

BELL PEPPER BACTERIAL LEAF SPOT RESISTANCE CULTIVAR TRIAL RESULTS IN NEW JERSEY – 2019



Wesley Kline, PhD¹ and Andy Wyenandt, PhD²

¹Agricultural Agent
Rutgers Cooperative Extension of Cumberland County
291 Morton Ave., Millville, NJ 08332
wkline@njaes.rutgers.edu

²Extension Specialist in Vegetable Pathology
Rutgers Agricultural Research and Extension Center
121 Northville Rd., Bridgeton, NJ 08302
wyenandt@njaes.rutgers.edu

Bacterial leaf spot (BLS) is caused by the pathogens, *Xanthomonas euvesicatoria*, *X. vesicatoria*, *X. perforans*, and *X. gardneri*, and is the second most important disease on bell and non-bell peppers in New Jersey. BLS has become more of a concern in New Jersey over the last ten to fifteen years. Early survey results from 2019 suggest *Xanthomonas euvesicatoria* is the most prevalent species found in pepper and tomato fields in the state. There are eleven (0-10) races of BLS identified in the United States; and past research has shown that all races are present in New Jersey today.

The pathogen is favored by high humidity, hard driving rains, vigorous plant growth, infested stakes, and working in the field when plants are wet.

In 2016, Rutgers started screening cultivars and advanced breeding lines with resistance to all races (often referred as X10R resistance) of bacterial leaf spot. The 2019 trials were done at the Rutgers Agricultural Research and Extension Center (RAREC) near Bridgeton, New Jersey and in a grower's field in Vineland, New Jersey. Plots were established on black plastic mulch with one drip line between double rows with distance between plants at 18 inches in double rows and 6 ft. between beds center to center at RAREC and 5.3 ft in Vineland. The plots (18 plants/plot) were transplanted June 5th at RAREC and May 30th in Vineland. All cultural practices such as staking/tying, fertilization and pest management were carried out by the grower in Vineland. The RAREC trial was not staked. Plots in each location were arranged in a randomized complete block design with four replications.

BLS was not observed at the Vineland location in 2019, except on the cultivar 'Paladin', thus plots were not rated for BLS development. Plots at RAREC were rated twice, once on July 17 and on September 9 (Table 10). At both locations, the cultivar 'Paladin' (no BLS resistance) was the susceptible control and 9325 (race 1-10 resistant) the resistant control. At RAREC, all entries showed some BLS development, but 'Paladin' consistently had the highest BLS rating. Most entries had less BLS development during the second rating date, except 'Paladin'. There was symptom development on fruit on either rating date at RAREC.

Entries, seed company and reported disease resistance are listed in Table 1. Tables 2 and 3 summarizes the monthly minimum, maximum and average temperatures and rainfall for the season.

The entries were harvested 4 times starting 62 days after transplanting from July 31 to September 5 in Vineland and 5 times starting 75 days after transplanting from August 19 to October 11 at RAREC. Peppers were graded based on weight (extra-large >0.49 lbs., large 0.33 – 0.49 lbs., medium 0.25 – 0.32 lbs., culls >0.25 lbs.). Harvest data is summarized by date and total harvests for RAREC (Tables 4-9) and Vineland (Tables 11-15). Fruit quality for diameter and length, wall thickness and number of lobes are presented in Table 16. See Appendix 1 for images of all cultivars.

Overall yields were higher at the Vineland location even with one less harvest in 2019. '3964' had the highest marketable yield in Vineland, but was not statistically different

from '1819', 'Antebellum', 'Turnpike', '7140', 'Prowler' or 'Aristotle'. At RAREC, 'Turnpike' had the highest marketable yield with '3964', 'Aristotle', 'Mercer', 'Outsider', '1819', '3255', 'SP2622', 'Labelle', 'FPP2862' and 'SP2628' not significantly different from it.

Table 1. Seed sources and disease resistance as report by the company.

Variety	Company	Disease Resistance ^a
Antebellum	Seminis	HR: Tm: 0, IR: TSWV, Xcv 1-10
Aristotle	Seminis	HR: PVY: 0, Tm: 0; Xcv: 0-3, 7, 8
Autry	Seminis	HR: Tm: 0, IR: TSWV, Xcv: 1-10
Boca	Seedway	HR: Xcv 1-10; IR: TSWV
Labelle	Seedway	IR: Xcv 1-10
Galleon	United Genetics	HR: Xcv 1-10
Green Flash	United Genetics	HR: TSWV, Xcv: 1-10
Green Machine	Seminis	HR: Tm: 0; IR: TSWV; Xcv 0-10
Mariner	United Genetics	HR: Xcv: 1-10
Mercer	Sakata	HR: TMV:0; Xcv 0-3, 7-8; IR: Pc
Ninja	Sakata	HR: TMV; IR: Xcv: 1-10
Outsider	Syngenta	HR: TSWV; Xcv: 1-10
Paladin	Syngenta	HR: Pc
Placepack	Enza Zaden	HR: PVY: 0-1; Tm: 0; Xcv: 1-10
Playmaker	Seminis	HR: Tm: 0; Xcv: 0-10; IR: Pc
Provider	Enza Zaden	HR: PVY: 0-1; Tm: 0; Xcv: 1-10, IR TEV
Prowler	HM Clause	IR: TSWV: 0; IR: Xcv 1-10
Samurai	Sakata	HR: TMV; IR: Xcv: 1-10
Skyhawk	HM Clause	IR: Xcv: 1-10
Standout	Syngenta	HR: TMV; TSWV; Xcv: 1-10
Turnpike	Seminis	HR: Tm; Xcv: 0-5, 7-9; IR: Pc
FPP 2862	Sakata	
FPP 2866	Sakata	
SP 2622	Sakata	
SP 2628	Sakata	
1819	Seminis	HR: Xcv: 0-5; IR: Pc
3255	Seminis	HR: Tm: 0; IR: Xcv: 1-10
3964	Seminis	HR: Xcv: 0-4, 7-9; Tm: 0; IR: CMV
7140	Seminis	HR: Xcv: 0-10; Pc
7331	Seminis	HR: Xcv: 1-10; IR: Pc
9325	Seminis	HR: Xcv: 1-10

^aPVY = Potato virus Y; TEV = Tobacco Etch Virus; TMV = Tobacco Mosaic Virus; TSWV = Tomato Spotted Wilt Virus; Tm = Tobamovirus; Xcv = Bacterial leaf spot race resistance; CMV = Cucumber mosaic virus; Pc = *Phytophthora capsici*, with HR = Highly resistant; IR = Intermediate resistance

Table 2. Summary of average, minimum and maximum temperatures ($^{\circ}\text{F}$), and total rainfall, Upper Deerfield May-October 2019.

Month	Average	Minimum	Maximum	Rainfall (inches)
May	65.3	41.4	89.2	3.94
June	73.1	48.9	93.0	5.17
July	78.8	60.6	95.2	4.72
August	75.3	57.2	93.4	2.16
September	70.4	46.2	92.5	0.40
October	60.1	35.6	94.8	6.59

Table 3. Summary of average, minimum and maximum temperatures ($^{\circ}\text{F}$), and total rainfall, Piney Hollow May-September 2019.

