

2018

North Carolina and Tennessee Pumpkin Cultigen Evaluations

Upper Mountain Research Station
Laurel Springs, NC

Department of Horticultural Science
North Carolina State University
Hort. Series No. 225



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Hort. Series # 225

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General Cultural Practices

The pumpkin and gourd cultigen evaluation study was grown on black plastic mulch and fertigated through drip tape. Pesticides used on all plots were chemicals labeled for that crop, (North Carolina Agricultural Chemicals Manual, 2018; North Carolina Vegetable Production Guide, 2018).

Acknowledgments

We gratefully acknowledge the assistance of Tracy Taylor (Superintendent), John Council, (Horticultural Crops Supervisor) and other supporting personnel at the NCDA&CS Upper Mountain Research Station, Laurel Springs, NC, for their help in establishing, maintaining, and harvesting the pumpkin cultigen evaluation study. Additionally, we would like to thank the University of Tennessee and North Carolina State University student workers and support staff

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Disclaimer

This publication presents data from the cultigen evaluation study conducted during 2018. Information contained in this report is believed to be reliable but should not be relied upon as a sole source of information. Limited accompanying detail is included but excludes some pertinent information, which may aid interpretation.

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Introduction

In 2017, North Carolina ranked 4th in pumpkin production in the US behind Illinois, Texas and California. This makes North Carolina the largest pumpkin producing state on the eastern seaboard. The economic value of the pumpkin crop in North Carolina was reported to be more than 15 million dollars in 2016. There was estimated to be 4,500 acres of pumpkins grown in NC, with 3,000 of these acres being located in the mountains of Western North Carolina in 2018 (Travis Birdsell, personal communication). The USDA - National Agricultural Statistics Service reported pumpkin acreage in Tennessee at 1,600 acres in 2017. The crop carries a significant value to producers in both states and it appears as though production of this commodity is increasing in North Carolina. In the western part of North Carolina and in pockets of Tennessee, pumpkin production is extensive due to the climate and soils of the region. Collaborative pumpkin cultigen evaluation studies have been conducted by North Carolina State University and the University of Tennessee for over a decade. Growing conditions in the higher elevations of these states seems to translate in less disease pressure. According to the USDA Economic Research Service, consumer demand for specialty pumpkins has been increasing in recent years. The pumpkin cultigens included in this study were mainly evaluated for yield and size. However, each entry was also rated for shape, color, suturing, vine habit, handle characteristics, fruit size measurements and powdery mildew symptoms. The fruit obtained from each replicated entry are also identified in a photograph. Several other cultigens were also included in the study as observation plots (non-replicated) and most of these cultigens are identified in a photograph where available.

Materials and Methods

This study was conducted at the NCDA&CS Upper Mountain Research Station, Laurel Springs, NC, and was a collaboration between North Carolina State University and the University of Tennessee. Seeds were planted on 12 June 2018. A total of 54 entries were evaluated, with 23 being un-replicated and for observational purposes only. The remaining 31 entries were evaluated in a randomized complete block (RCB) study with 4 replications. Each plot measured 18 feet long with 6 plants spaced 3 feet apart (in-row) and distance between-row spacing was 10 feet. The exceptions were the mini sized category where plants were spaced 1.5 feet apart and 12 plants were planted in each plot.

Plant bed preparation included pre-plant fertilizer (290 lbs/acre of 18-46-0) broadcast applied and incorporated into the beds on 21 May before laying plastic mulch, providing 52 lbs N, 133 lbs P and 0 lbs K per acre. Fertigation with either 20-20-20 or 2-0-25 was applied through drip irrigation on 13, 20 and 27 July 2018; 6, 10, 24 and 31 August 2018. A total of 110 lbs/acre N, 183 lbs/acre P and 160 lbs/acre K was applied to the study site throughout the entire growing season.

