2004 NEW JERSEY HEIRLOOM TOMATO CULTIVAR TRIAL RESULTS[1]

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Introduction

This is the third year evaluating heirloom tomatoes for New Jersey growers under the five year Program Enhancement Grant funded by the New Jersey Agricultural Experiment Station. New Jersey growers are looking for new markets to help maintain agricultural viability on their farms. There is increasing demand for heirloom tomatoes in the market place at, roadside stands, tailgate markets, restaurants and in the wholesale market. It is difficult for growers to evaluate heirloom tomatoes since there are hundreds of varieties. The objective of this study is to help growers narrow down the number of varieties suitable for New Jersey growing conditions and markets.

Materials and Methods

Culture

All seeds were disinfected with chlorine bleach (1 part Clorox in 4 parts water for two minutes then rinsed in water for 10 minutes). Seeds were sown on April 8 in 72-cell trays (11/2" X 11/2") containing peat vermiculite media at the Rutgers Agricultural Research and Extension Center (RAREC). Seedlings were thinned to 1 plant per cell on April 27. Plants were grown in a greenhouse until one week before transplanting when they were placed in an outside protected area to harden off. On May 7 *imidacloprid* (Admire) was applied as a drench to the seedling flats before transplanting at a rate of three milliliters (ml) per flat (72 plants) in sufficient water to saturate the growing media without draining off.

The trial was established in a field (Chillum silt loam, 6.45) at RAREC in Upper Deerfield. Beds on 6-ft centers were formed and black plastic mulch with drip irrigation tube was laid. On May 14 plants were set in the field using a water wheel transplanter in single rows with 24 inches between plants. After transplanting, the two lower suckers were removed from each plant and 8 ft. tomato stakes with one stake between every two plants were set. Tomato string was used to hold the plants on the stakes. The first string was placed 6 inches off the ground and the remaining strings (5 – 7) were placed at 8 – 12 inch intervals.

Before bed making and based on soil testing, 60 lbs/A of nitrogen, plus phosphorus (P_2O_5) and potassium (K_2O) were disked into the sandy loam soil. Devrinol 50DF (3 lbs/A) was applied and incorporated during bedding. After laying plastic, Devrinol 50DF(4 lbs/A), Sandea (1 oz/A) and Sencor 75 (1/3 lb/A) was applied between the beds. Three applications of 37 lbs/A of N, P_2O_5 and K_2O were applied through the drip system during the growing season. A total of 1.4 pounds per acre boron was applied with the other nutrients through the drip system. Insecticides (Spintor-6 oz/A July 18, Provado-3oz/A August 29 and Actara-4oz/A September 5) were applied for insect control. Diseases were controlled by applying the following materials: Bravo WS 3 pt/A (July 18, August 29, September 5 and 12); Bravo WS 1.5 pt/A (August 6); and Curzate 5 oz/A (July 18 and August 29). Rainfall was 3.82, 3.42, 5.55, 4.23 and 2.60 inches in May, June, July, August and September, respectively. Rainfall was supplemented with drip irrigation.

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Experimental Design, Harvesting and Evaluations

The trial was arranged in a randomized complete block design in four replications with eight plants per replication. Tomatoes were hand harvested on July 15, 22 and 29, August 5, 11, 17 and 26, September 2, 8 and 16. Fruits were graded into marketable and culls, counted and weighed. Culls were further divided by type of defect (blossom end rot, insect damage, green shoulder, cat facing, zipper, rot, small, misshapen, cracks, sunburn and rain checking) and counted. At the seventh harvest, ten fruit were randomly selected from marketable fruit for three replications to evaluate internal and external characteristics. On September 8, data was collected on vine vigor, vine size, plant color and plant height. All yield data is recorded in 25 lb. boxes.

The cultivars and seed sources are listed in Table 1 followed by the key for fruit characteristics in Table 2 and plant characteristics in Table 3.