Month	Average	Minimum	Maximum	Rainfall (inches)
May	63.8	41.9	89.2	3.96
June	71.6	44.6	92.7	5.71
July	77.4	56.7	96.0	4.31
August	73.6	54.5	92.8	3.22
September	68.5	41.9	90.9	1.64

Table 4. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at First Harvest on 8/19/2019 at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Turnpike	28.33 a ^x	264.52 a	91.52 a-d	96.73 a	384.37 a
Aristotle X3R	0.00 c	213.03 ab	97.74 abc	92.34 a	310.77 ab
Outsider	22.95 ab	199.82 ab	67.64 b-g	96.52 a	290.41 abc
Labelle	5.34 c	141.92 bcd	127.78 a	93.16 a	275.03 a-e
Prowler	5.44 c	155.02 bc	85.20 a-e	91.49 a	245.66 a-e
3964	25.64 ab	133.79 b-e	63.91 b-g	98.65 a	223.34 b-f
Skyhawk	2.59 c	68.63 c-g	102.14 ab	97.18 a	173.36 b-g
3255	0.00 c	69.30 c-g	84.68 a-e	96.85 a	153.99 c-h
Mercer	0.00 c	113.64 b-f	34.55 e-i	93.51 a	148.18 c-i
Autry	13.47 bc	56.35 c-g	63.14 b-g	97.19 a	132.96 d-i
Provider	0.00 c	51.69 c-g	79.56 a-f	95.41 a	131.25 d-i
FPP2862	2.59 c	82.77 c-g	45.27 c-i	99.06 a	130.63 d-i
9325	2.69 c	60.03 c-g	59.62 b-h	91.38 a	122.34 e-i
1819	5.59 c	38.59 d-g	75.78 a-f	98.09 a	119.96 e-i
Boca	2.95 c	47.50 d-g	63.66 b-g	93.82 a	114.10 e-i
Standout	8.24 c	55.42 c-g	38.69 d-i	95.91 a	102.35 e-i
Placepack	0.00 c	29.89 efg	66.04 b-g	98.28 a	95.92 f-i
7331	0.00 c	38.64 d-g	48.12 b-i	64.04 b	86.76 f-i
SP2622	0.00 c	37.45 d-g	45.48 c-i	100.00 a	82.92 f-i
Green Machine	0.00 c	20.30 fg	61.32 b-h	97.23 a	81.63 f-i
Green Flash	5.23 c	26.93 efg	28.80 f-i	87.51 a	60.96 ghi
Antebellum	2.59 c	15.12 fg	32.32 e-i	97.07 a	50.03 ghi
Samurai S10	0.00 c	33.46 efg	16.47 ghi	96.72 a	49.93 ghi
Playmaker	0.00 c	33.77 efg	15.28 ghi	90.02 a	49.05 ghi
7140	0.00 c	26.62 efg	16.73 ghi	97.32 a	43.35 ghi
SP2628	0.00 c	25.43 fg	15.38 ghi	100.00 a	40.81 ghi
Ninja S10	0.00 c	11.08 fg	20.98 ghi	89.56 a	32.06 ghi
FPP2866	0.00 c	7.77 fg	15.90 ghi	90.87 a	23.67 hi
Mariner	0.00 c	12.69 fg	7.82 hi	49.31 b	20.51 hi
Galleon	0.00 c	0.00 g	2.85 i	100.00 a	2.85 i
Paladin	0.00 c	0.00 g	0.00 i	0.00	0.00 i
LSD	13.75	107.21	54.67	22.47	148.62

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 5. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Second Harvest on 8/29/2019 at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Turnpike	35.95 a ^x	145.49 a	60.13 a-d	94.52 abc	241.57 a
Skyhawk	0.00 b	81.89 a-e	93.18 a	91.36 abc	175.07 ab
Aristotle X3R	2.75 b	111.77 ab	48.22 b-e	82.66 cd	162.74 abc
Mercer	5.39 b	82.98 a-e	68.89 a-d	93.47 abc	157.25 abc
3964	5.75 b	111.72 ab	33.87 b-f	97.96 ab	151.34 a-d
Outsider	2.80 b	78.31 a-f	70.03 a-d	85.27 bcd	151.14 a-d
1819	5.34 b	85.31 a-d	54.85 a-e	95.44 abc	145.49 a-e
FPP2862	2.59 b	107.32 abc	51.95 a-e	99.18 a	141.71 a-e
Prowler	2.69 b	82.61 a-e	47.86 b-e	87.10 abc	133.16 b-f
7140	3.11 b	53.04 b-h	72.46 abc	95.15 abc	128.61 b-f
Samurai S10	0.00 b	48.64 b-h	76.35 ab	93.53 abc	124.98 b-g
Labelle	0.00 b	66.66 b-h	51.22 a-e	87.44 abc	117.88 b-g
3255	0.00 b	43.82 c-h	73.76 abc	99.19 a	117.57 b-g
Playmaker	0.00 b	72.88 b-g	41.69 b-f	92.03 abc	114.57 b-g
Provider	2.64 b	43.66 c-h	61.01 a-d	91.14 abc	107.32 b-g
Boca	2.75 b	60.24 b-h	44.28 b-f	87.90 abc	107.27 b-g
Standout	5.65 b	44.13 c-h	53.19 a-e	94.29 abc	102.97 b-h
SP2628	0.00 b	25.22 d-h	31.34 c-f	93.92 abc	94.27 b-i
Green Machine	2.59 b	39.83 d-h	51.12 a-e	100.00 a	93.54 b-i
7331	0.00 b	29.32 d-h	61.27 a-d	100.00 a	90.59 b-i
9325	0.00 b	24.45 d-h	65.93 a-d	96.64 ab	90.38 b-i
FPP2866	0.00 b	32.37 d-h	31.80 b-f	95.90 abc	84.32 b-i
Autry	2.80 b	24.91 d-h	48.43 b-e	86.52 abc	76.14 b-i
Antebellum	0.00 b	41.38 c-h	31.80 b-f	95.79 abc	73.19 c-i
Ninja S10	0.00 b	17.20 e-h	46.10 b-e	90.72 abc	63.29 c-i
SP2622	0.00 b	52.93 b-h	41.33 b-f	100.00 a	56.56 d-i
Green Flash	0.00 b	37.76 d-h	10.46 ef	84.85 bcd	48.22 e-i
Placepack	0.00 b	8.39 gh	27.71 def	71.72 d	36.10 f-i
Galleon	0.00 b	12.53 fgh	15.38 ef	88.67 abc	27.92 ghi
Mariner	0.00 b	5.75 gh	1.29 f	13.61 e	7.04 hi
Paladin	0.00 b	0.00 h	0.00 f	0.00 e	0.00 i
LSD	8.51	67.49	44.68	13.87	99.96

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 6. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Third Harvest on 9/9/2019 at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Turnpike	6.27 abc ^x	56.72 c-j	15.69 fgh	95.39 abc	78.68 c-i
Skyhawk	0.00 c	48.32 c-j	16.37 fgh	74.30 de	64.69 d-i
Aristotle X3R	0.00 c	60.76 b-i	33.30 c-h	95.29 abc	94.06 b-h
Mercer	2.59 bc	60.24 b-i	42.63 b-g	89.62 a-d	105.45 b-g
3964	5.70 abc	81.42 a-f	28.59 c-h	91.54 a-d	115.71 b-f
Outsider	11.14 a	51.59 c-j	28.02 c-h	94.17 abc	90.74 b-h
1819	2.59 bc	116.80 ab	29.37 c-h	99.13 ab	148.75 bc
FPP2862	0.00 c	65.21 b-h	55.42 a-e	86.47 a-d	120.63 b-e
Prowler	2.85 abc	57.13 c-i	46.15 a-f	93.16 abc	106.13 b-g
7140	3.00 abc	83.13 a-f	71.99 ab	80.13 cd	158.13 abc
Samurai S10	0.00 c	32.16 f-j	49.72 a-f	93.20 abc	81.89 c-h
Labelle	2.69 bc	34.13 e-j	25.12 c-h	96.88 abc	61.95 d-i
3255	2.95 abc	76.97 b-g	60.13 abc	97.77 abc	140.05 bcd
Playmaker	0.00 c	74.17 b-g	22.12 d-h	97.50 abc	96.29 b-h
Provider	0.00 c	12.95 hij	20.04 d-h	81.31 bcd	32.99 ghi
Boca	5.65 abc	100.53 abc	56.97 a-d	98.13 abc	163.15 ab
Standout	5.18 abc	45.27 c-j	39.31 b-g	93.65 abc	89.76 b-h
SP2628	0.00 c	67.38 b-h	55.06 a-e	100.00 a	122.44 b-e
Green Machine	2.85 abc	89.09 a-e	34.81 b-h	98.61 abc	126.74 b-e
7331	0.00 c	20.87 g-j	30.61 c-h	91.00 a-d	51.48 e-i
9325	0.00 c	35.06 e-j	25.07 c-h	95.60 abc	60.13 e-i
FPP2866	0.00 c	72.67 b-g	39.52 b-g	97.39 abc	112.19 b-g
Autry	2.64 bc	33.30 e-j	18.34 e-h	91.01 a-d	54.28 e-i
Antebellum	0.00 c	93.07 a-d	61.89 abc	97.62 abc	154.97 abc
Ninja S10	0.00 c	49.00 c-j	41.80 b-g	80.19 cd	90.80 b-h
SP2622	0.00 c	57.23 c-i	28.90 c-h	93.24 abc	86.13 b-h
Green Flash	10.72 ab	137.57 a	83.08 a	94.92 abc	231.37 a
Placepack	0.00 c	5.90 ij	11.91 gh	59.71 e	17.82 hi
Galleon	0.00 c	27.35 f-j	12.22 gh	100.00 a	39.57 f-i
Mariner	2.90 abc	38.79 d-j	12.79 fgh	91.96 a-d	54.49 e-i
Paladin	0.00 c	0.00 j	1.45 h	100.00 a	1.45 i
LSD	8.33	56.79	37.29	18.66	79.72

