Storage temperature					
1 °C	80 a ^z	1 b	16 C	16 c	1
4 °C	61 b	3 b	33 B	33 b	1
10 °C	23 c	13 a	61 A	61 a	2
Significance	***	***	***	***	NS
Trt × Temp	***	***	***	***	NS

^zValues within each column followed by unlike letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.

NS, ***Nonsignificant or significant at $P \leq 0.001$.

LB8-9 (Sugar Belle) Results

Table 5. Effect of degreening duration on the development of peel color of 'Sugar Belle' fruit in 2009 from an Indian River County block.

Day after degreening	Duration of degreening (hour)	a*/b*	Hue	Chroma
0	Initial	0.44	66.26	60.16
1	0	0.47 ab ^z	64.99	60.78
	12	0.46 B	65.23	60.15
	24	0.51 A	63.19	59.51
Significance		*	NS	NS
0		0.46 b	65.16 a	67.40
7	12	0.47 b	64.66 a	68.03
	24	0.52 a	62.56 b	67.43
Significance		***	***	NS

^zValues within each column followed by unlike letters are significantly different by Duncan's multiple range test at $P \leq 0.05$.

NS, *, ***Nonsignificant or significant at $P \leq 0.05$ or 0.001, respectively.

LB8-9 (Sugar Belle) Results

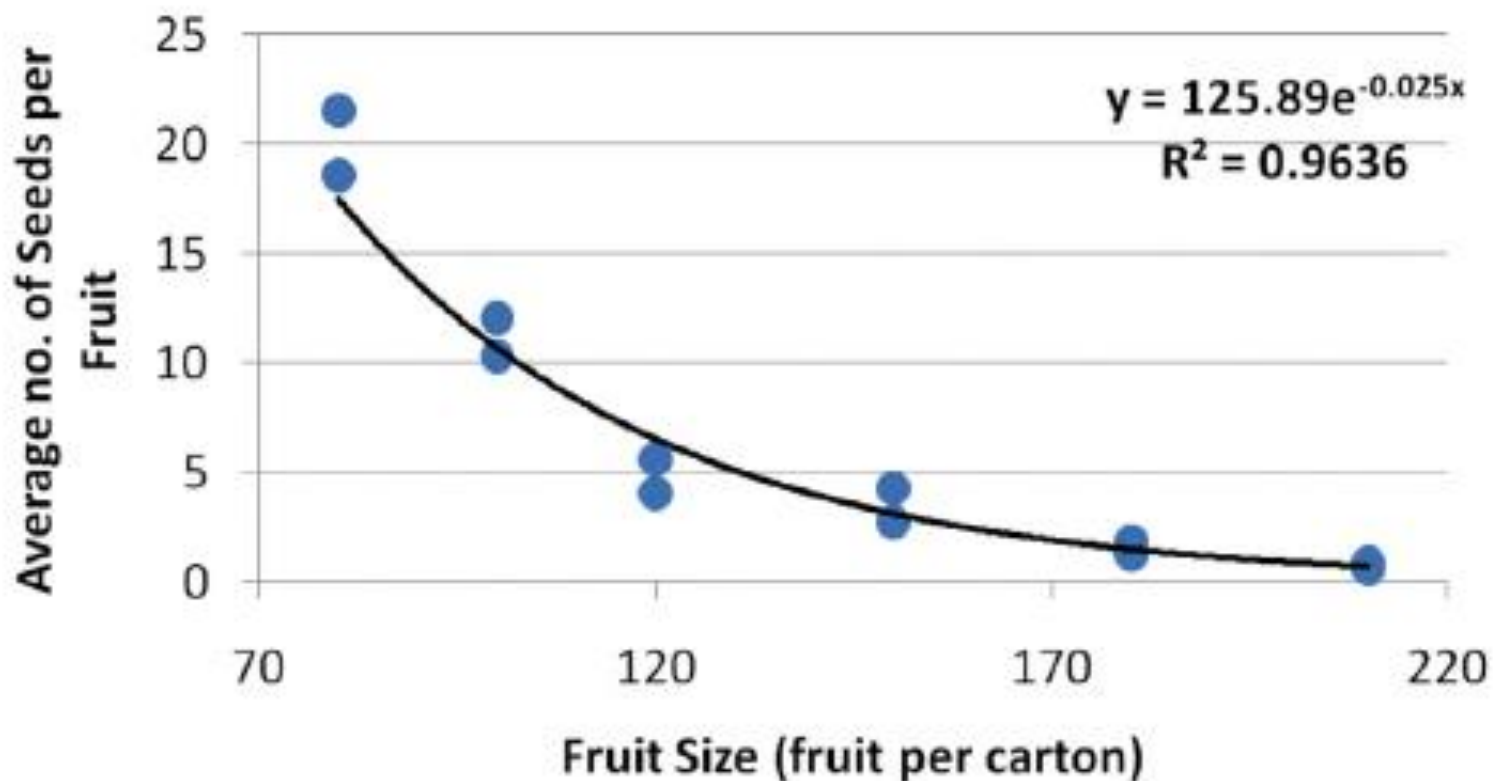



Fig. 1. Relationship between 'Sugar Belle' fruit size and the number of seeds per fruit. Fruit were collected from a commercial packinghouse on two different dates.

LB8-9 (Sugar Belle) Results

- Water loss was greater when fruit were waxed with shellac, compared to waxing with carnauba
 - **Fruit coating had no effect on decay or peel disorders**
- Fruit storage at 1°C usually resulted in significantly less decay than storage at 10°C
 - **in 2008, fruit from the Indian River block developed significantly more peel breakdown at 4°C (29%) than at 1 or 10 °C (15% and 10%, respectively)**
- In general, there was usually very little peel breakdown
