

## 2003 PLUM TOMATO VARIETY TRIAL SUMMARY<sup>1</sup>

Wesley L. Kline<sup>2</sup> Stephen A. Garrison<sup>3</sup>, and June F. Sudal<sup>4</sup>  
Rutgers Cooperative Extension of Cumberland County  
291 Morton Ave., Millville, NJ 08332

### Introduction

Commercial varieties and advanced breeding lines of tomatoes for the fresh plum market were evaluated for adaptation to New Jersey growing conditions. A total of seventeen varieties and promising lines were included in the trial conducted at Ed Wuillerman and Sons, Hammonton, New Jersey.<sup>5</sup>

### Methods

#### Culture

Seeds were sown on April 4 in 72-cell (1½" X 1½") trays containing peat-vermiculite media formulated for tomato transplant production at Rutgers Agricultural Research and Extension Center. Seedlings were thinned to 1 plant per cell. Plants were grown in a greenhouse until one week before transplanting when they were placed in an outside protected area to harden off. Black plastic mulch and drip irrigation tube were laid. Transplants were set 18" apart on raised beds with 6-ft centers on May 14. Plants were grown on 5-foot stakes. All other cultural practices were those used for commercial production of plum tomatoes. *Imidacloprid* (Admire) was applied as a drench to the seedling flats before transplanting at a rate of three mil per flat (72 plants) in sufficient water to saturate the growing media without draining off. Insects were controlled as required using commercial recommendations for tomatoes. Fungicides were applied for suppression of foliar diseases and fruit rots. Rainfall was 2.39, 7.64, 3.24, 2.92 and 5.18 inches in May, June, July, August, and September respectively.

#### Experimental, Harvesting and Evaluation

Field plots were replicated three times in a randomized block design. Tomatoes were hand harvested from each plot on August 7 when early fruits were ripening and on 8/19, 8/28, and 9/2. All fruits with pink to red maturity were harvested. Fruits were separated into usable and culls, counted and weighed. Culls were further divided by the type of defect (blossom end rot, insect damage, cracks, green shoulder, gold flecking, rots, undersize, cat facing, misshapen, sunburn and miscellaneous) and counted. All yields are reported in 25 lb boxes per acre. At the August 19<sup>th</sup> harvest, 10 fruit were randomly selected from marketable fruit for each replication to evaluate internal, external and jelly color, firmness, white tissue and the number of fruit with hollow locules. Table 1 lists the rating scales used for the different internal and external fruit characteristics. Data were statistically analyzed using ANOVA and compared with Tukey's Studentized Range (HSD) Test at the 5% level.

Table 1. Rating scales for internal and external fruit evaluations.

Jelly Color	White Tissue	External and Interior Color	Fruit Firmness
5 = Red	5 = None	5 = Excellent	5 = Very Firm
4 = Yellow Red	4 = Slight	4 = Very Good	4 = Firm
3 = Yellow	3 = moderate	3 = Good	3 = Medium
2 = Yellow Green	2 = Moderately Heavy	2 = Fair	2 = Medium Soft
1 = Green	1 = Severe	1 = Poor	1 = Soft

<sup>1</sup>This work supported by the New Jersey Agricultural Experiment Station Program Enhancement Grant, <sup>2</sup>Cumberland County Agricultural Agent (corresponding author), <sup>3</sup>Extension Specialist Emeritus in Vegetable Crops, <sup>4</sup>Research Technician in Horticulture, <sup>5</sup>We sincerely appreciate the cooperation and support of Ed and August Wuillerman of Ed Wuillerman and Sons, Hammonton, New Jersey in growing and managing the crop.

## Results and Discussion

Tables 2 and 3 are arranged with the highest marketable yield being the first cultivar listed in the tables. Table 4 is arranged alphabetically by cultivar. The yield, percent marketable fruit and average marketable fruit size for harvest 1 and 2 are shown in Table 2.

Total (marketable and culls) yields ranged from 1057 (H 130) to 2053 (Daiquiri) boxes/A. Daiquiri had the highest yield, but only statistically differed from NC 02206 and H 130, which had the lowest yields. H 107 had the second highest yield, but only differed statistically from H 130, which had the lowest total yield.

Marketable yields ranged from 412 to 1196 boxes/A. Health Kick had the highest yield, but was only statistically different from H 106, H 130, and Halley 3155. Plum Crimson had the second highest yield, but only differed statistically from H 106, which had the lowest yield. All other cultivars do not differ statistically from one another.