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 7. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Fourth Harvest on 9/23/2019 at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Mercer	3.11 bc ^x	186.51 ab	104.21 a	88.58 abc	293.83 a
SP2622	8.60 bc	198.68 a	85.05 a-d	95.79 a	292.33 a
SP2628	5.18 bc	182.99 ab	93.90 ab	96.58 a	282.07 ab
3964	48.58 a	140.62 a-d	47.65 b-f	89.94 abc	236.86 abc
Green Machine	8.39 bc	153.73 abc	56.66 a-e	88.50 a-d	218.78 a-d
1819	8.24 bc	126.64 a-e	55.83 b-e	86.03 a-d	190.71 a-e
Standout	15.02 b	112.45 a-f	46.93 b-g	91.71 ab	174.39 a-f
Green Flash	5.39 bc	69.09 c-h	87.64 abc	81.88 a-d	162.12 b-g
3255	0.00 c	102.86 b-g	53.50 b-e	93.18 a	156.37 b-g
Antebellum	0.00 c	101.36 b-g	49.26 b-f	89.05 abc	150.62 c-h
Samurai S10	0.00 c	87.12 c-h	53.71 b-e	72.55 a-e	140.83 c-i
Autry	5.96 bc	84.17 c-h	46.87 b-g	91.33 ab	137.00 c-j
Labelle	10.67 bc	70.34 c-h	50.81 b-f	86.20 a-d	131.82 c-j
Turnpike	0.00 c	87.79 c-h	25.17 efg	74.10 a-e	112.96 c-j
Playmaker	2.69 bc	86.55 c-h	23.05 efg	64.18 def	112.29 c-j
FPP2862	8.13 bc	67.59 c-h	31.96 efg	91.07 ab	107.68 d-j
Aristotle X3R	11.03 bc	53.19 e-h	42.32 c-g	86.04 a-d	106.54 d-j
FPP2866	8.08 bc	60.60 d-h	34.96 efg	89.05 abc	103.64 d-j
7140	6.06 bc	49.62 e-h	46.10 c-g	66.41 c-f	101.78 d-j
7331	2.69 bc	42.47 e-h	38.74 d-g	86.82 a-d	83.91 e-j
Mariner	2.90 bc	54.28 d-h	25.59 efg	72.49 a-e	82.77 e-j
Galleon	2.64 bc	42.68 e-h	33.93 efg	74.15 a-e	79.25 e-j
Prowler	2.59 bc	47.96 e-h	27.92 efg	83.53 a-d	78.47 e-j
Outsider	2.64 bc	39.16 fgh	28.64 efg	92.47 a	70.44 e-j
Boca	2.59 bc	32.01 fgh	26.52 efg	89.66 abc	61.12 f-j
Ninja S10	0.00 c	41.85 e-h	17.04 efg	55.50 ef	58.89 f-j
9325	2.64 bc	28.80 fgh	24.50 efg	68.00 b-e	55.94 f-j
Provider	0.00 c	18.80 gh	24.60 efg	94.55 a	43.40 g-j
Placepack	0.00 c	12.59 h	14.14 efg	93.48 a	26.73 hij
Skyhawk	0.00 c	12.95 h	0.00 g	42.45 f	12.95 ij
Paladin	0.00 c	4.25 h	4.56 fg	83.58 a-d	8.81 j
LSD	14.51	87.40	47.64	24.36	128.48

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 8. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Fifth Harvest on 10/11/2019 at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Playmaker	20.10 ab ^x	185.74 a	97.22 a-d	98.60 abc	303.05 a
Galleon	5.91 bcd	134.72 abc	99.24 abc	98.97 abc	239.86 ab
3255	2.69 cd	123.37 a-d	110.17 a	99.40 ab	236.24 ab
FPP2862	25.69 a	125.81 a-d	79.09 a-g	100.00 a	230.59 abc
3964	17.46 abc	125.60 a-d	87.27 a-e	100.00 a	230.33 abc
Outsider	26.42 a	118.82 a-d	78.42 a-g	98.95 abc	223.65 a-d
SP2622	8.13 bcd	110.58 b-f	103.49 ab	97.85 abc	222.20 a-d
Antebellum	8.49 bcd	112.14 b-e	98.20 abc	100.00 a	218.83 a-d
1819	14.66 a-d	118.87 a-d	71.37 a-h	98.85 abc	204.90 a-d
Autry	5.54 bcd	119.08 a-d	79.87 a-g	96.91 abc	204.49 a-d
Aristotle X3R	0.00 d	156.52 ab	47.55 c-i	98.59 abc	204.07 a-d
SP2628	2.69 cd	116.85 a-e	78.37 a-g	98.31 abc	197.91 a-d
Turnpike	14.71 a-d	119.70 a-d	61.74 a-h	100.00 a	196.15 a-d
FPP2866	0.00 d	132.65 abc	56.97 a-i	98.58 abc	189.62 a-e
Samurai S10	15.80 a-d	89.35 b-h	78.47 a-g	100.00 a	183.61 b-e
Labelle	2.80 cd	89.35 b-h	76.24 a-h	96.34 a-d	168.38 b-f
Mercer	2.75 cd	82.15 c-h	82.46 a-f	98.01 abc	167.35 b-f
Boca	2.80 cd	101.62 b-g	55.83 b-i	100.00 a	160.25 b-f
Green Machine	2.95 cd	89.50 b-h	63.09 a-h	90.81 a-e	155.54 b-f
7140	10.83 a-d	10.60 c-h	69.46 a-h	96.16 a-d	150.88 b-f
7331	5.65 bcd	67.18 c-h	75.72 a-h	89.87 b-e	148.55 b-f
9325	6.01 bcd	69.25 c-h	60.70 a-h	100.00 a	135.96 b-g
Mariner	2.64 cd	69.66 c-h	60.34 a-h	89.62 cde	132.65 b-g
Green Flash	10.77 a-d	64.28 c-h	38.22 e-i	86.82 de	113.27 c-g
Standout	0.00 d	67.44 c-h	43.71 d-i	100.00 a	111.15 d-g
Prowler	0.00 d	59.36 d-h	50.34 b-i	95.24 a-d	109.70 d-g
Ninja S10	2.75 cd	45.68 e-h	28.75 ghi	84.82 e	77.17 efg
Provider	0.00 d	38.90 fgh	24.24 hi	98.47 abc	63.14 fg
Skyhawk	2.59 cd	30.04 gh	30.14 f-i	100.00 a	62.78 fg
Paladin	0.00 d	24.40 h	26.67 ghi	93.66 a-e	51.07 fg
Placepack	0.00 d	18.96 h	5.85 i	100.00 a	24.81 g
LSD	16.85	72.34	53.54	9.75	118.37