Insecticides were only applied when needed and were applied at labeled rates for pumpkin production in North Carolina. Admire Pro was applied through drip irrigation on 27 June 2018

and applied at the labeled rate that can be referenced in the North Carolina Agricultural Chemical Manual or the North Carolina Vegetable Production Guide, 2018. The fungicide program implemented included protectant products of Initiate (chlorothalonil) or Roper (mancozeb) and the following products which were alternated to reduce potential for development of disease resistance: Previcur Flex, Aprovia Top, Ranman, Torino, Microthiol, Champion WP. These products are registered for use in this crop and were applied according to labeled rates that can be referenced in the North Carolina Agriculture Chemical Manual or the North Carolina Vegetable Production Guide, 2018. Fungicides were applied every 7 to 14 days throughout the growing season beginning 14 July 2018 and repeated on the following dates: 20, 27 July; 4, 12, 19, 25 August; and 7 September 2018. Herbicides, Command (1 pt/ac), Dual Magnum (1 pt/ac) and Sandea (0.75 oz/ac), were sprayed for weed control on 13 June 2018. Row middles were sprayed with Roundup Power Max (40 oz/ac) 29 June 2018. Pumpkins were harvested on 12 September (92 days after planting). Yield per acre was calculated by extrapolating total yield from the 180 ft² area of each plot. Five representative fruit from each plot were measured to find the average length and width of each cultivar. Pumpkin color, shape, and suturing; and handle length, thickness and attachment were rated subjectively for each plot.

Results

Pumpkin entries are discussed by size class and are organized in tables in alphabetical order. Results mentioned in the paragraphs below only correspond to the replicated entries.

Pie Pumpkin

Four entries were evaluated in the ‘mini’ size class (≤ 5.0 lbs). This year there were no entries that ranged between 5.1 to 10 lbs, with the exception of cultivars Brisbee Gold and EX 5, which are considered large pie pumpkins. As large pie pumpkins, they were evaluated with the other smaller pie pumpkins. Average fruit size ranged from 2.5 lbs for Jack Sprat to 6.7 lbs for EX 5 (Table 1). The smallest fruit were produced by Jack Sprat, while the fruit size of Mini Warts were very similar. EX 5 produced the largest fruit in the pie pumpkin size category. Mini Warts produced the least total yield at 12.5 tons/acre and EX 5 was the highest yielding cultivar in the Pie Pumpkin category at 23.6 tons/acre. Jack Sprat produced the greatest fruit number per acre of all of the replicated entries, at 11,979 fruit per acre (Table 1). Fruit of these entries were all orange and fruit shapes were mostly round (Table 2).

Small

Five entries were evaluated in the ‘small’ size class (10.1 – 15.0 lbs). Fruit size averaged between 11.0 to 14.7 lbs with JPN 62009 being the smallest followed by Scream II (Table 1). These entries ranged between 3,691 (Snow White) and 6,111 (Scream II) fruit number per acre. Scream II had the greatest yield in the small size category (Table 1). The fruit of these entries were all orange with the exception of Snow White, which had white skin color. The fruit of Snow White was mostly flat while all of the other entries in this category were round (Table 2).

Medium

Ten entries were evaluated in the ‘medium’ size class (15.1 - 20.0 lbs). Average fruit size in this category ranged between 15.2 to 18.9 lbs per fruit (Table 1). Orange Sunrise produced the highest fruit yield and fruit number in this size category. Fruit yields ranged from 34.2 tons/acre (Eros) to 55.1 tons/acre (Orange Sunrise). Gladiator produced the least fruit number per acre (4,235) and Orange Sunrise produced the greatest number of fruit per acre at 5,808. All fruit in this size category are orange with the exception of Snow White and Specter, which were white and white-buff in color (Table 2, see photo, page 13-14). Fruit shapes were mostly round to tall.

Large

Five varieties were evaluated in the ‘large’ size class (20.1 – 25.0 lbs). Average fruit size in this category ranged from 21.7 to 23.8 lbs (Table 1). Kratos produced the highest fruit weight per acre (56.3 tons/acre) while PMK-17-50 had the lowest total fruit weight per acre (41.4 tons per acre) for this size category. Thor produced the greatest number of fruit per acre, whereas, Solid Gold produced the least amount of fruit per acre (Table 1). Fruit shapes were mostly round in this size class with the exception Ares that produced a taller pumpkin (Table 2).