- Degreening treatments resulted in no significant difference in decay or physiological disorders during subsequent cold storage (data



LB8-9 (Sugar Belle)


- **Evaluated:** 5 times
 - **Harvest dates:** Dec. 9 – Jan. 25
 - **Brix:** 14.1 – 16.1; **Acids:** 1.01 – 1.32
 - Ratio from **11.8 – 16.0**
 - **Color (a/b):** 0.44 – 0.74
 - **Peel puncture resistance:** 0.15 – 1.00 kg
 - **Peelability (mean force):** 139 g
 - Peel length before breakage: **78.5 mm**
 - **Storage duration:** 6 weeks
 - **Healthy fruit:** 100%
- 

900


- **Evaluated:** 6 times
- **Harvest dates:** Oct. 5 – Nov. 21
- **Brix:** 11.4 - 13.6 ; **Acids:** 0.62 – 0.96
 - Ratio from **11.9 – 19.2**
- **Color (a/b):** 0.21 – 0.61
- **Peel puncture resistance:** 0.6 – 1.1 kg
- **Peelability (mean force):** 140 g
 - Peel length before breakage: **55 mm**
- **Storage duration:** 5 weeks
- **Healthy fruit:** 96 – 100%




950 (Florida Clementine)

- **Evaluated:** 4 times
 - **Harvest dates:** Dec. 9 – Jan. 9
 - **Brix:** 10.8 - 13.8; **Acids:** 0.43 – 0.58
 - Ratio from 23.8 – 25.0
 - **Color (a/b):** 0.18 – 0.48
 - **Peel puncture resistance:** 0.11 – 1.43 kg
 - **Peelability (mean force):** 545 - 744 g
 - Peel length before breakage: 31 - 80 mm
 - **Storage duration:** Up to 7 weeks
 - **Healthy fruit:** 99%
- 


N40W-6-3 (Seedless Snack)

- **Evaluated:** 5 times
 - **Harvest dates:** Nov. 2 – Dec. 19
 - **Brix:** 12.2 – 15.5; **Acids:** 0.69 – 0.72
 - Ratio from **17.1 – 22.4**
 - **Color (a/b):** 0.26 – 0.68
 - **Peel puncture resistance:** 0.17 – 1.50 kg
 - **Peelability (mean force):** 545 - 744 g
 - Peel length before breakage: **31 - 80 mm**
 - **Storage duration:** 7 weeks
 - **Healthy fruit:** 81 - 100%
- 