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 9. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) for all Harvests at RAREC, 2019, Bridgeton, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
Turnpike	85.25 ab ^x	674.20 a	254.26 b-f	92.80 a-e	1013.70 a
3964	103.12 a	593.20 abc	261.30 b-f	95.23 a-d	957.60 ab
Aristotle X3R	13.78 def	595.30 ab	269.12 b-e	91.10 a-e	878.20 abc
Mercer	13.83 def	525.50 a-d	332.73 ab	92.51 a-e	872.10 abc
Outsider	65.93 bc	487.70 a-e	272.75 a-e	94.51 a-d	826.40 a-d
1819	36.41 cde	486.20 a-e	287.20 a-d	94.70 a-d	809.80 a-e
3255	5.65 def	416.30 b-h	382.24 a	97.54 a	804.20 a-e
SP2622	16.73 def	456.90 a-f	304.24 a-d	97.33 a	777.90 a-f
Labelle	21.49 def	402.40 b-i	331.17 abc	91.55 a-e	755.10 a-f
FPP2862	39.00 cd	448.70 a-g	243.54 b-f	96.27 ab	731.20 a-f
SP2628	7.87 def	417.90 b-h	274.05 a-e	97.19 a	699.80 a-g
Green Machine	16.78 def	392.40 b-j	267.00 b-e	92.95 a-e	676.20 b-g
Playmaker	22.79 def	453.10 a-f	199.36 d-h	89.36 cde	675.20 b-g
Prowler	13.57 def	402.10 b-i	257.47 b-f	90.14 b-e	673.10 b-f
Antebellum	11.08 def	363.10 c-j	273.48 a-e	95.84 abc	647.60 b-g
Green Flash	32.11 c-f	335.60 d-j	248.20 b-f	87.25 ef	615.90 c-h
Boca	16.73 def	341.90 d-j	247.27 b-f	95.31 a-d	605.90 c-h
Autry	30.40 def	317.80 d-j	256.64 b-f	93.38 a-e	604.90 c-h
7140	23.00 def	283.00 e-k	276.74 a-d	86.83 ef	582.70 c-h
Samurai S10	15.80 def	290.70 e-k	274.72 a-d	95.17 a-d	581.20 c-h
Standout	34.08 c-f	324.70 d-j	221.84 c-g	94.83 a-d	580.60 c-h
FPP2866	8.08 def	306.10 d-k	199.31 d-h	95.62 abc	513.40 d-i
Skyhawk	5.18 def	241.80 f-l	241.83 b-f	88.43 d-f	488.80 e-i
9325	11.34 def	217.60 g-l	235.82 b-g	93.49 a-e	464.80 f-i
7331	8.34 def	198.50 h-l	254.47 b-f	93.63 a-e	461.30 f-i
Galleon	8.55 def	217.30 g-l	163.62 e-h	92.92 a-e	389.40 ghi
Provider	2.64 ef	166.00 jkl	209.46 d-h	93.40 a-e	378.10 g-j
Ninja S10	2.75 ef	164.80 j-l	154.66 fgh	82.06 f	322.20 hij
Mariner	8.44 def	181.20 i-l	107.84 hi	73.76 g	297.50 hij
Placepack	0.00 f	75.70 k-l	125.65 ghi	87.40 ef	201.40 i-j
Paladin	0.00 f	28.60 l	32.68 i	91.79 a-e	61.30 j
LSD	34.99	231.73	110.72	6.90	322.22

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 10. Bacterial Leaf Spot Ratings at RAREC in 2019.

Cultivar/Line	Mean ^x	
	Jul 17, 2019	Sep 9, 2019
9325	1.50	1.25
Autry	1.50	0.88
Placepack	1.50	1.33
Provider	1.50	1.50
Skyhawk	1.50	1.38
3255	2.00	0.75
7331	2.00	0.75
Green Machine	2.00	1.00
Labelle	2.00	1.13
Outsider	2.00	1.13
Samurai S10	2.00	2.00
Standout	2.00	2.00
Antebellum	2.25	1.50
Aristotle X3R	2.50	3.00
Green Flash	2.50	3.00
Mariner	2.50	1.75
Prowler	2.50	1.38
Ninja S10	2.75	2.00
7140	3.00	2.25
Boca	3.00	1.25
FPP2862	3.00	1.38
Turnpike	3.00	3.50
1819	3.25	3.75
3964	3.25	3.00
FPP2866	3.25	2.25
Mercer	3.25	3.13
Galleon	3.50	2.75
Playmaker	3.50	1.38
SP2622	3.50	1.13
SP2628	3.75	0.88
Paladin	4.00	4.00

Rating Scale where:

0=No symptom development

1=Few leaf spots present, strong plant growth and canopy

2=Major leaf spotting and marginal necrosis present, good growth

3=Heavy leaf spotting and leaf drop due to BLS, re-growth good

4=Heavy defoliation due to BLS, stunted growth, very little regrowth

Table 11. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at First Harvest on 7/31/2019, Vineland, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
3964	137.32 a ^x	259.76 a-d	56.84 b-i	99.07 ab	453.93 a
Skyhawk	12.82 b-e	351.44 a	82.67 a-d	93.11 b-f	446.93 a
Antebellum	34.88 bcd	299.98 abc	92.80 ab	99.19 ab	427.66 ab
1819	22.01 b-e	318.76 ab	70.49 a-h	97.95 abc	411.27 ab
Aristotle X3R	34.00 bcd	334.37 ab	34.93 c-i	98.04 abc	403.29 abc
Turnpike	38.79 b	313.23 ab	50.00 b-i	98.36 abc	402.02 abc
Provider	7.34 cde	257.76 a-d	78.42 a-e	90.43 def	343.51 a-d
Autry	28.57 b-e	243.96 a-f	62.27 a-i	97.05 a-d	334.81 a-e
Prowler	5.23 de	255.95 a-e	73.43 a-g	97.19 a-d	334.61 a-e
Outsider	36.79 bc	236.58 b-g	15.17 hi	96.50 a-d	288.53 b-f
9325	5.38 de	185.85 d-h	68.29 a-h	94.15 a-f	259.52 c-g
Placepack	0.00 e	189.37 c-h	50.39 b-i	88.94 ef	239.76 d-h
Ninja S10	0.00 e	126.51 g-l	113.10 a	97.96 abc	239.61 d-h
Mercer	22.41 b-e	162.51 d-i	34.39 c-i	96.21 a-d	219.31 d-i
Green Machine	2.79 e	173.96 d-h	39.23 b-i	100.00 a	215.98 d-i
Samurai S10	0.00 e	127.44 g-l	87.13 abc	98.03 abc	214.56 d-i
7331	5.09 de	127.53 g-l	76.07 a-f	100.00 a	208.69 d-j
Labelle	8.17 cde	140.45 f-l	53.03 b-i	93.88 a-f	201.65 d-k
Standout	0.00 e	150.53 d-j	47.94 b-i	98.16 abc	198.47 d-k
3255	6.80 cde	139.57 f-l	50.78 b-i	100.00 a	197.15 d-k
7140	13.70 b-e	145.58 e-k	37.18 b-i	97.33 abc	196.46 d-k
Playmaker F	10.03 b-e	146.03 e-k	33.75 c-i	95.18 a-e	189.81 e-k
Boca	9.39 b-e	81.16 h-l	77.44 a-f	98.98 ab	167.99 f-l
SP2622	0.00 e	101.70 h-l	48.04 b-i	94.46 a-f	149.74 f-l
Paladin	11.20 b-e	105.18 h-l	19.81 ghi	100.00 a	136.19 g-l
FPP2866	2.45 e	89.62 h-l	36.98 b-i	88.06 f	129.05 g-l
Mariner	0.00 e	40.26 jkl	52.25 b-i	91.65 c-f	92.51 h-l
FPP2862	1.57 e	58.31 i-l	23.38 e-i	95.83 a-d	83.26 i-l
Green Flash	0.00 e	39.43 kl	29.55 d-i	95.57 a-e	68.98 i-l
Galleon	0.00 e	36.35 kl	21.62 f-i	97.89 abc	57.97 jkl
SP2628	0.00 e	37.81 kl	15.75 hi	98.32 abc	53.57 kl
Playmaker	0.00 e	29.89 l	8.22 i	97.85 abc	38.11 l
LSD	30.24	110.94	55.86	6.82	151.09