Table 1. Seed Source

Variety	Seed Source
Arkansas Traveler	Tomato Grower's Supply
Box Car Willie	Tomato Grower's Supply
Brandywine Red	Tomato Grower's Supply
Carmello	Tomato Grower's Supply
Cherokee Purple	Tomato Grower's Supply
Costoluto Genovese	Tomato Grower's Supply
Eva Purple Ball	Tomato Grower's Supply
Hawaiian Pineapple	Tomato Grower's Supply
Mortgage Lifter	Rupp Seed Inc.
Prudens Purple	Rupp Seed Inc.
Ramapo	Rutgers University
Santa Clara Canner	Tomato Grower's Supply

Table 2. Fruit Characteristics Key

Shape
1 – Beef Steak
2 – Flattened Globe
3 – Round
4 – Blocky
5 – Long Blocky
6 – Very Deep-Round
7 – Pear
8 – Plum
9 – Oxheart
10 – Bell
11 – Flat
12 - Elongated Oxheart
13 - Globe

Stem Scar
1 – Small
2 – Small/Medium
3 – Medium
4 – Medium/Large
5 - Large

External Color
1 – White
2 – Green
3 – Light Yellow
4. – Yellow
5 – Dark Yellow
6 – Orange Yellow
7 – Orange
8 – Red Orange
9 – Red
10 – Light Pink
11 – Pink
12 – Dark Pink
13 - Purple
14 – Black
15 – Mahogany
16 – Pink Mahogany
17 – Orange Mahogany
18 – Red Gold
19 – Gold Red
20 – Red Green
21 – Yellow Red
22 – Gold

Firmness
1 – Very Soft
2 - Soft
3 - Medium
4 – Firm
5 – Very Firm

Blossom Scar
1 - Small
2 – Small/Medium
3 - Medium
4 – Medium/Large
5 - Large

Internal Color
1 - Red
2 – Yellow/Red
3 – Yellow
4 – Yellow/Green
5 - Green
6 – Red/Yellow
7 - Orange
8 – Pink

Table 2. Fruit Characteristics Key (continued)

Jelly Color	**Core Size**	Internal Color (cont.)
1 – Green	1 – Small	9 - Gold
2 – Yellow/Green	2 – Small/Medium	10 – Light Pink
3 – Yellow	3 - Medium	11.- Light Red
4 – Yellow/Red	4 – Medium/Large	12.- Pink/Red
5 – Red	5 - Large	13. – Pink/Green
6 - Orange		

Cracking	**Shoulder Appearance**	**White Tissue**
1 – Severe	1 - Poor	1 – Severe
2 - Abundant	2 - Fair	2 – Moderate Heavy
3 - Moderate	3 – Good	3 - Moderate
4 - Light	4 – Very Good	4 – Slight
5 - No	5 - Excellent	5 - None

Table 3. Plant Characteristics Key

Plant Color	**Plant Vigor**
1 – Dark Green	1 – Poor
2 – Green	2 – Fair
3 – Light Green	3 – Good/Average
4 – Blue Green	4 – Very Good
	5- Excellent

Stem Attachment	**Leaf Type**	**Vine Size**
1 – Jointless	1 – Regular	1 - Small
2 – Jointed	2 – Regular/Narrow	2 – Small/Medium
	3 – Regular/Curled	3 - Medium
	4 – Regular/Fuzzy	4 – Medium/Large
	5 – Potato	5 - Large

Results and Discussion

Rainfall was distributed evenly throughout the production season. Plants were not as vigorous in 2004 and fruit rots were not a serious problem. Early season harvests (1-4) are summarized in Table 4. Days to harvest for marketable fruit from transplanting ranged from 61 (Costoluto Genovese and Mortgage Lifter) to 82 (Ramapo) days. There was some fruit produced earlier, but they were not marketable. Cherokee Purple (859 boxes/A) and Mortgage Lifter (834 boxes/A) had significantly higher total yield than all other cultivars. Carmello and Costoluto Genovese had the second highest total yield, but did not differ statistically from Arkansas Traveler, Brandywine Red, Hawaiian Pineapple or Prudens Purple. Santa Clara Canner had the lowest total yield, but there was no significant difference from Box Car Willie, Eva Purple Ball, Arkansas Traveler, Brandywine Red, Hawaiian Pineapple or Ramapo.

Mortgage Lifter and Cherokee Purple produced significantly more marketable yield than all other cultivars 720 and 686 boxes/A, respectively. Statistically Carmello (519 boxes/A) had the second highest yield, but was not statistically different from Prudens Purple or Arkansas Traveler. The cultivar with the lowest marketable yield was Santa Clara Canner (154 boxes/A). Several cultivars (Arkansas Traveler, Box Car Willie, Brandywine Red, Costoluto Genovese, Eva Purple Ball, Hawaiian Pineapple, and Ramapo) did not differ statistically from Santa Clara Canner.

