

# **BELL PEPPER BACTERIAL LEAF SPOT RESISTANCE VARIETY TRIAL RESULTS IN NEW JERSEY – 2021**



Wesley Kline, PhD<sup>1</sup> and Andy Wyenandt, PhD<sup>2</sup>

<sup>1</sup>Agricultural Agent  
Rutgers Cooperative Extension of Cumberland County  
291 Morton Ave., Millville, NJ 08332  
[wkline@njaes.rutgers.edu](mailto:wkline@njaes.rutgers.edu)

<sup>2</sup>Extension Specialist in Vegetable Pathology  
Rutgers Agricultural Research and Extension Center  
121 Northville Rd., Bridgeton, NJ 08302  
[wyenandt@njaes.rutgers.edu](mailto:wyenandt@njaes.rutgers.edu)

## **Introduction:**

Bacterial leaf spot (BLS) is caused by the pathogens, *Xanthomonas euvesicatoria*, *X. vesicatoria*, *X. perforans*, or *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 years. Early survey results from 2019 suggest *Xanthomonas euvesicatoria* was 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. Disease development is favored by high humidity, hard driving rains, vigorous plant growth, infested stakes, and working in the field when plants are wet.

## **Materials and Methods:**

Since 2016, we have screened varieties and advanced breeding lines with resistance to all races (often referred to as X10R resistance) of bacterial leaf spot. In 2021, One hundred twenty-eight cell trays were seeded on March 17 and entries transplanted June 9<sup>th</sup> in a randomized complete block design with four replications (18 plants/plot). The trial was established at the Rutgers Agricultural Research and Extension Center (RAREC) in Upper Deerfield, New Jersey on black plastic mulch with one drip line between double rows 18 inches between plants and 80 inches between beds center to center.

All cultural practices such as staking and tying, fertilization and pest management were carried out using standard recommendations except no fungicides were applied to control BLS. Plots were observed each week for presence of BLS and rated on October 22 after the last harvest. Rating scale: 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, re-growth good and 4=Heavy defoliation, stunted growth with very little regrowth.

The entries were harvested 5 times starting 68 days after transplanting from August 17 to October 13. Peppers were graded based on weight (extra-large >0.49 lbs., large 0.33 – 0.49 lbs., medium 0.25 – 0.32 lbs., commercials, and culls <0.25 lbs.).

Ten large and extra-large fruit were randomly selected from the four plots of each variety to assess fruit characteristics (fruit size, wall thickness and number of lobes) at the second harvest. Prior to cutting the fruit, the length and width (diameter) of each fruit were measured with a digital caliper at the fruit middle for width and longest points from the top and bottom for length. The fruit were cut in the middle horizontal to the stem to measure the wall thickness (digital caliper) and count the number of lobes. See Appendix 1 for images of all varieties.

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

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

Variety	Company	Disease Resistance <sup>1</sup>
Captain (HMC 1996)	Harris Moran	HR: Xcv: 1-10
Revolution	Harris Moran	HR: Xcv: 1,2,3,5; IR: Pc; IR: CMV
Mercer	Sakata	HR: TMV:0; Xcv 0-3, 7-8; IR: Pc
Nitro S10	Sakata	HR: TMV:0, IR: Xcv 0-10
Shogun S10	Sakata	IR: Xcv; IR: TSWV; HR: TMV
Labelle	Seedway	IR: Xcv 1-10
Sailfish	Seedway	IR: Xcv 1-10; HR: Tm:0; IR: Pc
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
9325	Seminis	HR: Xcv: 0-10
Antebellum	Seminis	HR: Tm: 0, IR: TSWV, Xcv 1-10
Aristotle X3R	Seminis	HR: PVY: 0, Tm: 0; Xcv: 0-3, 7, 8
Camelot X3R	Seminis	Xcv 1-3
Playmaker	Seminis	HR: Xcv: 0-10; HR: Tm:0
Tarpon	Seminis	HR:Tm:0, Xcv: 0-10; Pc
Turnpike	Seminis	HR: Tm; Xcv: 0-5, 7-9; IR: Pc
RPP 52214	Syngenta	Not known
RPP 52243	Syngenta	Not known
RPP 52254	Syngenta	Not known
Intruder	Syngenta	HR: Xcv: 1-3; IR: Pc
Outsider	Syngenta	HR: TSWV; Xcv: 1-10
Paladin	Syngenta	HR: Pc

<sup>1</sup>PVY = Potato virus Y; 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 (°F), and total rainfall, Upper Deerfield, New Jersey May-October 2021.**

Month	Average	Minimum	Maximum	Rainfall (inches)
May	68.1	38.8	91.8	3.22
June	77.3	51.3	95.2	2.91
July	80.1	58.5	93.0	8.50
August	80.6	57.9	94.6	4.07
September	75.4	48.9	87.7	4.31
October	75.7	43.2	83.5	3.77

## Discussion:

The variety '3964' had the highest total marketable yield for the first harvest, but it was not statistically different from 'Turnpike', 'Revolution', 'Paladin', '1819', 'Aristotle', or 'Shogun'. (Table3). Most of the '3964' yield came from large fruit. 'Turnpike', 'Revolution' had the highest yield of extra-large fruit, but was not statistically different than 'Revolution', '1819' or 'Aristotle'.