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 12. Table 11. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Second Harvest on 8/12/2019, Vineland, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
3964	53.32 ab ^x	362.40 a	35.03 a-e	94.66 ab	450.80 a
1819	63.35 a	336.40 ab	26.22 cde	93.74 abc	425.90 ab
Antebellum	54.06 ab	309.20 abc	42.76 a-e	97.96 a	406.00 abc
Prowler	10.22 c	282.90 a-d	68.15 a-d	90.14 a-d	361.30 a-d
Turnpike	30.38 abc	287.80 a-d	34.05 a-e	95.99 ab	352.20 a-e
FPP2862	7.34 c	268.80 a-e	72.99 abc	94.54 ab	349.10 a-e
SP2628	7.63 c	268.40 a-e	48.77 a-e	89.30 a-d	324.80 a-f
Boca	32.78 abc	250.10 a-f	30.57 b-e	86.57 a-d	313.40 a-f
Green Machine	15.46 bc	242.50 a-f	49.16 a-e	92.94 abc	307.20 a-f
Aristotle X3R	24.85 abc	213.00 a-g	52.49 a-e	91.69 a-d	290.40 a-g
SP2622	2.64 c	202.20 a-g	79.89 a	97.09 ab	284.70 a-g
7140	5.04 c	249.70 a-f	18.79 e	91.17 a-d	273.60 a-g
Mercer	5.04 c	226.20 a-g	34.73 a-e	87.57 a-d	265.90 a-g
Playmaker F	2.54 c	161.90 a-g	76.98 ab	96.00 ab	241.40 a-g
Standout	25.73 abc	182.60 a-g	30.28 b-e	78.46 cd	238.60 a-g
FPP2866	0.00 c	191.30 a-g	46.84 a-e	91.21 a-d	238.20 a-g
Labelle	24.07 abc	161.60 a-g	33.95 a-e	76.05 d	219.60 a-g
Outsider	25.73 abc	170.80 a-g	22.75 de	90.09 a-d	219.30 a-g
3255	2.49 c	159.10 a-g	56.99 a-e	99.38 a	218.60 a-g
Skyhawk	8.02 c	152.60 b-g	29.50 b-e	88.69 a-d	190.10 a-g
Ninja S10	0.00 c	133.20 b-g	56.75 a-e	94.13 abc	189.90 a-g
Playmaker	0.00 c	134.80 b-g	50.04 a-e	84.59 a-d	184.80 b-g
Samurai S10	5.09 c	134.20 b-g	28.72 b-e	94.22 abc	168.00 b-g
Provider	2.64 c	105.90 c-g	48.43 a-e	84.46 a-d	157.00 c-g
Autry	4.90 c	129.00 c-g	12.94 e	95.45 ab	146.80 c-g
9325	2.64 c	122.40 c-g	16.29 e	95.14 ab	141.30 d-g
7331	0.00 c	84.50 d-g	27.69 cde	94.95 ab	112.20 d-g
Green Flash	0.00 c	52.60 fg	47.60 a-e	86.82 a-d	100.20 d-g
Placepack	2.79 c	73.50 efg	21.82 de	81.30 bcd	98.10 d-g
Mariner	5.19 c	53.50 fg	35.74 a-e	60.17 e	94.40 efg
Galleon	0.00 c	49.90 fg	25.88 cde	88.32 a-d	75.80 fg
Paladin	2.45 c	21.90 g	8.37 e	86.88 a-d	32.70 g
LSD	40.91	205.90	49.05	15.79	264.44

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 13. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Third Harvest on 8/23/2019, Vineland, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
7140	15.90 cde ^x	253.75 a	31.41 c-h	82.09 a-e	301.05 a
Provider	15.70 cde	214.32 ab	48.68 a-f	86.16 a-e	278.70 ab
Mercer	10.66 cde	184.33 a-d	56.50 a-d	83.16 a-e	251.50 abc
FPP2862	20.79 bcd	167.21 a-e	60.66 a-d	87.90 a-e	248.66 abc
Standout	7.48 cde	197.05 abc	42.27 a-h	85.43 a-e	246.80 abc
7331	2.84 de	182.62 a-d	56.31 a-d	90.85 a-d	241.76 a-d
FPP2866	3.33 de	186.97 a-d	50.93 a-e	73.41 b-f	241.22 abcd
9325	7.39 cde	167.11 a-e	50.78 a-e	83.92 a-e	225.27 a-e
3255	4.99 de	140.50 b-e	77.44 a	93.99 ab	222.93 a-e
Boca	43.54 a	167.16 a-e	11.69 fgh	75.79 a-f	222.39 a-e
Green Flash	0.00 e	166.67 a-e	47.01 a-f	78.03 a-f	213.68 a-e
Playmaker	0.00 e	124.21 b-f	73.28 ab	70.56 def	197.49 a-e
Turnpike	26.47 abc	151.75 b-e	17.12 e-h	96.06 a	195.34 a-e
Green Machine	0.00 e	150.33 b-e	44.42 a-g	88.00 a-e	194.75 a-e
SP2628	2.54 de	157.81 a-e	31.70 c-h	90.97 a-d	192.06 a-e
1819	5.38 de	159.87 a-e	25.54 d-h	91.97 abc	190.79 a-e
Samurai S10	0.00 e	117.31 c-f	69.42 abc	82.82 a-e	186.73 a-e
Labelle	2.59 de	139.71 b-e	30.92 d-h	77.60 a-f	173.22 b-e
Aristotle X3R	38.16 ab	110.61 c-f	23.77 d-h	91.86 abc	172.54 b-e
Playmaker F	0.00 e	123.82 b-f	47.26 a-f	84.55 a-e	171.07 b-e
Skyhawk	5.14 de	147.84 b-e	16.49 e-h	68.55 ef	169.46 b-e
Autry	16.34 cde	121.32 b-f	30.38 d-h	88.25 a-e	168.04 b-e
Ninja S10	0.00 e	114.81 c-f	52.69 a-e	76.96 a-f	167.50 b-e
SP2622	7.73 cde	130.71 b-f	28.32 d-h	86.09 a-e	166.77 b-e
3964	7.53 cde	152.38 b-e	5.09 h	88.89 a-e	165.01 b-e
Prowler	0.00 e	125.33 b-f	36.05 b-h	72.85 c-f	161.39 b-f
Antebellum	9.74 cde	141.92 b-e	5.58 h	86.01 a-e	157.23 c-f
Outsider	0.00 e	131.01 b-f	7.19 gh	77.68 a-f	148.47 c-f
Mariner	0.00 e	100.38 def	24.41 d-h	36.14 g	124.79 def
Galleon	2.89 de	76.22 ef	35.08 b-h	71.09 def	114.18 ef
Placepack	2.49 de	78.17 ef	26.47 d-h	60.54 f	107.13 ef
Paladin	0.00 e	39.82 f	3.96 h	87.75 a-e	43.78 f
LSD	19.90	96.32	38.40	20.64	119.85