The main culls were blossom end rot, small fruit, and catfacing. Costoluto Genovese (263 boxes/A) had significantly more culls than all other cultivars. Cherokee Purple produced the second highest number of cull fruit, but it was statistically different from

Brandywine Red, Mortgage Lifter or Prudens Purple. Box Car Willie (48 boxes/A) had the least cull fruit, but did not significantly differ from the remaining cultivars.

Marketable fruit percentage ranged from 49% (Costoluto Genovese) to 86% (Mortgage Lifter). Costoluto Genovese had statistically less percentage marketable fruit than all other cultivars. Mortgage Lifter was not significantly different from most other cultivars.

There was a range of fruit sizes represented in this trial. Costoluto Genovese (3.46 oz) had the smallest size for the early harvest period as would be expected. It was significantly smaller than all other cultivars. Eva Purple Ball (5.22 oz) had the second smallest fruit which was statistically different from other cultivars. Arkansas Traveler (6.82 oz), Box Car Willie (6.77 oz), Brandywine Red (7.03 oz), Carmello (7.55 oz), and Santa Clara Canner (7.16 oz) had the next smallest fruit. Hawaiian Pineapple (13.91 oz) had the largest fruit which was statistically larger than all other cultivars. Mortgage Lifter (10.81 oz) and Prudens Purple (11.39 oz) had the second largest fruit which were statistically different from all other cultivars. Cherokee Purple (8.98 oz), Carmello (7.55 oz) and Ramapo (8.57 oz) had the third largest fruit, but Ramapo and Carmello were not different from several other cultivars.

Table 4. Heirloom tomato yield and fruit size for first, second, third and fourth harvest (early) – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	DTH[1]	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Arkansas Traveler	75	342bcd	276bcd	65cd	79abc	6.82e
Box Car Willie	75	281d	233cd	48d	84ab	6.77e
Brandywine Red	75	356bcd	229cd	127bc	64d	7.03e
Carmello	75	519b	434b	85cd	84ab	7.55cde
Cherokee Purple	68	859a	686a	173b	80abc	8.98c
Costoluto Genovese	61	508b	246cd	263a	49e	3.46g
Eva Purple Ball	75	254d	190d	65cd	80abc	5.22f
Hawaiian Pineapple	75	331bcd	260cd	71cd	76abcd	13.91a
Mortgage Lifter	61	834a	720a	114bcd	86a	10.81b
Prudens Purple	68	497bc	381bc	116bc	77abcd	11.39b
Ramapo	82	299cd	213d	86cd	70bcd	8.57cd
Santa Clara Canner	75	237d	154d	83cd	66cd	7.16de
LSD 0.05	**---------**	**200.37**	**164.66**	**66.52**	**14.25**	**1.52**

[1]Days to harvest for marketable fruit from transplanting

Table 5 summarizes the mid season yield data (5-7). Carmello (1812 boxes/A) had statistically the highest total yield. While Brandywine Red (775 boxes/A) had the lowest, but was not significantly different from Arkansas Traveler (859 boxes/A), Cherokee Purple (796 boxes/A), or Santa Clara Canner (784 boxes/A). All other cultivars were not statistically different from one another. Carmello (1548 boxes/A) again had the most marketable fruit and differed statistically from all other cultivars. Santa Clara Canner (470 boxes/A) had the least marketable yield, but not significantly different from Brandywine Red (687 boxes/A) or Cherokee Purple (504 boxes/A). Most other cultivars were not statistically different from one another.

Brandywine Red (88 boxes/A) had the least cull fruit, but was not significantly different from Arkansas Traveler (145 boxes/A) or Ramapo (182 boxes/A). Prudens Purple (403 boxes/A) produced more cull fruit than all other cultivars except Santa Clara Canner (314 boxes/A) or Costoluto Genovese (332 boxes/A). Most other cultivars were not different from one another. Carmello, Costoluto Genovese, and Santa Canner had more Blossom end rot than all other cultivars.