411 (Heather)

- **Evaluated:** 6 times
 - **Harvest dates:** Jan. 4 – March 10
 - **Brix:** 13.7 – 18.3; **Acids:** 0.77 – 1.43
 - Ratio from **11.8 – 19.7**
 - **Color (a/b):** 0.46 – 0.49
 - **Peel puncture resistance:** 0.79 – 2.14 kg
 - **Peelability (mean force):** 139 g
 - Peel length before breakage: **78.5 mm**
 - **Storage duration:** 5 - 6 weeks
 - **Healthy fruit:** 20 - 94%
- 


C4-15-19 (Kid's Favorite)

- **Evaluated:** 3 times
 - **Harvest dates:** Nov. 6 – Dec. 19
 - **Brix:** 15.0 – 16.5; **Acids:** 0.72 – 0.86
 - Ratio from **19.2 – 21.1**
 - **Color (a/b):** 0.39 – 0.68
 - **Peel puncture resistance:** 0.15 – 1.00 kg
 - **Peelability (mean force):** 210 - 386 g
 - Peel length before breakage: **42.5 – 46.3 mm**
 - **Storage duration:** 7 weeks
 - **Healthy fruit:** 81 - 98%
- 


7-6-27 (Bingo)

- **Evaluated:** 3 times
- **Harvest dates:** Sept. 29 – Nov. 10
- **Brix:** 10.6 – 16.3; **Acids:** 0.63 – 0.94
 - Ratio from **11.3 – 21.9**
- **Color (a/b):** 0.05 – 0.55 (degreening helps)
- **Peel puncture resistance:** 0.64 – 0.74 kg
- **Peelability (mean force):** 114 - 125 g
 - Peel length before breakage: **35.4 – 75.0 mm**
- **Storage duration:** 8 weeks
- **Healthy fruit:** 100%
(degreening reduced from 100% to 80% 1 of 2 times)


1420

- **Evaluated:** 3 times
 - **Harvest dates:** Sept. 29 – Dec. 11
 - **Brix:** 14.1 – 16.5; **Acids:** 0.61 – 0.78
 - Ratio from **19.9 – 24.6**
 - **Color (a/b):** 0.09 – 0.50
 - **Peel puncture resistance:** 0.8 – 1.5 kg
 - **Peelability (mean force):** 240 - 266 g
 - Peel length before breakage: **25.7 – 30.3 mm**
 - **Storage duration:** 6 weeks
 - **Healthy fruit:** 100%
- 


1351

- **Evaluated:** 6 times
 - **Harvest dates:** Nov. 18 – Jan. 4
 - **Brix:** 12.0 – 14.9; **Acids:** 0.70 – 0.96
 - Ratio from **12.5 – 21.2**
 - **Color (a/b):** 0.35 – 0.67
 - **Peel puncture resistance:** 0.5 – 1.2 kg
 - **Peelability (mean force):** 234 g
 - Peel length before breakage: **35.2 mm**
 - **Storage duration:** 5 weeks
 - **Healthy fruit:** 89%
- 

RBB7-34

- **Evaluated:** 1 time
 - **Harvest dates:** Jan. 22
 - **Brix:** 12.5; **Acids:** 0.57
 - **Ratio** 21.9
 - **Color (a/b):** 0.21
 - **Peel puncture resistance:** 1.0 kg
 - **Peelability (mean force):** NA
 - **Peel length before breakage:** NA
 - **Storage duration:** 8 weeks
 - **Healthy fruit:** 60%
- 

711

- **Evaluated:** 2 times
 - **Harvest dates:** Jan. 18 – Jan. 28
 - **Brix:** 13.0 – 14.1; **Acids:** 0.95
 - Ratio from **13.7 – 14.9**
 - **Color (a/b):** 0.27 – 0.70
 - **Peel puncture resistance:** 0.87 – 0.99 kg
 - **Peelability (mean force):** 171 g
 - Peel length before breakage: **60.8 mm**
 - **Storage duration:** 6 weeks
 - **Healthy fruit:** 90%
- 