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 14. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) at Fourth Harvest on 9/5/2019, Vineland, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
7140	11.20 b-e ^x	113.59 a	22.41 b-e	90.20 ab	147.20 a
Green Flash	2.74 de	99.89 ab	39.09 ab	78.11 abc	141.72 ab
Galleon	2.54 de	48.53 c-f	57.28 a	89.74 ab	108.36 abc
SP2628	0.00 e	76.61 abc	26.47 bcd	93.28 ab	103.07 a-d
Playmaker	7.49 de	58.85 b-e	31.46 bc	79.16 abc	97.79 a-e
Boca	21.43 a-d	62.23 bcd	12.47 cde	95.44 ab	96.13 a-e
Turnpike	35.37 a	41.68 c-f	7.19 de	98.87 a	84.24 a-f
1819	29.74 ab	42.56 c-f	2.89 e	96.74 ab	75.19 b-g
Labelle	13.21 b-e	45.40 c-f	8.12 de	86.58 ab	66.73 c-h
Mercer	7.73 de	36.30 c-f	21.82 b-e	92.51 ab	65.85 c-h
7331	0.00 e	46.62 c-f	18.30 b-e	91.60 ab	64.92 c-h
Standout	4.89 de	32.58 c-f	22.31 b-e	89.73 ab	59.78 c-h
9325	0.00 e	43.73 c-f	12.91 cde	96.06 ab	56.65 c-h
3964	26.76 abc	24.12 def	1.57 e	100.00 a	52.44 c-h
Antebellum	16.49 a-e	28.86 c-f	6.70 de	100.00 a	52.05 c-h
FPP2862	5.28 de	30.82 c-f	15.41 cde	83.12 abc	51.51 c-h
Provider	8.56 cde	31.94 c-f	4.01 de	75.87 abc	44.52 c-h
Prowler	2.50 de	27.79 c-f	12.57 cde	89.81 ab	42.85 c-h
Green Machine	0.00 e	28.03 c-f	5.19 de	100.00 a	33.22 d-h
Aristotle X3R	10.52 cde	19.86 def	1.52 e	87.27 ab	31.90 e-h
SP2622	8.07 cde	14.48 def	7.09 de	48.92 c	29.65 e-h
FPP2866	0.00 e	22.41 def	6.80 de	72.18 abc	29.21 e-h
Skyhawk	5.28 de	20.74 def	3.08 e	82.79 abc	29.11 e-h
Playmaker F	0.00 e	25.78 def	2.98 e	97.40 a	28.76 e-h
Mariner	5.19 de	21.82 def	1.47 e	61.00 bc	28.47 e-h
Samurai S10	2.50 de	11.25 ef	6.46 de	100.00 a	20.20 fgh
Ninja S10	0.00 e	18.49 def	1.37 e	100.00 a	19.86 fgh
Placepack	0.00 e	12.38 ef	3.03 e	81.91 abc	15.41 fgh
3255	0.00 e	5.72 f	4.99 de	92.25 ab	10.71 gh
Autry	5.04 de	3.77 f	0.00 e	75.00 abc	8.81 gh
Outsider	0.00 e	6.46 f	0.00 e	66.67 abc	6.46 gh
Paladin	0.00 e	1.76 f	0.00 e	100.00 a	1.76 h
LSD	19.03	49.66	22.77	36.37	70.92

^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

Table 15. Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) for all Harvests in 2019, Vineland, NJ.

Variety/Line	XL	L	M	% Marketable	Total Marketable
3964	224.93 a ^x	798.70 ab	98.52 gh	94.82 abc	1122.20 a
1819	120.49 bc	857.60 a	125.14 c-g	94.00 a-e	1103.20 a
Antebellum	115.16 bc	779.90 a-d	147.84 b-g	95.74 ab	1042.90 ab
Turnpike	131.01 b	794.40 abc	108.36 fgh	97.42 a	1033.80 ab
7140	45.84 ef	762.70 a-e	109.78 fgh	91.42 a-f	918.30 abc
Prowler	17.95 ef	692.00 a-f	190.20 abc	88.59 a-h	900.10 a-d
Aristotle X3R	107.53 bcd	677.90 a-g	112.71 efg	93.27 a-e	898.10 a-d
Skyhawk	31.26 ef	672.60 a-h	131.74 b-g	86.76 b-i	835.60 b-e
Provider	34.24 ef	609.90 b-i	179.54 a-d	88.30 a-h	823.70 b-e
Mercer	45.84 ef	609.30 b-i	147.44 b-g	88.33 a-h	802.60 b-e
Boca	107.13 bcd	560.60 d-j	132.18 b-g	85.98 c-i	799.90 b-e
Green Machine	18.25 ef	594.90 b-i	138.00 b-g	92.44 a-f	751.10 c-f
Standout	38.11 ef	562.70 c-j	142.80 b-g	88.83 a-h	743.60 c-f
FPP2862	34.98 ef	525.10 f-j	172.44 a-f	91.04 a-f	732.50 c-f
9325	15.41 f	519.10 f-j	148.28 b-g	91.97 a-f	682.80 c-g
SP2628	10.18 f	540.60 e-j	122.69 d-g	92.76 a-e	673.50 c-g
Outsider	72.79 cde	544.90 e-j	45.10 hi	89.31 a-h	662.80 c-g
Labelle	48.04 ef	487.20 f-j	126.02 b-g	83.23 f-i	661.20 c-g
Autry	54.84 def	498.10 f-j	105.59 gh	94.67 abc	658.50 c-g
3255	14.28 f	444.90 g-k	190.20 abc	96.72 a	649.40 d-g
FPP2866	5.77 f	490.30 f-j	141.55 b-g	84.91 d-i	637.70 d-g
Playmaker F	12.57 f	457.50 g-j	160.97 a-g	90.84 a-f	631.00 efg
SP2622	18.44 ef	449.10 g-k	163.34 a-g	81.32 ghi	630.90 efg
7331	7.92 f	441.30 h-l	178.36 a-e	94.24 a-d	627.60 efg
Ninja S10	0.00 f	393.00 i-m	223.91 a	89.98 a-g	616.90 e-h
Samurai S10	7.58 f	390.20 i-m	191.72 ab	91.84 a-f	589.50 e-i
Green Flash	2.74 f	358.60 j-m	163.24 a-g	80.18 hi	524.60 f-i
Playmaker	7.48 f	347.70 j-m	163.00 a-g	78.71 i	518.20 f-i
Placepack	5.28 f	353.40 j-m	101.70 gh	85.08 d-i	460.40 g-j
Galleon	5.43 f	211.00 lm	139.86 b-g	84.74 e-i	356.30 hij
Mariner	10.37 f	216.00 lm	113.86 d-g	51.16 j	340.20 ij
Paladin	13.65 f	168.70 m	32.14 i	95.10 abc	214.50 j
LSD	56.85	233.42	66.36	3.66	262.91