Percentage marketable fruit ranged from 62% to 86%. Santa Clara Canner (62%) had the lowest percentage of marketable fruit, but did not differ statistically from Prudens Purple (68%) or Cherokee Purple (64%). Brandywine Red (89%) had the highest percentage marketable fruit, but it was not different than Carmello (86%), Eva Purple Ball (84%), Hawaiian Pineapple (83%), Ramapo (85%) or Arkansas Traveler (84%).

Hawaiian Pineapple (13.49 oz) and Prudens Purple (11.86 oz) had statistically larger fruit than all other cultivars. Cherokee Purple (8.66 oz), Ramapo (9.25 oz) and Santa Clara Canner (8.62 oz) had the second largest fruit size and differed from all other cultivars. Arkansas Traveler (6.37 oz), Box Car Willie (6.32 oz), Brandywine Red (6.82 oz) had the smallest fruit, but were not significantly different from Carmello (5.65 oz) or Eva Purple Ball (5.66 oz).

Table 5. Heirloom tomato yield and fruit size for the fifth, sixth and seventh harvest (mid season) – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Arkansas Traveler	859cd	713cd	145fg	84abc	6.37c
Box Car Willie	1323b	1051b	272bcde	79bcd	6.32c
Brandywine Red	775d	687de	88g	89a	6.82c
Carmello	1812a	1548a	264bcde	86ab	5.65cd
Cherokee Purple	796cd	504e	292bc	64f	8.66b
Costoluto Genovese	1296b	964bcd	332ab	74de	4.29d
Eva Purple Ball	1300b	1081b	219cdef	84abc	5.66cd
Hawaiian Pineapple	1102bc	906bcd	197def	83abc	13.49a
Mortgage Lifter	1280b	991bc	289bcd	78cd	10.19b
Prudens Purple	1278b	876bcd	403a	68ef	11.86a
Ramapo	1303b	1122b	182efg	85ab	9.25b
Santa Clara Canner	784cd	470e	314ab	62f	8.62b
LSD 0.05	**319.44**	**288.49**	**95.25**	**7.62**	**1.67**

Table 6 summarizes the yield and fruit size data for the late harvest period. Total yields ranged from 844 boxes/A for Hawaiian Pineapple to 322 boxes/A for Costoluto Genovese. Most cultivars were not statistically different from one another. Hawaiian Pineapple had the highest total yield, but it did not differ significantly from Arkansas Traveler, Brandywine Red, Carmello, Eva Purple Ball, Mortgage Lifter, Prudens Purple or Santa Clara Canner. While Costoluto Genovese and Cherokee Purple had the lowest yield.

Eva Purple Ball had the highest marketable yield, but it was not significantly different from Arkansas Traveler, Brandywine Red, Hawaiian Pineapple, Mortgage Lifter, Ramapo or Santa Clara Canner. Three cultivars Costoluto Genovese, Cherokee Purple and Prudens Purple had the lowest marketable yield. There was statistical difference among the cultivars for cull fruit. The percentage of marketable fruit ranged from 62 to 90%. Eva Purple Ball (90%) had the highest percentage marketable fruit, but it did not differ statistically from Arkansas Traveler (79%), Brandywine Red (84%), Mortgage Lifter (81%) or Ramapo (87%). Costoluto Genovese (62%) had the lowest percentage of marketable fruit, but it was not significantly different form Cherokee Purple (67%), or Prudens Purple (68%).

Fruit size was smaller for most cultivars than in the earlier harvests. Hawaiian Pineapple (10.57 oz) had the largest fruit size and was statistically different from all other cultivars. Santa Clara Canner (8.91 oz) and Prudens Purple (9.15 oz) had the second largest fruit which were significantly different from all others. Costoluto Genovese (3.78 oz) had the smallest fruit, but it was not significantly different from Carmello (4.78 oz).