**Table 3. 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 8/17/2021, Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>		L		M		% Marketable		Total Marketable
<b>3964</b>	49.91	bcd <sup>2</sup>	222.27	a	22.91	bc	96.30	ab	295.10 a
<b>Turnpike</b>	94.80	a	144.13	abc	19.68	bc	96.99	ab	255.92 ab
<b>Revolution</b>	58.50	abc	158.62	ab	34.55	abc	92.89	ab	251.67 abc
<b>Paladin</b>	35.72	b-e	113.70	b-e	51.89	ab	97.94	ab	201.30 a-d
<b>1819</b>	63.10	ab	126.99	bcd	8.98	c	95.46	ab	199.07 a-d
<b>Aristotle X3R</b>	63.17	ab	95.74	b-f	18.54	bc	98.70	ab	177.45 a-e
<b>Shogun</b>	21.88	cde	116.87	b-e	37.82	abc	99.28	a	176.57 a-e
<b>Playmaker</b>	25.15	b-d	78.50	b-h	60.48	a	95.92	ab	164.13 b-f
<b>Captain</b>	26.09	b-d	103.58	b-f	19.84	bc	96.57	ab	149.51 b-g
<b>9325</b>	1.72	e	96.58	b-g	32.83	abc	99.73	a	131.13 b-h
<b>Outsider</b>	31.70	b-d	85.66	b-h	7.55	c	99.24	a	124.91 c-i
<b>3255</b>	0.00	e	91.72	b-g	15.95	bc	100	a	107.67 d-i
<b>Mercer</b>	23.30	b-d	60.64	c-i	3.50	c	99.24	a	87.44 d-i
<b>Camelot X3R</b>	18.34	cde	62.91	c-i	5.32	c	95.86	ab	86.57 d-i
<b>Tarpon</b>	4.44	e	63.46	c-h	13.45	c	90.22	ab	81.35 d-i
<b>Antebellum</b>	16.21	de	51.92	d-h	2.88	c	98.17	ab	71.01 e-i
<b>Nitro</b>	.35	e	54.29	d-i	.97	c	97.69	ab	55.61 e-i
<b>LaBelle</b>	7.26	e	33.90	e-i	3.73	c	96.82	ab	44.89 f-i
<b>RPP52243</b>	7.58	e	20.74	f-i	13.16	c	98.99	ab	41.49 f-i
<b>Intruder</b>	18.80	cde	17.31	ghi	4.70	c	97.71	ab	40.81 f-i
<b>RPP 52254</b>	0.00	e	17.66	ghi	18.41	bc	82.94	b	36.07 g-i
<b>Sailfish</b>	0.00	e	6.19	hi	2.85	c	100	a	9.04 hi
<b>RPP 52214</b>	0.00	e	1.20	i	1.94	c	50.00	c	3.14 i
<b>LSD</b>	<b>40.60</b>		<b>84.36</b>		<b>37.41</b>		<b>16.19</b>		<b>127.94</b>

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different

At the second harvest, 'LaBelle' had the highest total yield of which most came from large fruit. 'LaBelle' differed statically from '3964', 'Outsider', RPP 52214', 'Revolution', 'Sailfish', 'Camelot', 'Playmaker', 'RPP 52254' and '9325'. The variety 'Turnpike' had the highest yield of extra-large fruit but was not statically different from '1819' or 3964' (Table 4). 'Sailfish' yielded statistically more medium fruit than other entries. It was the variety that yielded fewer large and extra-large fruit than most other entries.