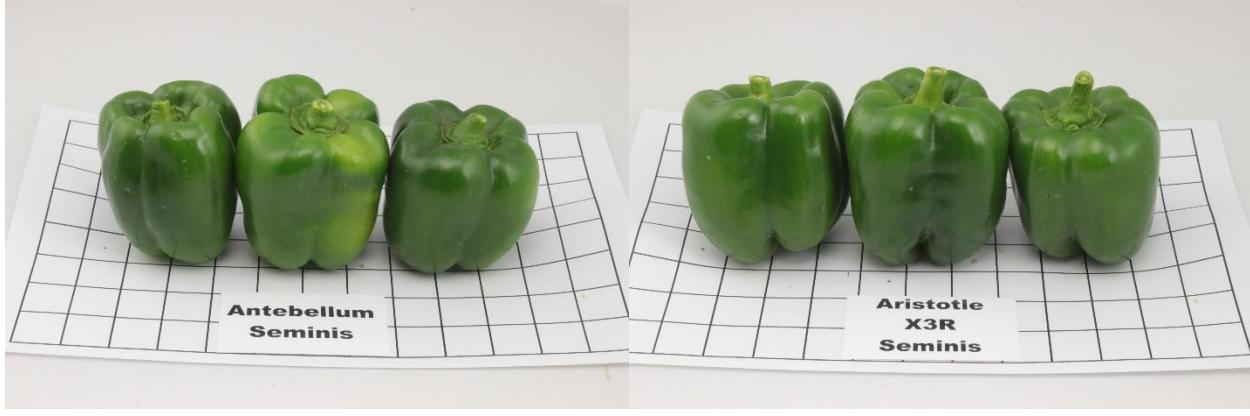
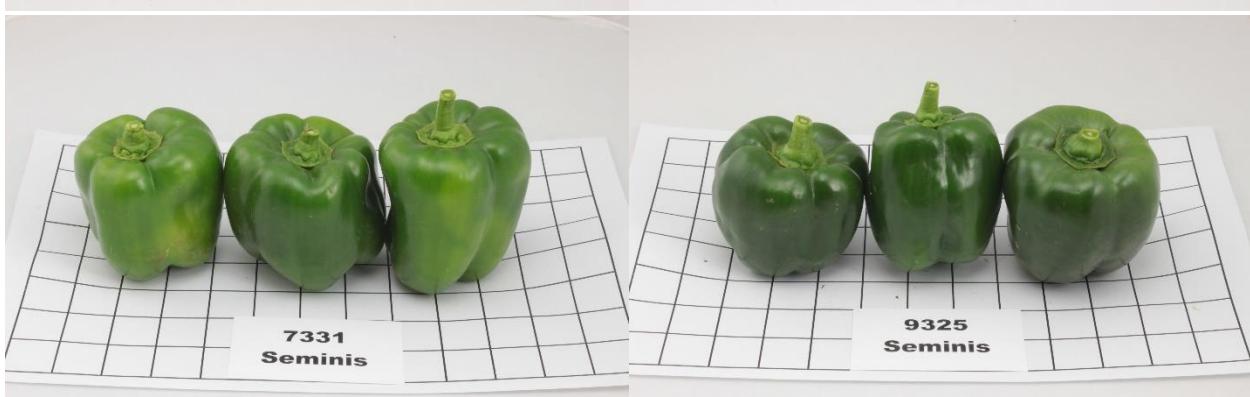
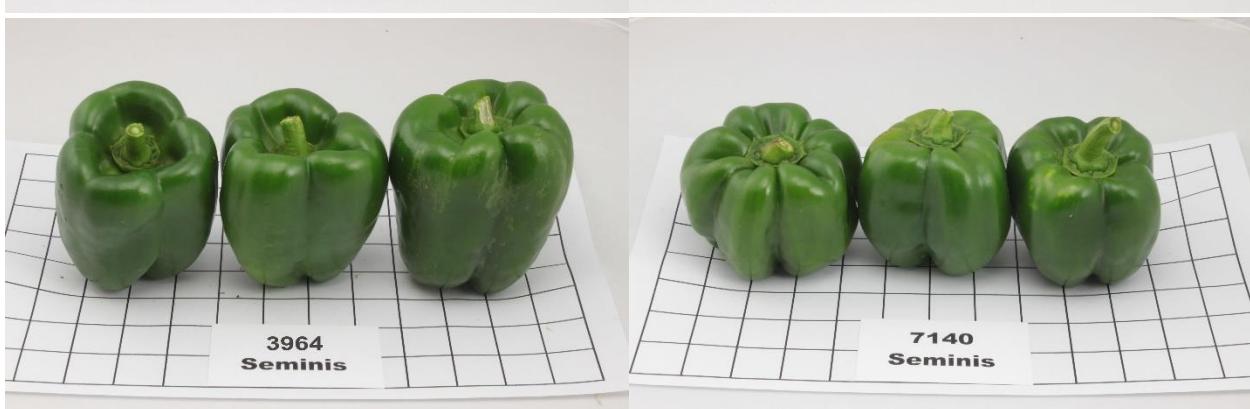
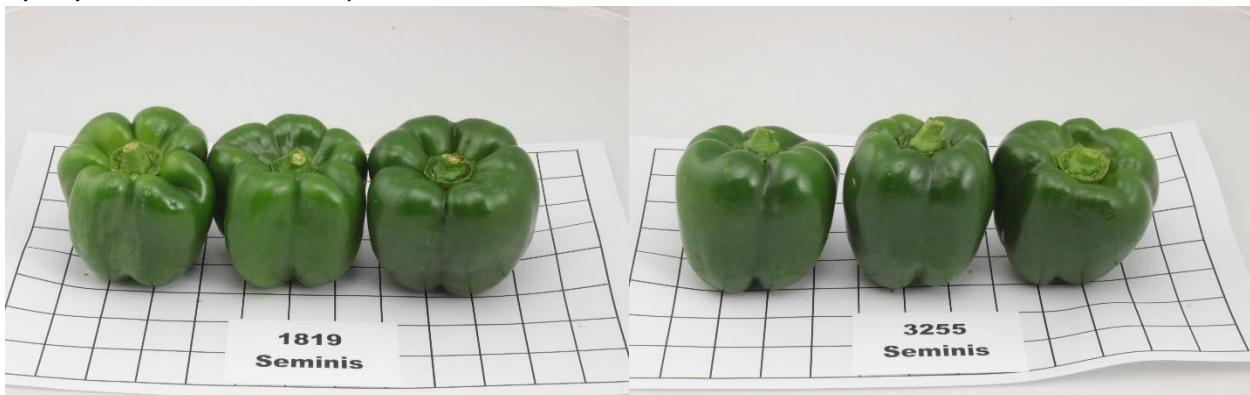
^xWithin columns, means followed by different letters are significantly different

XL = Extra-Large; L = Large; M = Medium

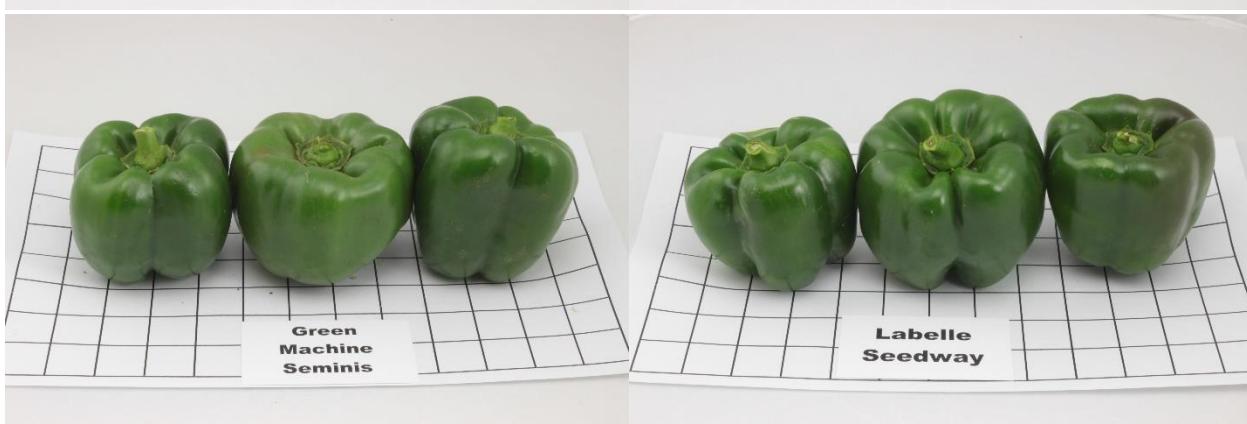
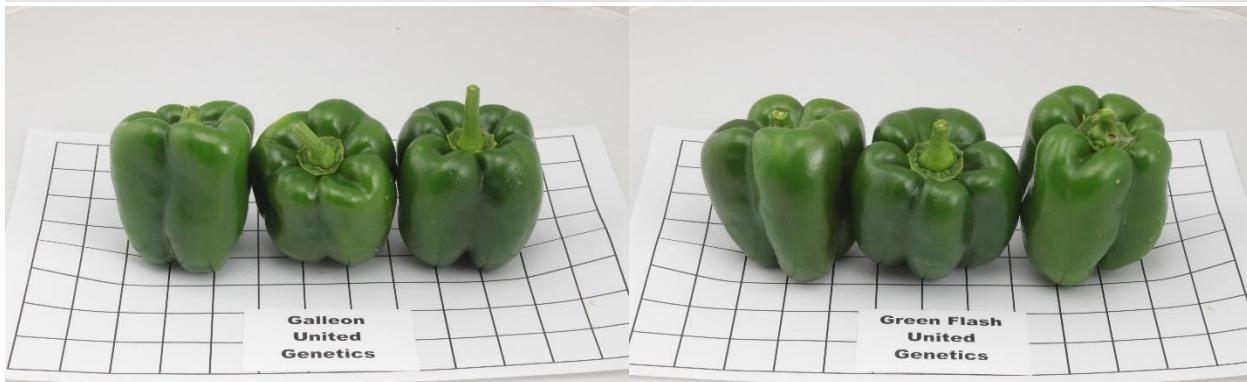
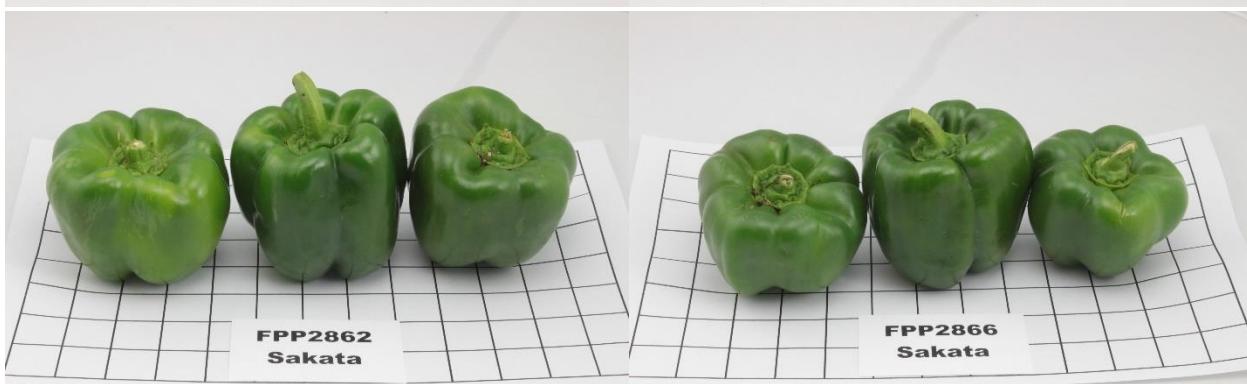
Table 16. Cultivar, Average Fruit Size Ratio (Length/Width), Wall Thickness, and Average Number of Lobes at RAREC and Vineland 2019.