Table 6. Heirloom tomato yield and fruit size for the eighth, ninth and tenth harvest (late season) – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Arkansas Traveler	656ab	535abc	121	79abc	5.01e
Box Car Willie	588bc	461bcd	127	78bcd	5.47e
Brandywine Red	670ab	564abc	106	84abc	5.03e
Carmello	612abc	461bcd	152	76cde	4.78ef
Cherokee Purple	407cd	272de	135	67ef	7.27cd
Costoluto Genovese	332d	207e	125	62f	3.78f
Eva Purple Ball	826ab	736a	89	90a	4.61ef
Hawaiian Pineapple	844a	665ab	180	78bcd	10.57a
Mortgage Lifter	660ab	526abc	134	81abc	7.77c
Prudens Purple	617abc	419cde	198	68def	9.15b
Ramapo	637abc	554abc	83	87ab	6.59d
Santa Clara Canner	842a	643ab	200	75cde	8.91b
LSD 0.05	**241.18**	**223.79**	**NS**	**10.93**	**1.11**

Total season yield and fruit size data is summarized in Table 7. The total number of days that the different cultivars were harvested is listed in table 7. Harvest days ranged from 42 (Ramapo) to 62 (Mortgage Lifter and Costoluto Genovese). Since harvesting terminated on the same day the differences are related to when the first marketable fruit was harvested. Carmello produced the highest total yield (3474 boxes/A) and marketable yield (2733 boxes/A). It was statistically different from all other cultivars except Mortgage Lifter which produced 3349 boxes/A total yield and 2666 boxes/A marketable yield. Mortgage Lifter did not differ from Prudens Purple (2862 boxes/A) or Eva Purple Ball (2849 boxes/A) for total yield or Ramapo (2225 boxes/A), Hawaiian Pineapple (2192 boxes/A), and Eva Purple Ball (2221 boxes/A) for marketable yield.

Brandywine Red (2109 boxes/A) had the lowest total yield for the full season, but it was not statistically different from Arkansas Traveler (2145 boxes/A), Box Car Willie (2398 boxes/A), Cherokee Purple (2427 boxes/A), Costoluto Genovese (2350 boxes/A), Ramapo (2647 boxes/A) or Santa Clara Canner (2167 boxes/A). There was more variability in the marketable yields. Santa Clara Canner (1500 boxes/A) had the lowest marketable yield, but it did not differ statistically from Costoluto Genovese (1565 boxes/A), Cherokee Purple (1668 boxes/A), Brandywine Red (1670 boxes/A), Box Car Willie (1918 boxes/A) or Arkansas Traveler (1707 boxes/A).

Arkansas Traveler (438 boxes/A) had the least cull yield, but it did not differ statistically from Box Car Willie (480 boxes/A), Brandywine Red (439 boxes/A), Eva Purple Ball (628 boxes/A), Hawaiian Pineapple (537 boxes/A), or Ramapo (422 boxes/A). Costoluto Genovese (785 boxes/A) had the most culls; several cultivars were not different from it including Santa Clara Canner (668 boxes/A), Prudens Purple (859 boxes/A), Mortgage Lifter (683 boxes/A), Cherokee Purple (760 boxes/A), or Carmello (741 boxes/A). Small fruit and blossom end rot were the main culls. Data for the individual defects are not shown, but will be summarized. Costoluto Genovese had statistically more blossom end rot than all other cultivars (88 out of 599 fruit). Several cultivars: Box Car Willie, Eva Purple Ball, Costoluto Genovese, Arkansas Traveler, Santa Clara Canner and Carmello had small fruit (53-86 out of 413-636). These were not statistically different from one another.

Most cultivars did not differ statistically from one another for percentage of marketable fruit. The cultivars with the highest marketable fruit were Ramapo (84%), Mortgage Lifter (80%), Hawaiian Pineapple (80%), Box Car Willie (80%), Arkansas

Traveler (80%), Brandywine Red (79%), and Carmello (79%). These did not differ statistically. The remaining cultivars Cherokee Purple (69%), Costoluto Genovese (67%), Prudens Purple (70%) and Santa Clara Canner (68%) had the lowest percentage marketable fruit.

Hawaiian Pineapple (10.92 oz) and Prudens Purple (10.78 oz) had significantly larger fruit than all other cultivars for all harvests. Costoluto Genovese (3.98 oz) had the smallest fruit, but was not statistically different from Eva Purple Ball (4.85 oz). The cultivars divided into four groups: large (Hawaiian Pineapple and Prudens Purple), medium large (Santa Clara Canner, Ramapo, Mortgage Lifter and Cherokee Purple), Medium (Arkansas Traveler, Box Car Willie, Brandywine Red, and Carmello) and small (Costoluto Genovese and Eva Purple Ball).