**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 Second Harvest on 8/30/2021, Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>		L		M		% Marketable		Total Marketable	
LaBelle	19.06	cd <sup>2</sup>	467.72	a	119.40	b-d	94.6	a-e	606.18	a
Aristotle X3R	39.54	bcd	446.36	ab	64.95	d-g	93.5	b-f	550.85	ab
Mercer	9.98	d	465.42	a	66.31	c-g	96.3	a-d	541.71	abc
Tarpon	5.12	d	374.67	a-d	134.67	bc	96.5	a-d	514.46	a-d
Nitro	17.57	cd	403.87	abc	78.86	c-g	96.9	abc	500.29	a-d
Turnpike	110.94	a	359.82	a-d	26.87	g	96.2	a-d	497.63	a-d
Antebellum	16.85	cd	362.61	a-d	108.80	b-f	98.4	ab	488.27	a-d
1819	75.03	ab	362.64	a-d	30.82	g	93.0	c-g	468.50	a-d
Intruder	22.72	cd	367.96	a-d	59.64	d-g	93.9	b-f	450.31	a-d
RPP 52243	13.16	cd	278.99	cd	153.59	b	93.8	b-f	445.74	a-d
Paladin	28.20	cd	325.57	a-d	83.62	c-g	93.1	c-g	437.38	a-d
3255	0.00	d	321.38	a-d	113.66	b-d	99.5	a	435.05	a-d
Shogun	20.61	cd	366.60	a-d	36.07	g	97.6	abc	423.28	a-d
Captain	32.54	cd	316.72	a-d	69.23	c-g	88.1	gh	418.49	a-d
3964	105.01	a	256.01	cd	37.34	g	91.9	d-g	398.36	bcd
Outsider	33.97	bcd	288.16	bcd	65.96	c-g	84.2	h	388.09	bcd
RPP 52214	10.31	d	255.79	cd	117.46	b-e	95.7	a-e	383.55	bcd
Revolution	27.29	cd	318.79	a-d	32.99	g	88.9	fgh	379.08	bcd
Sailfish	0.00	d	76.42	e	294.48	a	99.1	a	370.91	bcd
Camelot X3R	52.73	bc	277.27	cd	37.69	g	93.5	b-f	367.70	bcd
Playmaker	11.80	cd	296.91	bcd	43.72	fg	94.5	a-e	352.43	cd
RPP 52254	1.88	d	211.29	de	126.21	bcd	95.5	a-e	339.37	d
9325	16.66	cd	270.34	cd	52.21	efg	90.9	efg	339.21	d
LSD	41.87		163.68		68.99		5.02		196.56	

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different

The variety 'Antebellum' had the highest yield for total marketable fruit for the third harvest but was not statistically different from 'Shogun', 'LaBelle', 'Sailfish', 'Intruder', 'Outsider', 'RPP 52254', 'Tarpon', 'Captain', '3964', or 'Paladin'. 'Turnpike' had statically more extra-large fruit yield than any other entry for the third harvest (Table 5).

**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 Third Harvest on 9/10/2021, Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>		L		M		% Marketable		Total Marketable	
Antebellum	4.86	b <sup>2</sup>	149.96	a-d	91.63	a	92.39	a-e	246.45	a
RPP 52214	7.71	b	145.56	a-e	90.81	a	96.87	abc	244.09	a
Turnpike	35.16	a	184.55	ab	20.78	de	88.34	c-f	240.49	ab
Camelot X3R	14.45	b	192.81	a	30.53	de	90.09	a-f	236.79	ab
9325	3.66	b	155.60	abc	76.42	abc	92.11	a-e	235.69	ab
Revolution	12.51	b	141.83	a-e	42.78	b-e	86.95	c-f	197.12	abc
1819	12.54	b	139.76	a-f	25.67	de	85.46	d-f	177.97	a-d
Playmaker	3.47	b	112.66	b-g	51.14	a-e	88.06	c-f	167.27	a-d
Nitro	0.00	b	103.46	c-h	51.21	a-e	94.46	a-d	154.66	a-e
3255	0.00	b	88.25	c-i	59.96	a-d	99.50	ab	148.21	a-e
Mercer	11.67	b	106.24	c-h	29.23	de	90.95	a-f	147.14	a-e
Aristotle X3R	3.92	b	103.26	c-h	38.21	cde	92.61	a-e	145.39	a-e
RPP 52243	0.00	b	81.77	d-i	59.86	a-d	93.20	a-d	141.63	a-e
Shogun	13.32	b	110.55	c-h	10.53	e	88.42	c-f	134.41	b-e
LaBelle	1.65	b	74.84	e-i	40.93	b-e	90.56	a-f	117.42	cde
Sailfish	0.00	b	28.20	i	83.62	ab	100.00	a	111.82	cde
Intruder	3.86	b	87.83	c-i	16.59	de	76.34	g	108.28	cde
Outsider	7.36	b	77.23	d-i	20.74	de	82.83	efg	105.33	cde
RPP 52254	0.00	b	50.46	ghi	51.50	a-e	94.00	a-d	101.96	cde
Tarpon	6.32	b	59.60	ghi	28.59	de	89.37	b-f	94.51	cde
Captain	0.00	b	58.18	ghi	20.87	de	76.05	g	79.05	de
3964	1.88	b	66.64	f-i	8.23	e	86.06	d-f	76.75	de
Paladin	0.00	b	38.54	hi	14.71	de	80.85	fg	53.25	e
LSD	14.64		73.65		45.38		10.19		107.37	

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different

For the fourth harvest, '3964' had statistically more extra-large fruit and a higher total marketable yield, but was not statistically different from 'Intruder', 'Mercer', 'Antebellum', 'Playmaker', 'Nitro', '9325', 'Camelot', '1819', '3255' or 'sailfish' (Table 6).