Percent marketable fruit varied from 30% (H106) to 75% (Health Kick and NC 02232). Only the cultivar H 106 had statistically lower percent marketable fruit than other cultivars. Cultivars with the highest pack out (70-75%) included NC 02232, Health Kick and HMX 0830. All cultivars had at least 50% marketable fruit except Sunoma, Halley 3155 and H 106.

Large fruit are preferred for the fresh market trade. A 3.0-ounce fruit is considered the minimum for acceptance and 3.5 ounces is preferred for the fresh market. All cultivars except BHN 411 (2.9 ounces) had 3.0-ounce fruit or larger and ranged from 3.0 to 3.4 ounces. There were no statistical differences among the cultivars.

Cull fruit yields did not differ statistically among the cultivars. With the early harvests, certain problems can be more of a concern such as blossom end rot, cracks, zippers, cat facing, and blotchy ripening. When the cull fruit was separated by type (data not shown) there were differences for some defects. H 107 had statistically more blossom end rot fruit than any other cultivar. H 106 had the second highest and statistically differed from Plum Dandy, NC 02205 and Plum Crimson which had less than one fruit with blossom end rot for the two harvests. All other cultivars were not statistically different from one another. Daiquiri had more cracked fruit (112 out of 688) than all other cultivars except Sunoma. NC 02206 and H 132 had the least cracked fruit (less than 1), but statistically were not different from the other cultivars except Daiquiri, Sunoma or HMX 0830.

Zippers on fruit can result from cool temperatures at very early fruit development. BHN 411 had the most (84 out of 496) zippered fruit, but it was not statistically different from four other cultivars (Daiquiri, H 106, Sunoma, and BHN 404). All other cultivars did not differ from one another.

Rain checking or russetting is caused by water on the fruit surface for extended periods of time. This can be from rainfall, mist, fog or dew. Generally, rain checking is more of a problem with later harvests, but in 2003 rain and dew contributed to checked fruit even with the early harvests. H 107 had the most rain-checked fruit (167 fruit out of 647) followed by H 130. These differed statistically only from NC 02205 (12 fruit) which had the least.

Yellow eye, a ring of yellow tissue surrounding the stem scar, often relates to internal white tissue. Plum Dandy had statistically more yellow eye (14 out of 505 fruit)

than H 106 and Halley 3155, which had less than one fruit. All the other cultivars were not different from one another or the other three.

A pink shoulder was observed on certain cultivars that could be a deterrent in the market place. NC 02205, NC 02233, and NC 02206 (35, 28 and 18 fruit respectively) had the most pink shouldered fruit and differed statistically from the other cultivars.

**Table 2. Plum tomato yield and fruit size for first and second harvest (early) – Wuillerman Farms, Hammonton, New Jersey – 2003.**

Variety	Source	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
Health Kick	Seminis	1588	1196	392	75	3.3
Plum Crimson	Harris Moran	1764	1182	582	68	3.2
H 107	Heinz	1883	1131	751	60	3.1
Daiquiri	Stokes	2053	1111	942	54	3.2
NC 02232	North Carolina	1398	1049	350	75	3.3
H 132	Heinz	1480	1028	452	68	3.1
NC 02205	North Carolina	1447	1013	434	68	3.1
HMX 0830	Harris Moran	1421	988	433	70	3.3
NC 02233	North Carolina	1574	882	692	57	3.3
Plum Dandy	Seedway	1518	832	686	55	3.0
Sunoma	Seminis	1817	791	1026	43	3.4
NC 02206	North Carolina	1130	775	355	68	3.1
BHN 404	BHN	1364	734	630	54	3.0
BHN 411	BHN	1257	680	577	53	2.9
H 130	Heinz	1057	489	568	50	3.2
Halley 3155	Seedway	1248	482	765	42	3.2
H 106	Heinz	1377	412	965	30	3.1
<b>HSD 0.05</b>	-----	<b>822</b>	<b>670</b>	<b>NS</b>	<b>37</b>	<b>NS</b>

Table 3 summarizes the combined yield and fruit size data for the four harvests. H 132 had the highest total yield (3562 boxes/A) for the full season, but statistically only differed from Halley 3155 and Plum Dandy which had the lowest yields 2335 and 2603 boxes/A respectively. H 132 also had the highest marketable yield (2335 boxes/A), but did not statistically differ from eight other cultivars. H 130 and H 106 had the lowest yields (862 and 885 boxes/A respectively), but did not differ statistically from six other cultivars. Eleven cultivars had over 50% marketable fruit for the full season. NC 02232 had the highest percent marketable fruit with 69% and did not differ statistically from the other ten cultivars. The cultivars with less than 50% marketable fruit were BHN 411, Sunoma, H 107, BHN 404, H 106 and H 130, which statistically did not differ one another.