Extra Large

Seven entries were evaluated in the ‘large’ size class (≥ 25.1 lbs). Average fruit size in this category ranged from 37.1 to 52.1 lbs (Table 1). Zombie produced the highest fruit weight per acre (52.1 tons/acre) while Tallon had the lowest total fruit weight per acre (38.3 tons per acre). Zombie also produced the greatest number of fruit per acre, whereas, SPU 13118 produced the least amount of fruit per acre. Fruit shapes were mostly round in this size class with the exception of Hulk, Tallon and HMX 53L6790 that produced taller pumpkins and Ritz that produced a flatter pumpkin (Table 2). Ritz was also more orange-red in color (Figure 2, page 12), while the rest of the entries in this category were orange to burnt orange (Table 2).

Figure 1. Photographs of pumpkins from replicated entries.
Laurel Springs, NC, 2018.



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Table 1. Pumpkin and gourd cultigen evaluation study. Cumulative yield (tons) / acre, fruit number per acre, number of bins per acre and average fruit weight. **Laurel Springs, NC, 2018.**

Size Class	Cultigen	Seed Company	Cumulative			Average Fruit Weight (lbs)
			Yield (tons) / Acre	Number of Fruit / Acre	Number of Bins ¹ / Acre	
Pie Pumpkin (≤ 5.0 lb)	Bisbee Gold*	Rupp Seeds Inc.	26.2	8107	-	6.5
	Jack Sprat (Control)	Sakata	15.2	11979	-	2.5
	Mini Warts	HM Clause	12.5	9983	-	2.6
	EX 5*	Enza Zaden	23.6	7079	-	6.7
	Average		19.4	9287	-	4.6
	LSD (0.05)		6.2	3795	-	0.6
Small (10.1-15.0 lb)	Cracker Jack (Control)	Sakata	31.0	4235	84.7	14.7
	Scream II	DP Seed	38.9	6111	122.2	12.7
	Skidoo Gold	Rupp Seeds Inc.	39.4	5990	119.8	13.1
	Snow White	Clifton Seed	25.5	3691	73.8	13.9
	JPN 62009	Johnny's Selected Seed	29.8	5324	106.5	11.0
	Average		32.9	5070	101.4	13.1
	LSD (0.05)		13.1	1715	34.3	2.1
Medium (15.1 - 20.0 lb)	Bayhorse Gold	Rupp Seeds Inc.	48.0	5203	130.1	18.5
	Early Prince	Syngenta	38.3	5022	125.5	15.2
	Eros	Hybrid	34.2	4477	111.9	15.4
	Gladiator (Control)	HM Clause	37.5	4235	105.9	17.7
	Jason	Hybrid	42.3	4719	118.0	17.9
	Magic Wand (Control)	HM Clause	45.9	5627	140.7	16.3
	Orange Sunrise	HM Clause	55.1	5808	145.2	18.9
	Specter	HM Clause	39.0	4659	116.5	16.8
	EX 16	Enza Zaden	44.2	4780	119.5	18.5
	RPX 5588	Rupp Seeds Inc.	37.6	4477	111.9	16.9
Average		42.2	4901	122.5	17.2	
	LSD (0.05)		9.8	1291	32.3	1.5
Large (20.1-25.0 lb)	Ares	HM Clause	43.6	3872	129.1	22.5
	Kratos	HM Clause	56.3	4840	161.3	23.3
	Solid Gold	Rupp Seeds Inc.	42.3	3570	119.0	23.8
	Thor	Sakata	52.5	4901	163.4	22.2
	PMK-17-50	DP Seed	41.4	3812	127.1	21.7
Average		47.2	4198.7	140.0	22.7	
	LSD (0.05)		11.1	973	32.4	5.7
Extra Large (≥ 25.1 lb)	Cronus	HM Clause (Control)	37.1	2662	-	28.5
	Hulk	Sakata	44.5	2904	-	30.7
	Ritz	DP Seed	49.7	3812	-	26.0
	Tallon	HM Clause	38.3	2904	-	26.2
	Zombie	DP Seed	52.1	4114	-	25.1
	HMX 53L6790	HM Clause	40.1	2723	-	29.4
	SPU13118	Sakata	46.7	2178	-	43.8
	Average		44.1	3042	-	30.0
	LSD (0.05)		14.5	1136	-	4.2

¹ Number of bins per acre were calculated for three fruit size categories; Small (10.1 to 15.0 lb) = 50 count bin +/- 5 fruit; Medium (15.1 to 20.0 lb) = 40 count bin +/- 5 fruit; Large (20.1 to 25.0 lb) = 30 count bin +/- 5 fruit.