Table 7. Heirloom tomato yield and fruit size for all harvests. – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Total Harvest Days	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Arkansas Traveler	49	2145d	1707def	438e	80a	5.70de
Box Car Willie	49	2398cd	1918cdef	480de	80a	5.91d
Brandywine Red	49	2109d	1670ef	439e	79a	5.71de
Carmello	49	3474a	2733a	741abc	79a	5.54de
Cherokee Purple	56	2427cd	1668ef	760ab	69b	8.01bc
Costoluto Genovese	62	2350cd	1565ef	785ab	67b	3.98f
Eva Purple Ball	49	2849bc	2221bc	628bcde	79a	4.85ef
Hawaiian Pineapple	49	2729c	2192bcd	537cde	80a	10.92a
Mortgage Lifter	62	3349ab	2666ab	683abcd	80a	8.82b
Prudens Purple	56	2862bc	2003cde	859a	70b	10.78a
Ramapo	42	2647cd	2225bc	422e	84a	7.58c
Santa Clara Canner	49	2167d	1500f	668abcd	68b	8.26bc
LSD 0.05	**-----**	**556.16**	**486.89**	**211.31**	**7.54**	**1.03**

Table 8 summarizes the green fruit remaining at the end of the season. This gives an indication of what would be the total yield for each cultivar. Mortgage Lifter (575 boxes/A) highest total yield for green fruit, but it was not significantly different from Ramapo, Prudens Purple, Hawaiian Pineapple, Eva Purple Ball, or Carmello. Boxcar Willie (206 boxes/A) had the lowest total yield, but was not statistically different from Arkansas Traveler, Costoluto Genovese, Brandywine Red, Cherokee Purple, Ramapo, or Santa Clara Canner. As with total yield, Mortgage Lifter (429 boxes/A) had the highest marketable yield. It was not statistically different from Eva Purple Ball, Ramapo, or Hawaiian Pineapple. The remaining cultivars were not significantly different from Costoluto Genovese (148 boxes/A) which had the lowest marketable yield except Carmello.

There was no statistical difference for individual defects. The cultivar Carmello had the highest cull yield and Box Car Willie the lowest. However, statistically there was little different among the cultivars. Fruit weights were lower for the green fruit than for red fruit. This makes sense which, the fruit has not ripened thus have not reached the maximum size. The same pattern that was observed for ripe fruit follows for green fruit. Prudens Purple, Mortgage Lifter and Hawaiian Pineapple had the largest fruit along with Santa Clara Canner. Costoluto Genovese and Eva Purple Ball along with Brandywine Red had the smallest fruit.

Table 8. Heirloom tomato yield and fruit size for green fruit at the end of the season. – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Arkansas Traveler	289cd	183ef	107bc	75abc	4.48de
Box Car Willie	206d	172ef	34c	84a	4.52de
Brandywine Red	309cd	191ef	118bc	63bcde	4.15ef
Carmello	532ab	291bcde	241a	57de	4.44e
Cherokee Purple	366bcd	206ef	159ab	60cde	5.79bc
Costoluto Genovese	214d	148f	66bc	70abcd	3.37f
Eva Purple Ball	469abc	214def	256a	46e	3.40f
Hawaiian Pineapple	451abc	362ab	89bc	80ab	6.91a
Mortgage Lifter	575a	429a	146abc	77abc	6.28ab
Prudens Purple	470abc	327abcd	143abc	71abcd	7.08a
Ramapo	408abcd	336abc	72bc	82a	5.36cd
Santa Clara Canner	304cd	233cdef	71bc	77abc	6.72a
LSD 0.05	**203.98**	**118.78**	**122.92**	**17.63**	**0.88**

The importance of external and Internal fruit characteristics depends on the market. A wholesale market may not accept rough shoulders, soft fruit, large stem or blossom scars while the retail market may. Determine what the market wants then select which cultivars to plant.