**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 Fourth Harvest on 9/24/2021, Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>		L		M		% Marketable		Total Marketable
<b>3964</b>	72.86	a <sup>2</sup>	65.50	a-d	15.23	b-e	92.72	ab	152.52 a
<b>Intruder</b>	5.06	cd	90.10	a	25.83	abc	93.42	ab	120.99 ab
<b>Mercer</b>	5.44	cd	85.05	ab	27.19	ab	97.83	a	117.68 abc
<b>Antebellum</b>	7.45	cd	75.42	abc	21.72	bcd	92.92	ab	104.59 a-d
<b>Playmaker</b>	17.73	bcd	66.12	a-d	17.34	b-e	95.59	ab	101.19 a-e
<b>Nitro</b>	9.76	cd	75.19	abc	13.16	b-e	90.44	abc	98.11 a-e
<b>9325</b>	9.04	cd	62.20	a-d	26.12	abc	90.09	abc	97.36 a-e
<b>Camelot X3R</b>	3.70	cd	64.04	a-d	22.40	bcd	81.05	bcd	90.13 a-e
<b>1819</b>	33.77	b	37.43	a-d	14.07	b-e	92.95	ab	85.27 a-e
<b>3255</b>	1.98	cd	66.67	a-d	16.40	b-d	98.54	a	85.05 a-e
<b>Sailfish</b>	0.00	d	43.69	a-d	40.12	a	100.00	a	83.81 a-e
<b>Turnpike</b>	20.58	bc	45.73	a-d	11.47	cde	96.32	a	77.79 b-e
<b>Outsider</b>	17.50	bcd	38.34	a-d	16.43	b-e	77.49	cd	72.28 b-e
<b>Aristotle X3R</b>	10.56	cd	45.34	a-d	13.06	b-e	85.86	abc	68.97 b-e
<b>RPP 52254</b>	18.11	bcd	31.18	bcd	12.67	b-e	96.57	a	61.97 b-e
<b>Shogun</b>	8.95	cd	33.80	a-d	16.63	b-e	86.96	abc	59.38 b-e
<b>RPP 52243</b>	1.82	cd	30.86	bcd	15.23	b-e	97.88	a	47.90 b-e
<b>Paladin</b>	5.70	cd	38.86	a-d	2.85	e	92.44	ab	47.42 cde
<b>Tarpon</b>	5.31	cd	24.94	cd	16.04	b-e	96.09	a	46.28 cde
<b>Captain</b>	8.39	cd	18.47	d	11.41	cde	67.89	de	38.28 de
<b>Revolution</b>	5.67	cd	18.64	d	11.83	b-e	60.96	e	36.14 de
<b>RPP 52214</b>	7.23	cd	18.70	d	8.55	de	92.48	ab	34.49 de
<b>LaBelle</b>	0.00	d	16.89	d	12.19	b-e	87.99	abc	29.07 e
<b>LSD</b>	<b>19.37</b>		<b>56.34</b>		<b>15.48</b>		<b>14.66</b>		<b>73.20</b>

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different

On the fifth harvest, 'Paladin' had the highest total marketable yield and was statistically different from all other varieties except 'Playmaker' and 'Outsider' and had the highest large fruit yield. The yield of extra-large fruit decreased for most entries compared to the fourth harvest (Table 7). 'Sailfish' continued to produce only medium and large fruit.

**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 Fifth Harvest on 10/13/2021, Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>		L		M		% Marketable		Total Marketable	
Paladin	3.47	e <sup>2</sup>	286.61	a	25.38	abc	96.81	ab	315.45	a
Playmaker	27.48	ab	122.97	b	42.81	a	97.46	a	193.27	ab
Outsider	25.86	abc	103.46	b	40.74	a	94.84	abc	170.06	abc
3964	38.05	a	76.52	b	29.66	abc	93.73	abc	144.23	bc
Mercer	24.73	a-d	73.90	b	36.98	ab	96.81	ab	135.61	bc
9325	8.72	e	65.57	b	23.11	abc	96.85	ab	97.39	bc
1819	31.24	a	44.50	b	19.51	abc	98.14	a	95.26	bc
3255	3.73	e	59.64	b	27.23	abc	99.03	a	90.59	bc
Shogun	8.65	e	47.25	b	25.99	abc	99.32	a	81.90	bc
Sailfish	0.00	e	35.26	b	43.92	a	100.00	a	79.18	bc
Intruder	14.71	b-e	41.13	b	22.04	abc	90.30	abc	77.88	bc
Aristotle X3R	11.96	cde	45.80	b	19.28	abc	97.42	ab	77.04	bc
LaBelle	8.85	e	41.87	b	24.28	abc	94.46	abc	75.00	bc
Tarpon	8.46	e	41.58	b	23.79	abc	84.73	c	73.83	bc
RPP 52254	6.38	e	32.83	b	23.01	abc	98.86	a	62.23	bc
Nitro	8.20	e	40.77	b	10.73	c	97.00	ab	59.70	bc
Antebellum	9.37	e	36.56	b	13.35	bc	95.22	abc	59.28	bc
Turnpike	6.64	e	30.53	b	20.94	abc	98.69	a	58.11	bc
RPP 52243	8.36	e	35.72	b	10.08	c	95.63	abc	54.16	bc
Revolution	5.90	e	14.49	b	21.29	abc	85.92	bc	41.68	bc
RPP 52214	3.60	e	25.44	b	7.39	c	89.36	abc	36.43	bc
Captain	9.72	de	10.99	b	9.66	c	92.75	abc	30.37	c
Camelot XR3	5.28	e	9.63	b	5.09	c	97.99	a	20.00	c
LSD	15.26		157.13		24.74		11.50		162.16	