Variety	RAREC			Vineland		
	L/W	Wall Thickness (mm)	No. Lobes	L/W	Wall Thickness (mm)	No. Lobes
1819	0.89	5.65	4.00	1.15	5.88	3.60
3255	1.00	6.45	3.80	0.90	5.12	3.75
3964	1.06	6.06	3.60	1.29	6.15	3.30
7140	0.93	5.97	3.80	1.24	5.55	3.30
7331	1.00	6.17	3.80	1.09	5.70	3.80
9325	0.84	5.73	3.40	1.04	5.03	3.10
Antebellum	0.95	6.50	4.00	1.22	6.00	3.60
Aristotle X3R	1.12	5.66	3.50	1.31	6.14	3.20
Autry	0.78	5.93	3.83	1.08	5.55	4.00
Boca	0.88	6.23	4.20	1.03	6.48	3.50
FPP2862	0.96	5.77	4.00	0.96	5.48	3.50
FPP2866	0.81	5.95	4.10	0.87	5.01	4.10
Galleon	1.02	6.27	3.88	1.21	5.81	3.80
Green Flash	1.06	6.22	3.90	1.09	5.27	4.00
Green Machine	0.93	5.97	4.10	1.08	5.44	3.40
Labelle	0.87	5.83	4.00	1.14	5.20	3.40
Mariner	1.01	6.50	0.00	1.02	5.86	3.60
Mercer	0.92	5.69	3.60	1.18	5.87	3.20
Ninja S10	0.85	5.40	4.00	1.05	5.45	3.67
Outsider	0.98	6.39	3.70	1.19	5.85	4.00
Placepack	-	-	-	1.02	6.73	3.60
Playmaker	0.95	5.95	3.50	1.14	5.88	3.50
Provider	0.95	5.73	3.40	1.09	6.37	3.90
Prowler	0.97	5.93	3.40	1.03	6.41	3.70
Samurai S10	1.01	6.04	3.70	1.04	5.70	3.29
Skyhawk	0.74	5.72	3.50	0.92	6.14	3.50
SP2622	0.86	5.87	4.30	0.86	4.97	4.60
SP2628	0.86	5.92	4.20	1.22	4.82	3.20
Standout	0.83	6.23	3.80	0.95	4.99	3.70
Turnpike	1.04	6.26	3.70	1.38	6.30	3.30

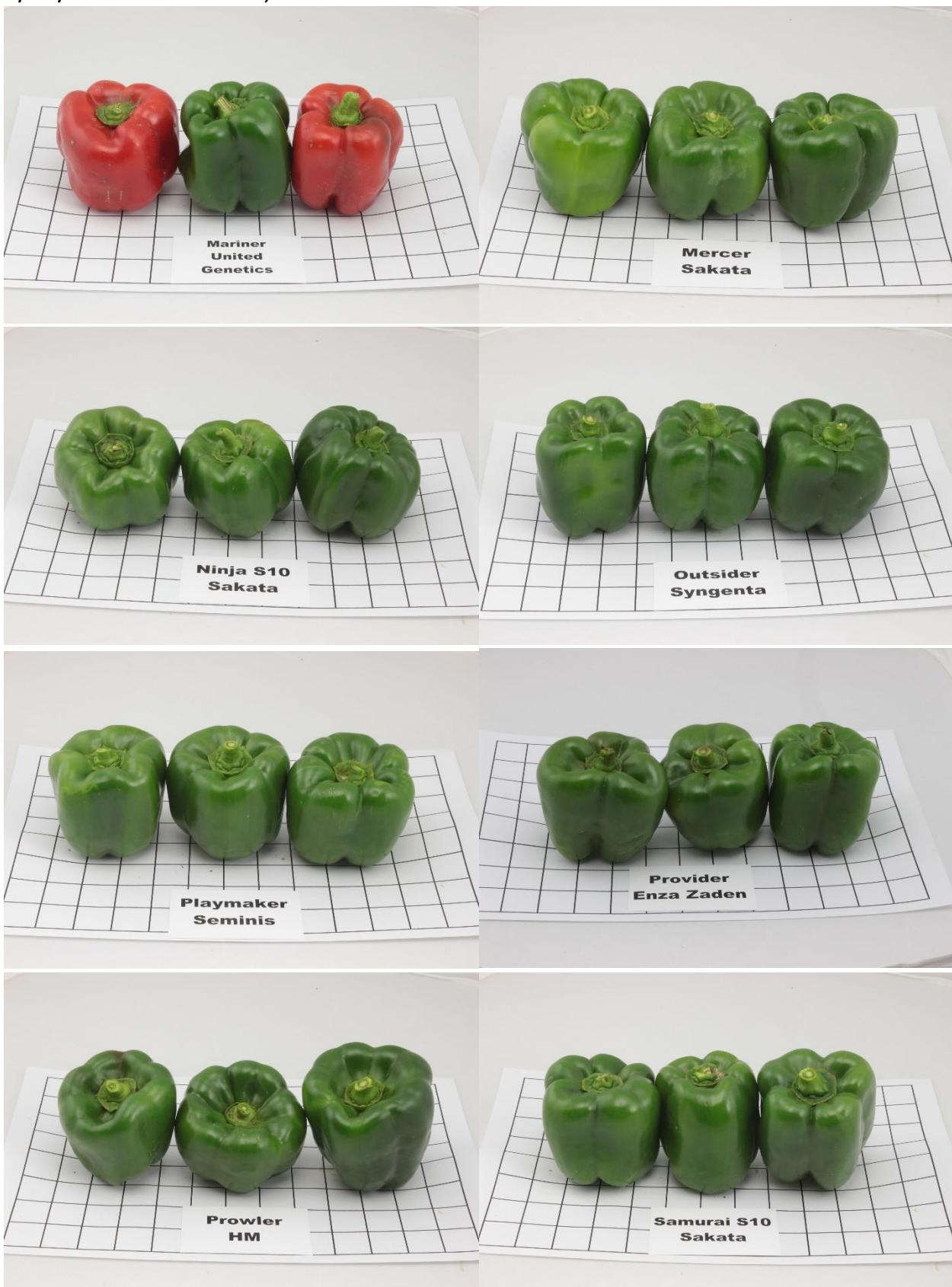
Appendix 1. Images of cultivars and breeding lines taken at harvest two on 9/29/2019 at Vineland, NJ.



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