Hawaiian Pineapple (7.10 cm) had the largest diameter of all cultivars. The second largest was Mortgage Lifter (6.61 cm), but it was not significantly different from Prudens Purple, Eva Purple Ball, Brandywine Red, Box Car Willie or Arkansas Traveler. The cultivar Costoluto Genovese (4.21 cm) had smallest diameter fruit which was statistically different from all other cultivars. As with diameter, Hawaiian Pineapple (9.88 cm) was the cultivar with the most depth, but it was not statistically different from Santa Clara Canner, Prudens Purple, or Mortgage Lifter. Eva Purple Ball had the narrowest fruit, but it was not significantly different from all other cultivars except Cherokee Purple, Hawaiian Pineapple, Mortgage Lifter, Prudens Purple or Santa Clara Canner. The Diameter/Depth ratio indicates how round the fruits were in this trial. The closer the number is to 1.0 the rounder the fruit. Eva Purple Ball had the roundest fruit, but it did not differ statistically from Arkansas Traveler, Box Car Willie, Brandywine Red, or Carmello. Costoluto Genovese had the widest diameter compared to its depth, but did not differ statistically from Santa Clara Canner.

Shoulder appearance relates to how smooth the fruit shoulder feels and looks. Cherokee Purple, Costoluto Genovese and Eva Purple Ball had very good smooth shoulder. Three cultivars (Santa Clara Canner, Hawaiian Pineapple and Carmello) had rough shoulders. Most of the cultivars had a flattened globe-to-globe shape. None of the cultivars had firm or very firm fruit. The cultivars with the firmness fruit were Box Car Willie, Carmello, Cherokee Purple, Costoluto Genovese and Prudens Purple while the softest cultivars were Arkansas Traveler, Brandywine Red, and Hawaiian Pineapple. Most cultivars had medium/large to large stem and blossom scars. Only one Carmello had a small stem and blossom scar. All cultivars were dark pink (Arkansas Traveler, Eva Purple Ball, Mortgage Lifter and Santa Clara Canner), pink mahogany (Cherokee Purple) or red (Box Car Willie, Brandywine Red, Carmello, Costoluto Genovese, Prudens Purple, and Ramapo) except Hawaiian Pineapple which was orange/yellow.

Table 9. Heirloom tomato external fruit characteristics - Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Diameter (cm)	Depth (cm)	Dia/Dep	Shoulder Appearance	Shape	Firm-ness	Stem Scar	Blossom Scar	External Color
Arkansas Traveler	6.50bcd	7.64de	1.19de	3bc	2	1c	4bc	3bc	12
Box Car Willie	6.20bcde	7.61de	1.22de	3bc	2	3a	5a	3bc	9
Brandywine Red	6.20bcde	7.60de	1.22de	3ab	13	1c	4c	3c	9
Carmello	6.00e	7.17e	1.21de	2d	3	3a	1e	1d	9
Cherokee Purple	6.08de	8.47bcd	1.40c	4a	2	3a	5a	5a	16
Costoluto Genovese	4.21f	7.18e	1.71a	4a	2	3a	4c	5a	9
Eva Purple Ball	6.30bcde	7.12e	1.13e	4a	13	2b	3d	3bc	12
Hawaiian Pineapple	7.10a	9.88a	1.40c	2d	2/13	1c	5a	5a	6
Mortgage Lifter	6.61b	9.24abc	1.40c	3bc	2	2b	5a	5a	12
Prudens Purple	6.57b	9.59ab	1.45bc	3bc	2	3a	5a	5a	9
Ramapo	6.13cde	8.18cde	1.33cd	3bc	2/13	3a	5a	4b	9
Santa Clara Canner	6.04de	9.57ab	1.58ab	2d	2	2b	5a	5a	12
LSD 0.05	**0.43**	**2.05**	**0.15**	**0.72**	**-----**	**0.65**	**0.62**	**0.69**	**-----**

Internal fruit characteristics are summarized in Table 10. Internal pulp color was red for all cultivars except Hawaiian Pineapple with a bright orange color. Most cultivars had yellow jelly color except Arkansas Traveler and Prudens Purple (yellow/green), Cherokee Purple (green), Mortgage Lifter (yellow/red) and Hawaiian Pineapple (orange). The orange color of the 'Hawaiian Pineapple' was very distinct and made for an attractive fruit. A small core allows more tomato for slicing. Arkansas Traveler had a small core, but was not statistically different from Costoluto Genovese or Eva Purple Ball. Prudens Purple had a large core, but was not significantly different from Ramapo, Santa Clara Canner, Mortgage Lifter, or Cherokee purple. The other cultivars had a medium size core. Eva Purple Ball was the only cultivar with no cracking in this ten fruit sample. Two cultivars had light cracking (Brandywine Red and Costoluto Genovese) Cherokee Purple, Hawaiian Pineapple, Mortgage Lifter and Santa Clara Canner had severe cracking. All remaining cultivars had moderate to abundant cracking. As with stem and blossom scars, cracking may not be a problem for selling heirloom especially at a local market. Consumers may look for the cracks as a sign the cultivars are heirlooms. Internal white tissue can reduce the internal fruit quality. Most cultivars had slight or no internal white tissue. Box Car Willie, Brandywine Red, Carmello, Prudens Purple and Ramapo did have moderate internal white tissue.