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different



Total Harvest data is summarized in table 8. ‘Turnpike’ had the highest marketable yield (extra-large, large and medium) fruit, but was not statistically different from ‘3964’, ‘Paladin’, ‘Mercer’, ‘1819’, ‘Aristotle’, ‘Playmaker’, ‘Antebellum’, ‘Revolution’, or ‘9325’. ‘Turnpike’, ‘3964’ and ‘1819’ had statistically more extra-large fruit than the other entries. The variety ‘Sailfish’ produced statistically more medium fruit than other entries, but had no extra-large fruit. For markets that require extra-large peppers ‘Sailfish’ would not be acceptable based on this trial.

**Table 8. Total Extra-Large, Large, and Medium Sized Fruit (in 28 Lb. Boxes per Acre); Percent Marketable Yield, and Total Marketable (Boxes per Acre) for all 5 Harvests in 2021 Upper Deerfield, NJ.**

Variety/Line	XL <sup>1</sup>	L	M	% Marketable	Total Marketable
Turnpike	268.13 a <sup>2</sup>	764.8 ab	97.04 i	95.3 cde	1129.9 a
3964	267.71 a	686.9 abc	112.30 i	93.2 c-f	1067.0 ab
Paladin	73.09 b-e	803.3 a	178.45 b-i	94.4 c-f	1054.8 ab
Mercer	75.13 b-e	791.2 ab	163.22 c-i	95.8 bcd	1029.6 abc
1819	215.69 a	711.3 abc	99.05 i	92.0 c-f	1026.1 abc
Aristotle	129.16 b	736.5 abc	154.05 d-i	93.8 c-f	1019.7 abc
Playmaker	85.63 b-e	677.2 a-d	215.50 b-f	94.6 c-f	978.3 abc
Antebellum	54.74 c-g	676.5 a-d	238.38 bc	96.0 abc	969.6 abc
Revolution	109.87 bc	652.4 a-d	143.45 f-i	87.8 ghi	905.7 abcd
9325	39.80 d-g	650.3 a-d	210.70 b-g	93.1 c-f	900.8 abcd
Shogun	73.41 b-e	675.1 a-d	127.05 hi	95.6 bcd	875.5 bcde
LaBelle	36.82 d-g	635.2 a-d	200.53 b-h	94.0 c-f	872.6 bcde
Nitro	35.87 d-g	677.6 a-d	154.92 d-i	96.4 abc	868.4 bcde
3255	5.70 fg	627.7 a-d	233.20 bcd	99.2 ab	866.6 bcde
Outsider	116.39 bc	592.9 a-d	151.42 e-i	87.8 hi	860.7 bcde
Tarpon	29.66 efg	564.2 a-e	216.54 b-f	95.1 c-f	810.4 cdef
Camelot	93.50 bcd	606.7 a-d	101.02 i	91.6 fgh	801.2 cdef
Intruder	65.15 c-f	604.3 a-d	128.80 hi	91.4 fgh	798.3 cdef
RPP 52243	30.92 d-g	448.1 de	251.93 b	93.8 c-f	730.9 def
Captain	76.75 b-e	507.9 cde	131.00 hi	87.6 i	715.7 def
RPP 52214	28.85 efg	446.7 de	226.16 b-e	95.6 bcd	701.7 def
Sailfish	0.00 g	189.8 f	465.00 a	99.7 a	654.8 ef
RPP 52254	26.38 efg	343.4 ef	231.80 b-e	95.5 bcd	601.6 f
LSD	63.20	235.57	81.72	3.82	238.24

<sup>1</sup>XL = Extra-Large; L = Large; M = Medium sized fruit

<sup>2</sup>Within columns, means followed by different letters are significantly different

The trial was evaluated weekly for BLS with the first observed BLS symptoms on July 14 in two plots of the variety 'Paladin' and one plot of 'Camelot'. By July 20 all plots of 'Paladin' showed symptoms along with at least one plot of twelve other entries. The varieties that did not show symptoms were 'Captain', 'Sailfish', 'LaBelle', '3255', '9325', 'Antebellum', 'Tarpon', 'Aristotle' and 'Playmaker'. Plots were rated on October 22 after the last harvest (Table9). Plots continued to be observed through November 6 with no changes to the varieties that were infected or the severity of the infections. The entries that did not show any BLS symptoms when rated included 'Nitro', 'Shogun', 'LaBelle', 'Sailfish', '3255', '9325', 'Antebellum', 'RPP 52214', 'RPP 52243' and 'Outsider'. There were differences between varieties with symptoms when first observed and the final rating. This is the results of plants putting out new growth by the end of the season. Note that these were leaf symptoms, not fruit symptoms. No fruit symptoms were observed during harvest. Plants were sampled for bacterial leaf spot and the laboratory identified the pathogen as *Xanthomonas euvesicatoria* which was also isolated from other pepper fields in South Jersey.