*Although average fruit size is greater than 5.0 lbs the industry accepts these varieties as 'large' pie pumpkins.

Table 2. Pumpkin and gourd cultigen evaluation study. Fruit and quality measurements for replicated cultigens. **Laurel Springs, NC, 2018.**

Cultigen	Fruit Color ¹	Fruit Shape ²	Fruit Suturing ³	Fruit Texture ⁴	Vine Health Rating ⁵	Handle ⁶			Fruit ⁷		
						Thickness	Length	Attachment	Length	Width	L/W
Ares	6.3	8.4	2.8	1.6	5.3	8.1	7.0	7.4	15.0	11.7	1.3
Bayhorse Gold	6.6	5.8	6.0	1.0	5.5	6.6	6.9	6.6	11.2	11.1	1.0
Bisbee Gold	7.8	5.1	4.1	2.5	4.8	7.8	7.5	5.6	7.2	7.8	0.9
Cracker Jack	7.1	5.0	4.9	2.0	5.5	5.8	4.9	7.1	9.8	11.1	0.9
Cronus	6.5	5.1	5.4	3.3	6.5	9.0	8.4	8.8	12.8	14.6	0.9
Early Prince	6.8	5.4	3.9	1.1	4.0	6.5	3.9	6.3	10.9	11.1	1.0
Eros	7.0	4.9	2.8	1.4	4.8	6.0	5.4	7.6	9.9	10.9	0.9
Gladiator	7.0	5.0	3.9	2.6	6.5	7.3	6.1	7.3	10.8	12.2	0.9
Hulk	6.5	8.3	6.1	1.6	5.5	8.5	6.1	8.3	16.4	12.3	1.3
Jack Sprat	6.3	4.8	3.5	1.3	4.5	6.5	6.4	5.8	5.6	6.4	0.9
Jason	6.5	5.5	3.8	1.9	3.8	6.1	6.5	7.0	11.5	11.3	1.0
Kratos	7.0	5.3	5.1	2.0	6.3	8.3	5.1	8.4	12.7	13.4	1.0
Magic Wand	6.9	4.5	4.9	2.8	5.0	6.8	5.1	8.4	10.6	12.0	0.9
Mini Warts	5.9	5.0	1.0	1.3	5.5	6.3	7.1	6.0	5.2	5.7	0.9
Orange Sunrise	6.4	5.3	4.4	1.8	6.5	7.6	6.0	7.8	11.6	12.3	0.9
Ritz	Orange-red	3.3	5.1	5.6	7.8	6.8	3.1	2.5	9.9	14.0	0.7
Scream II	5.9	5.3	2.8	1.8	4.3	6.1	5.9	5.9	9.5	10.1	0.9
Average	6.6	5.4	4.1	2.1	5.4	7.1	6.0	6.9	10.6	11.1	1.0
LSD (0.05)⁸	0.8	0.6	1.3	0.7	0.8	1.5	0.6	0.1	0.9	2.0	0.8

¹ Color Scale: 1 = yellow, 5 = orange, 9 = burnt orange.

² Fruit Shape Rating: 1 = flat, 5 = round, 9 = tall.

³ Fruit Suturing: 1 = none, 5 = medium, 9 = deep.

⁴ Texture Rating: 1 = smooth, 5 = semi-rough, 9 = rough.

⁵ Vine Health Rating: 1 = poor, 9 = excellent.

⁶ Handle Rating:

Thickness: 1 = thin, 5 = medium, 9 = thick.

Length: 1 = short, 5 = medium, 9 = long.

Attachment: 1 = poor, 5 = average, 9 = excellent.

⁷ Fruit Measurements = Individual length and width values (inches) were taken from 5 fruit per replication, (20 total), The LD ratio was determined by dividing fruit length by fruit width.