Table 10. Heirloom tomato internal fruit characteristics – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Internal Color	Jelly Color	Core Size	Cracking	White Tissue
Arkansas Traveler	1	2	1d	2d	5a
Box Car Willie	1	3	3bc	3cd	3c
Brandywine Red	1	3	3bc	4b	3bc
Carmello	1	3	3bc	3c	3bc
Cherokee Purple	1	1	4ab	1f	4ab

Variety	Internal Color	Jelly Color	Core Size	Cracking	White Tissue
Costoluto Genovese	1	3	2cd	4b	5a
Eva Purple Ball	1	3	2cd	5a	5a
Hawaiian Pineapple	7	6	3bc	1f	5a
Mortgage Lifter	1	4	4ab	1f	4bc
Prudens Purple	1	2	5a	2e	3c
Ramapo	1	3	4ab	3cd	3bc
Santa Clara Canner	1	3	4ab	1f	4ab
LSD 0.05	**-----**	**-----**	**1.03**	**0.56**	**1.01**

Plant characteristics are summarized in Table 11. All cultivars had good to excellent plant vigor. The plant height ranged from 4.1 to 5.7 feet. This was shorter than in past years for the same cultivars. There would be no need for tall stakes (7 or 8 foot) to grow these cultivars based on this one year. However, these same cultivars in the past two production seasons had plant height in the 7 to 8 foot range. Vine size for all cultivars was medium to medium/large. All the cultivars had a regular leaf type except Arkansas Traveler (narrow leaf) and Prudens Purple (potato leaf). All the cultivars were jointed except Hawaiian Pineapple and Santa Clara Canner which were mixed.

Table 11. Heirloom tomato plant characteristics – Rutgers Agricultural Research and Extension Center, Bridgeton, New Jersey – 2004.

Variety	Avg. Plant Height (ft)	Plant Color	Plant Vigor	Vine Size	Leaf Type	Stem Attachment
Arkansas Traveler	4.7cd	2.0	3.4abc	3.5	2	2
Box Car Willie	4.5d	2.0	3.0c	3.8	1	2
Brandywine Red	5.1b	1.5	4.0ab	4.0	1	2
Carmello	4.6d	1.3	3.5abc	3.3	1	2
Cherokee Purple	4.4de	1.3	3.0c	3.0	1	2
Costoluto Genovese	5.4a	2.5	4.0ab	3.8	1	2
Eva Purple Ball	5.0bc	2.0	3.8abc	3.8	1	2
Hawaiian Pineapple	5.7a	1.8	4.1ab	4.3	1	1 / 2
Mortgage Lifter	5.5a	1.5	3.3bc	3.5	1	2
Prudens Purple	5.6a	1.5	4.3a	3.5	5	1 / 2
Ramapo	4.1e	2.3	3.3bc	3.0	1	2
Santa Clara Canner	5.5a	1.8	4.3a	4.3	1	1 / 2
LSD 0.05	**0.34**	**NS**	**0.92**	**NS**	**-----**	**-----**

Conclusion

Any of these cultivars would be acceptable as heirloom tomatoes. The market will determine which fit into each situation whether it is wholesale or retail.

2004 HEIRLOOM TOMATO


Cherokee Purple


Cherokee Purple


Costoluto Genovese


Costoluto Genovese


Eva Purple Ball


Eva Purple Ball


Hawaiian Pineapple


Hawaiian Pineapple


Mortgage Lifter


Mortgage Lifter


Prudens Purple


Prudens Purple


Ramapo


Ramapo


Santa Clara Canner


Santa Clara Canner

NOTES