NC 02206 had the least cull fruit by weight (886 boxes/A), but the cultivar did not differ statistically from nine other cultivars. H 106 had the most cull fruit (2016 boxes/A) that was statistically equal to seven other cultivars.

Fruit size (ounces/fruit) ranged from 2.7 to 3.2 ounces for the full season. Sunoma and H 106 had the largest fruit at 3.2 ounces followed by H 132 (3.1 ounces), but differed statistically only from Plum Dandy at 2.7 ounces. All the other cultivars did not differ statistically from the largest fruit or Plum Dandy.

The data for individual defects is not shown in table form. As with the early harvest, H 107 had statistically more blossom end rot (106 out of 1175 fruit) than any other cultivar. All other cultivars were not statistically different from one another except

H 106 that had the second most blossom end rot. Daiquiri had more cracked fruit than all other cultivars except Sunoma. The other cultivars did not differ from one another. The number of zippered fruit followed the same pattern as the early harvest. BHN 411 had the most (141 out of 1086) zippered fruit and was statistically different from all cultivars except H 106, BHN 404, Daiquiri and Sunoma. Most others were not different from one another.

There were no statistical differences for green shoulder for the early harvest, but differences were observed when comparing the full season. H 130 had the most green-shouldered fruit (242 out of 996), but it was not statistically different from nine other cultivars. All other cultivars were not significantly different from one other.

H 107 had the most (272 out of 1175) rain-checked fruit, but the cultivar did not statistically differ from BHN 404, H 130 or H 106. All cultivars had at least some rain checked fruit. NC 02205 had the fewest (20) checked fruit, but only differed from the four cultivars mentioned above. Health kick had more fruit with yellow eye (61) for the full season, but only differed statistically from H 106, which had the least. Pink shoulder fruit numbers did not increase after the early harvests.

**Table 3. Plum tomato yield and fruit size for total red fruit harvests (4) – Wuillerman Farms, Hammonton, New Jersey – 2003.**

Variety	Source	Total Boxes/A	Marketable Boxes/A	Cull Boxes/A	% Marketable	Fruit Wt. Oz.
H 132	Heinz	3562	2335	1226	65	3.1
Plum Crimson	Harris Moran	3203	2134	1069	67	3.0
NC 02232	North Carolina	2983	2043	941	69	3.0
NC 02205	North Carolina	3156	2023	1133	64	3.0
NC 02206	North Carolina	2807	1921	886	68	2.8
Daiquiri	Stokes	3530	1896	1634	54	3.0
NC 02233	North Carolina	2806	1796	1010	63	2.8
Health Kick	Seminis	2777	1707	1071	62	2.9
HMX 0830	Harris Moran	3048	1633	1415	54	3.1
Plum Dandy	Seedway	2603	1503	1100	58	2.7
BHN 411	BHN	3167	1460	1707	46	3.0
Sunoma	Seminis	3258	1411	1848	43	3.2
Halley 3155	Seedway	2335	1269	1067	55	3.0
H 107	Heinz	3109	1193	1916	39	2.9
BHN 404	BHN	3019	1058	1961	34	2.9
H 106	Heinz	2900	885	2016	30	3.2
H 130	Heinz	2783	862	1922	31	2.9
<b>HSD 0.05</b>	-----	<b>953</b>	<b>747</b>	<b>649</b>	<b>17</b>	<b>0.4</b>

Table 4 summaries the fruit characteristics data. The fruit length ranged between 2.5 and 3.0 inches with the shortest being BHN 404 and the longest NC 02205, but there were no statistical differences among the cultivars for fruit length. The fruit width was the same for most cultivars with a range of 1.8 to 2.1 inches. BHN 411 had the narrowest fruit and Health Kick and Sunoma with the widest. There were no significant differences among the cultivars for the length/width ratio.