Table 2 (Cont'd). Pumpkin and gourd cultigen evaluation study. Fruit and quality measurements for replicated cultigens. **Laurel Springs, NC, 2018.**

Cultigen	Fruit Color ¹	Fruit Shape ²	Fruit Suturing ³	Fruit Texture ⁴	Vine Health Rating ⁵	Handle ⁶			Fruit ⁷		
						Thickness	Length	Attachment	Length	Width	L/W
Skidoo Gold	6.9	4.6	2.8	1.6	4.8	6.8	5.8	5.8	9.1	10.3	0.9
Snow White	White	2.0	2.8	1.0	7.3	5.6	3.1	2.3	5.9	11.5	0.5
Solid Gold	6.0	4.8	3.4	1.3	4.5	7.5	6.1	6.1	12.0	13.3	0.9
Specter	White-buff	5.3	4.4	1.3	6.0	6.8	7.9	6.0	10.2	10.7	1.0
Tallon	6.1	8.0	4.0	2.4	5.8	8.9	8.5	7.8	14.7	13.8	1.1
Thor	7.1	4.6	4.0	1.9	5.8	6.6	5.0	7.6	10.9	11.3	1.0
Zombie	6.8	5.6	2.8	1.5	4.3	6.4	5.6	8.8	13.2	13.1	1.0
EX5	7.3	5.0	6.5	3.4	4.8	7.8	7.5	6.0	7.1	7.7	0.9
EX 16	6.9	5.3	3.9	1.8	5.0	6.6	5.5	7.0	10.7	11.3	0.9
HMX 53L6790	6.4	8.5	6.4	2.3	5.5	9.0	8.5	6.1	15.8	13.3	1.2
JPN 62009	7.1	4.8	4.4	2.0	5.0	6.9	7.0	6.8	8.9	9.7	0.9
PMK-17-50	7.1	6.4	6.1	2.3	4.3	7.5	7.0	8.8	12.6	11.6	1.1
RPX 5588	7.1	5.1	5.8	2.8	4.8	6.6	6.5	7.3	11.1	11.3	1.0
SPU13118	5.9	6.9	3.4	1.5	4.5	9.0	3.9	8.5	15.9	15.1	1.1
Average	6.7	5.5	4.3	1.9	5.1	7.3	6.3	6.8	11.3	11.7	1.0
LSD (0.05)⁸	0.8	0.6	1.3	0.7	0.8	1.5	0.6	0.1	0.9	2.0	0.8

¹ Color Scale: 1 = yellow, 5 = orange, 9 = burnt orange.

² Fruit Shape Rating: 1 = flat, 5 = round, 9 = tall.

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⁷ Fruit Measurements = Individual length and width values (inches) were taken from 5 fruit per replication, (20 total), The LD ratio was determined by dividing fruit length by fruit width.

Figure 2. Photographs of pumpkin and gourd cultivars from selected observation entries. **Laurel Springs, NC, 2018.**



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Table 3. Pumpkin and gourd cultivar evaluation study. Selected observations (non-replicated cultivars). Cumulative yield (tons) per acre, number fruit per acre and average fruit weight. **Laurel Springs, NC, 2018.**

Size Class	Cultivar	Seed Company	Cumulative		Average Fruit Weight (lbs)
			Yield (Tons) / Acre	Number of Fruit / Acre	
Mini (≤ 5.0 lb)	Flame	Hollar Seeds	9.1	16698	1.1
	Orangita	DP Seed	13.6	20570	1.3
	Sirius Star	Rupp	30.7	26620	2.3
	Spark	Hollar Seeds	15.9	49852	0.6
	Average		17.3	28435	1.3
Small (5.1 - 10.0 lb)	Lunch Lady	Johnny's Selected Seed	36.0	8470	8.5
	Moonshine	Johnny's Selected Seed	45.9	9196	10.0
	Speckled Swan	Johnny's Selected Seed	36.6	10406	7.0
	Sunshine	Johnny's Selected Seed	23.7	9438	5.0
	Red October	Johnny's Selected Seed	20.3	6292	6.4
	Average		32.5	8760	7.4
Medium (10.1 - 20.0 lb)	Blue Doll	DP Seed	36.6	4840	15.0
	Blue Hubbard	Johnny's Selected Seed	21.2	3630	12.0
	Country Bumpkin	T & M Nursery	37.3	4114	18.0
	Indian Doll	DP Seed	47.9	6050	16.0
	Knuckle Head	Johnny's Selected Seed	40.7	4840	17.0
	Magic Lantern	HM Clause	56.8	6292	18.0
	New Racer Plus	Johnny's Selected Seed	51.6	7260	14.0
	Rouge Vif D'Etampes	Johnny's Selected Seed	38.7	4840	16.0
	Average		41.4	5233	15.8
Large (20.1 - 25.0 lb)	Bellatrix	Rupp	45.6	4114	22.0
	One Too Many	Rupp	35.2	3146	22.0
	Rhea	HM Clause	54.4	4598	24.0
	Average		45.1	3953	22.7
Extra Large (≥ 25.1 lb)	Autumn Buckskin	Seeds By Design	62.3	4840	26.0
	New Moon	Hollar Seeds	44.9	1936	46.0
	Average		53.6	3388	36.0