ORANGES



N7-3 (Valenfresh)

- **Evaluated:** 3 times
- **Harvest dates:** Jan. 28 – Apr. 8
- **Brix:** 9.4 – 12.7; **Acids:** 0.79 – 1.00
 - Ratio from **12.0 – 12.3**
- **Color (a/b):** 0.12 – 0.26
- **Peel puncture resistance:** NA
- **Peelability (mean force):** NA
 - Peel length before breakage: **78.5 mm**
- **Storage duration:** 7 weeks
- **Healthy fruit:** 76 - 100%




T2-21

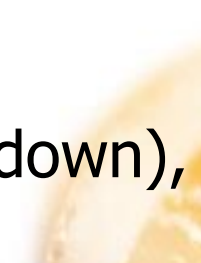
- **Evaluated:** 6 times
- **Harvest dates:** Jan. 28 – Apr. 8
- **Brix:** 10.6 – 12.8; **Acids:** 0.65 – 1.20
 - Ratio from **10.7 – 18.1**
- **Color (a/b):** 0.04 – 0.51
- **Peel puncture resistance:** 1.23 – 1.56 kg
- **Peelability (mean force):** 416 g
 - Peel length before breakage: **30 mm**
- **Storage duration:** 7 weeks
- **Healthy fruit:** 85 - 100%




OLL 8

- **Evaluated:** 6 times
 - **Harvest dates:** Jan. 22 – Apr. 8
 - **Brix:** 10.8 – 12.9; **Acids:** 0.65 – 0.90
 - Ratio from **11.4 – 18.1**
 - **Color (a/b):** 0.14 – 0.34
 - **Peel puncture resistance:** 1.55 – 2.90 kg
 - **Peelability (mean force):** 489 - 594 g
 - Peel length before breakage: **49 - 80 mm**
 - **Storage duration:** 7 weeks
 - **Healthy fruit:** 78, 88, rest 100%
- 


OLL 4

- **Evaluated:** 2 times
 - **Harvest dates:** Feb. 17 (both years)
 - **Brix:** 11.0 – 11.7; **Acids:** 0.85 – 1.0
 - Ratio from **11.7 – 13.0**
 - **Color (a/b):** 0.30 – 0.31
 - **Peel puncture resistance:** 1.50 – 1.87 kg
 - **Peelability (mean force):** 514 g
 - Peel length before breakage: **60 mm**
 - **Storage duration:** 6 or 8 weeks
 - **Healthy fruit:** 55% (6 week, mostly peel breakdown),
100% (8 weeks)
- 

B9-65

- **Evaluated:** 4 times
 - **Harvest dates:** Feb. 17 – Mar. 26
 - **Brix:** 9.2 – 11.6; **Acids:** 0.57 – 0.98
 - Ratio from **11.9 – 16.2**
 - **Color (a/b):** 0.04 – 0.37
 - **Peel puncture resistance:** 1.41 – 2.00 kg
 - **Peelability (mean force):** 493 g
 - Peel length before breakage: **6.5 mm**
 - **Storage duration:** 8 weeks
 - **Healthy fruit:** 68 - 94%
- 

SF14W-62 (Valquarius)

- **Evaluated:** 6 times
 - **Harvest dates:** Dec. 13 – Feb. 24
 - **Brix:** 7.3 – 15.3; **Acids:** 0.59 – 1.35
 - Ratio from **5.57** (once), rest **15.17 – 18.1**
 - **Color (a/b):** 0.13 – 0.14
 - **Peel puncture resistance:** 1.18 – 2.12 kg
 - **Peelability (mean force):** 493 g
 - Peel length before breakage: **6.5 mm**
 - **Storage duration:** 7 weeks
 - **Healthy fruit:** 67 - 100%
- 

Thank You!

- For more information,
visit the UF Postharvest Website

<http://irrec.ifas.ufl.edu/postharvest/>