Firm fruit are important when picking red tomatoes for the fresh market. All cultivars were evaluated at the full red stage. H 106 had the firmest fruit in the trial, but it was not statistically different from HMX 0830, Daiquiri, NC 02233, NC 02205 or NC 02206. Plum Dandy produced the softest fruit in the trial, but did not differ statistically from nine other cultivars.

Uniform red color is important for the fresh market since fruit are sold by color. All the cultivars had at least good color (3 rating) except BHN 411, Sunoma, H 107 and H 106 that had fair to good color. The three cultivars with the best color were Plum Crimson, Plum Dandy and BHN 404. These three cultivars were not statistically different from eleven other cultivars. H 132 had a poor to fair internal color rating while all other cultivars were rated fair to good. There were no statistical differences for jelly color. All cultivars were red except for Daiquiri that had a yellow-red color.

Internal white tissue can leave hard areas within the fruit and cause fruit to be rejected. Most cultivars were rated at least good for white tissue. The cultivars which had unacceptable (3.0 or less) levels of white tissue were H 106, H 107, Daiquiri, Sunoma, BHN 411 and H 132.

Hollow locules can lead to fruit compression when placed in boxes. Most of the cultivars in this trial had few hollow locules except Halley 3155 that had 6.3 fruit out of ten.

### **Summary**

Considering yield, fruit size and fruit characteristics the following cultivars performed best for early harvest Health Kick, Plum Crimson, H 132, Daiquiri, HMX 0830, NC 02232, NC 02205 and NC 02233. The same cultivars performed best for the full season with the addition of NC 02206



Table 4. Fruit characteristics at the second harvest – Wuillerman Farms, Hammonton, New Jersey – 2003

Variety	Length <sup>1</sup> (in)	Width <sup>1</sup> (in)	L/W <sup>1</sup> Ratio	Firmness <sup>2</sup>	External Color <sup>3</sup>	Internal Color <sup>3</sup>	Jelly Color <sup>4</sup>	White Tissue <sup>5</sup>	Hollow Locules <sup>1</sup>
BHN 404	2.5	2.0	1.2	2.0	4.0	3.7	5.0	3.7	0.3
BHN 411	2.9	1.8	1.6	3.0	2.7	2.7	5.0	1.7	1.0
Daiquiri	2.9	2.0	1.5	4.0	3.3	2.7	4.0	2.0	1.7
H 106	2.7	2.0	1.3	5.0	2.0	3.3	5.0	2.7	0.0
H 107	2.8	2.0	1.4	3.0	2.3	3.3	5.0	3.0	0.7
H 130	2.6	2.0	1.4	3.3	3.0	3.7	5.0	4.3	1.0
H 132	2.6	2.0	1.3	2.3	3.7	1.7	5.0	1.3	3.0
Halley 3155	2.7	1.9	1.4	2.3	3.3	3.0	5.0	3.7	6.3
Health Kick	2.6	2.1	1.3	2.3	3.7	3.3	5.0	3.3	0.0
HMX 0830	2.6	2.0	1.3	4.3	3.0	3.7	5.0	4.0	3.0
NC 02205	3.0	2.0	1.4	3.7	3.3	3.7	5.0	4.0	2.7
NC 02206	2.8	2.0	1.4	3.7	3.3	3.7	5.0	3.7	2.0
NC 02232	2.6	2.0	1.3	3.0	3.0	3.3	5.0	4.0	1.3
NC 02233	2.8	2.0	1.4	4.0	3.3	3.3	5.0	4.0	0.7
Plum Crimson	2.6	2.0	1.3	2.3	4.3	3.7	5.0	3.3	1.0
Plum Dandy	2.8	1.9	1.5	1.7	4.3	3.0	5.0	3.3	1.0
Sunoma	2.7	2.1	1.3	2.7	2.3	2.7	5.0	2.0	0.3
<b>HSD 0.05</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>1.5</b>	<b>1.8</b>	<b>1.8</b>	<b>NS</b>	<b>1.8</b>	<b>4.2</b>

<sup>1</sup> Sample of ten fruit; <sup>2</sup> 1=soft, 2=medium soft, 3=medium, 4= firm, 5=very firm; <sup>3</sup> 1=poor, 2=fair, 3=good, 4=very good, 5=excellent;

<sup>4</sup> 1=green, 2=yellow-green, 3=yellow, 4=yellow-red, 5=red; <sup>5</sup> 1=severe, 2=moderately heavy, 3=moderate, 4=slight, 5=none;





2003 Plum Tomato Variety Trial Pictures