Table 4. Pumpkin and gourd cultigen evaluation study. Fruit and quality measurements for selected observation (non-replicated) cultivars. Laurel Springs, NC, 2018.

Cultivar	Fruit Color ¹	Fruit Shape ²	Fruit Suturing ³	Fruit Texture ⁴	Vine Health Rating ⁵	Handle ⁶			Fruit ⁷
						Thickness	Length	Attachment	L/D
Autumn Buckskin	buff-pinkish	3.5	4.0	1.0	7.0	3.0	6.0	3.0	0.9
Bellatrix	6.5	5.0	5.5	1.5	5.0	8.0	7.0	7.5	0.9
Blue Doll	blue-grey	4.0	9.0	4.0	6.0	6.5	3.0	4.5	0.8
Blue Hubbard	blue-grey	pear	3.0	5.0	6.0	8.0	2.0	4.0	1.4
Country Bumpkin	green-tan	2.0	9.0	9.0	7.0	3.0	8.0	6.5	0.5
Flame	white-yellow with orange stripe	3.5	5.5	2.0	3.0	5.0	6.0	7.0	0.7
Indian Doll	pink / variegated	2.0	6.0	4.0	8.0	6.5	2.0	4.0	0.5
Knuckle Head	7.5	6.0	3.0	2.0	3.0	6.0	7.0	7.0	1.1
Lunch Lady	yellow ocher	9.0	5.0	2.0	5.0	4.0	6.0	4.5	2.2
Magic Lantern	7.0	5.5	4.0	1.0	4.0	6.5	7.0	5.5	1.0
Moonshine	white with orange netting	5.0	5.0	1.0	4.0	6.0	5.0	6.5	0.9
New Moon	white	4.0	5.0	1.0	8.0	7.0	3.0	2.0	0.8
New Racer Plus	7.0	4.5	6.0	2.0	5.0	6.5	6.0	4.5	0.8
One Too Many	white with orange netting	4.5	3.0	3.0	8.0	6.5	4.0	2.5	0.7
Orangita	5.5	3.0	7.0	1.0	7.0	4.0	6.0	7.0	0.6
Red October	red	bulb	2.0	3.0	7.0	8.0	1.0	3.0	1.4
Rhea	6.5	4.0	7.0	2.0	8.0	7.5	8.0	7.0	0.8
Rouge Vif D'Etampes	pink-red	2.0	4.5	4.0	7.0	6.0	3.0	2.5	0.9
Sirius Star	white	6.0	2.0	1.0	6.0	5.5	6.0	5.5	0.9
Spark	white-yellow w/ orange stripes	3.0	5.0	2.0	8.0	5.0	6.0	6.5	0.6
Sunshine	red	2.0	2.5	2.0	8.0	8.5	3.0	2.5	0.6
Average		4.1	4.9	2.5	6.2	6.0	5.0	4.9	0.9

¹ Color Scale: 1 = yellow, 5 = orange, 9 = burnt orange.

² Fruit Shape Rating: 1 = flat, 5 = round, 9 = tall.

³ Fruit Suturing: 1 = none, 5 = medium, 9 = deep.

⁴ Texture Rating: 1 = smooth, 5 = semi-rough, 9 = rough.

⁵ Vine Health Rating: 1 = poor, 9 = excellent.

⁶ Handle Rating:

Thickness: 1 = thin, 5 = medium, 9 = thick.

Length: 1 = short, 5 = medium, 9 = long.

Attachment: 1 = poor, 5 = average, 9 = excellent.

⁷ Fruit Measurements = Individual length and width values (inches) were taken from 5 fruit per replication, (20 total). The LD ratio was determined by dividing fruit length by fruit width.

* a pale brownish yellow color.