Fruit quality for length/diameter, wall thickness and number of lobes are presented in Table 9. The industry generally looks for fruit that are slightly elongated. Varieties with a length/diameter (L/W) greater than 1.00 is elongated. The varieties with the longest fruit were '3964', 'Camelot' and 'Paladin'. Fruit less than 1.00 tend to have "squatty" fruit. Those less than 1.00 were 'Revolution', 'Nitro', 'Captain', 'Labelle', and '9325'.

'Turnpike' and '1819' had the thickest walls while 'RPP 52254', '9325' and 'Camelot' had the thinnest. Most entries averaged close to 4 lobes per fruit with 'Tarpon' having the lowest number 3.3 lobes per fruit.

Table 9. Bacterial Leaf Spot Rating, Fruit Size, Wall Thickness, and Number of Lobes. RAREC, 2021.

Variety	Seed Company	Rating <sup>1</sup>	L/W <sup>2</sup>	Wall Thickness (mm)	No. Lobes
<b>Captain</b>	Harris Moran	1.00	0.96	6.39	4.1
<b>Revolution</b>	Harris Moran	4.00	0.94	6.36	4.0
<b>Mercer</b>	Sakata	3.75	1.01	6.37	3.6
<b>Nitro S10</b>	Sakata	0.00	0.92	6.41	4.1
<b>Shogun S10</b>	Sakata	0.00	1.00	6.25	4.3
<b>Labelle</b>	Seedway	0.00	0.96	6.45	3.8
<b>Sailfish</b>	Seedway	0.00	1.01	6.29	3.8
<b>1819</b>	Seminis	4.00	1.06	7.16	3.8
<b>3255</b>	Seminis	0.00	1.01	6.80	4.0
<b>3964</b>	Seminis	3.50	1.15	6.68	3.5
<b>9325</b>	Seminis	0.00	0.94	5.75	3.6
<b>Antebellum</b>	Seminis	0.00	1.12	6.58	3.7
<b>Aristotle X3R</b>	Seminis	2.50	1.05	6.94	4.0
<b>Camelot X3R</b>	Seminis	4.00	1.15	5.77	3.7
<b>Playmaker</b>	Seminis	0.25	1.05	6.45	3.6
<b>Tarpon</b>	Seminis	0.25	1.05	6.64	3.3
<b>Turnpike</b>	Seminis	4.00	1.05	7.17	4.0
<b>RPP 52214</b>	Syngenta	0.00	1.07	6.28	4.1
<b>RPP 52243</b>	Syngenta	0.00	1.11	5.52	3.8
<b>RPP 52254</b>	Syngenta	0.50	1.13	6.49	3.9
<b>Intruder</b>	Syngenta	3.75	1.09	7.00	3.7
<b>Outsider</b>	Syngenta	0.00	1.01	6.15	4.3
<b>Paladin</b>	Syngenta	3.50	1.14	6.61	3.8

<sup>1</sup>Rating Scale for BLS symptom development done on October 22:

0=No symptom development

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

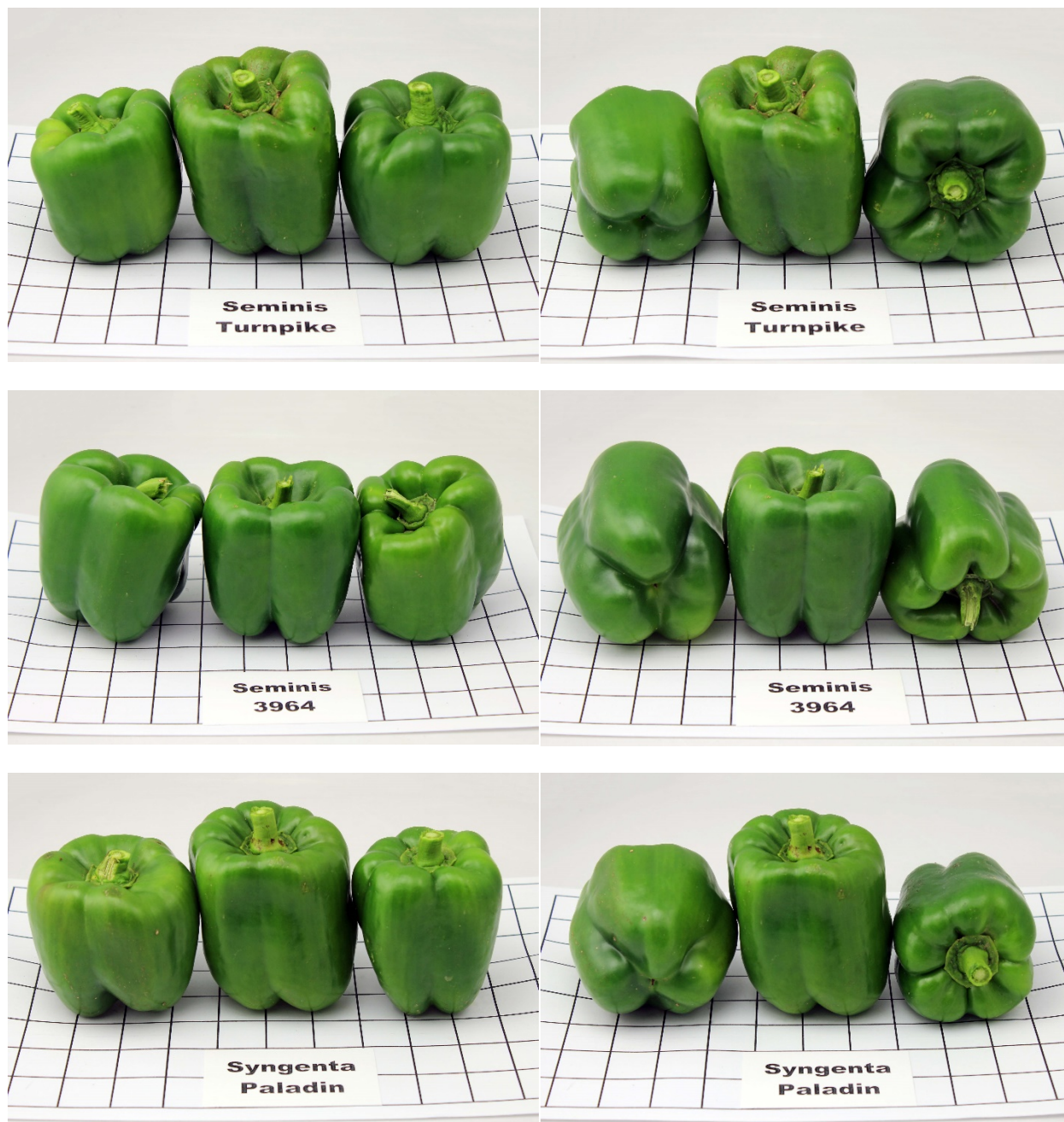
2=Major leaf spotting and marginal necrosis present, good growth

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

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

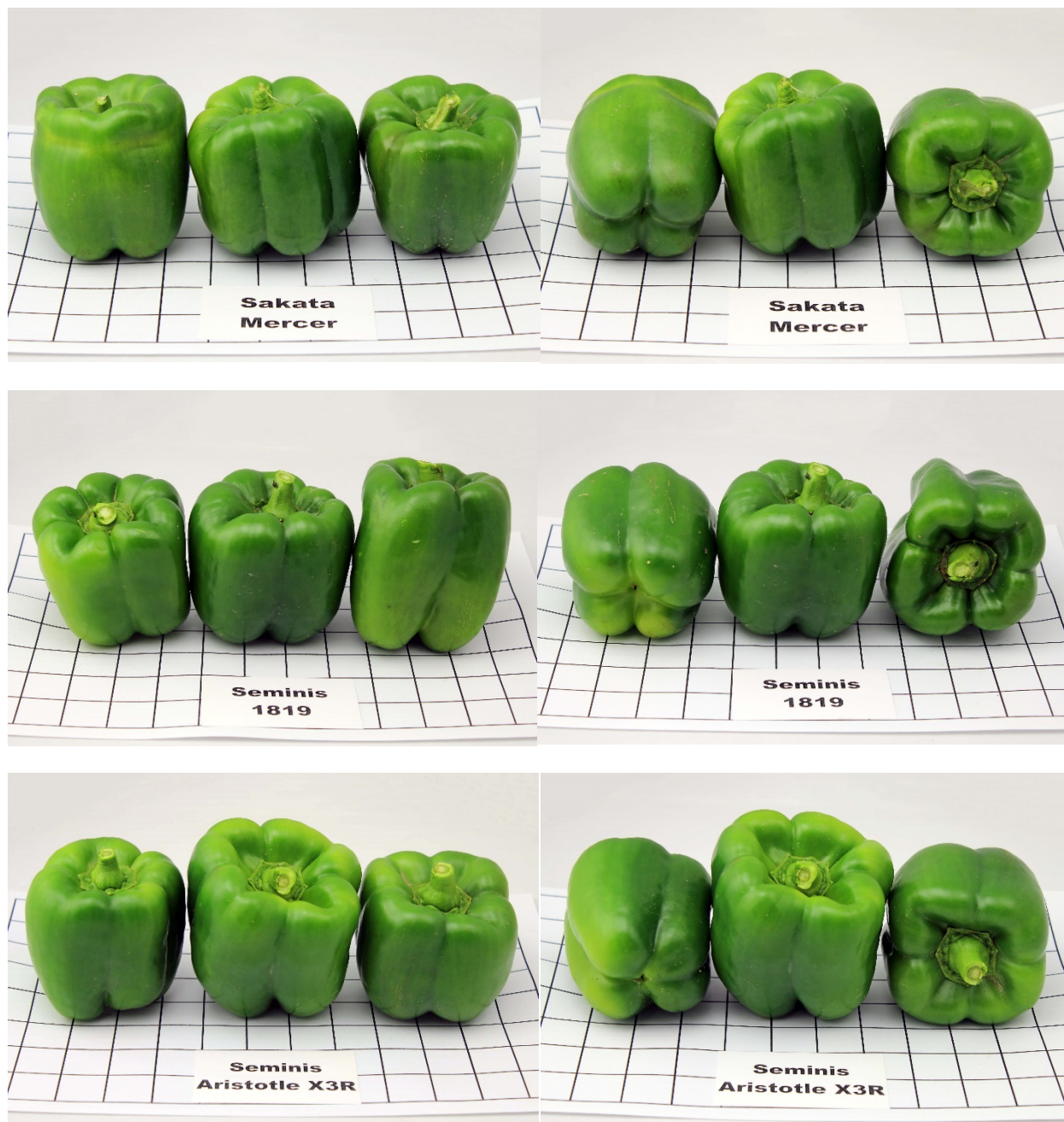
<sup>2</sup>Length/Diameter (L/W)

Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

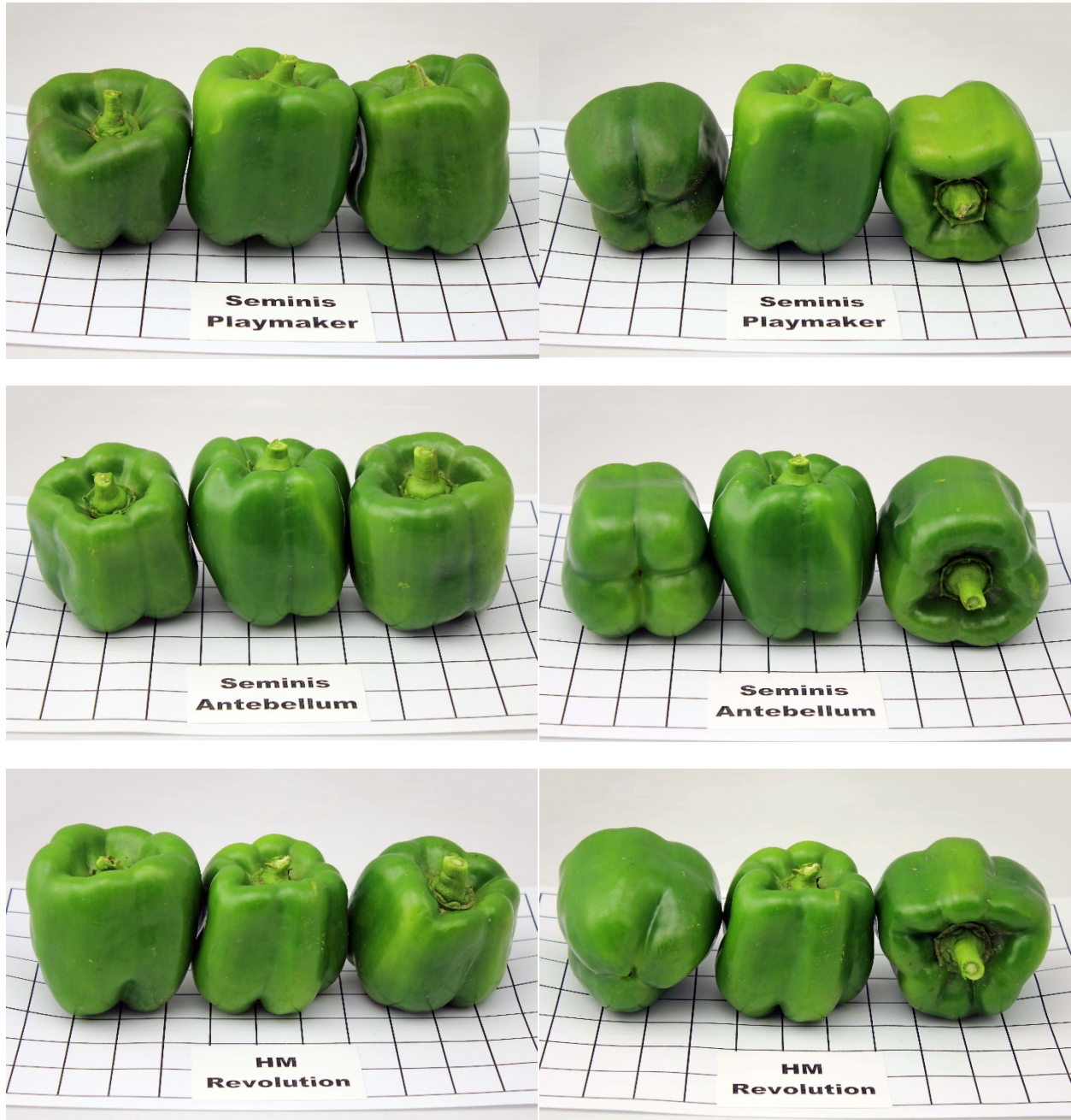




Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

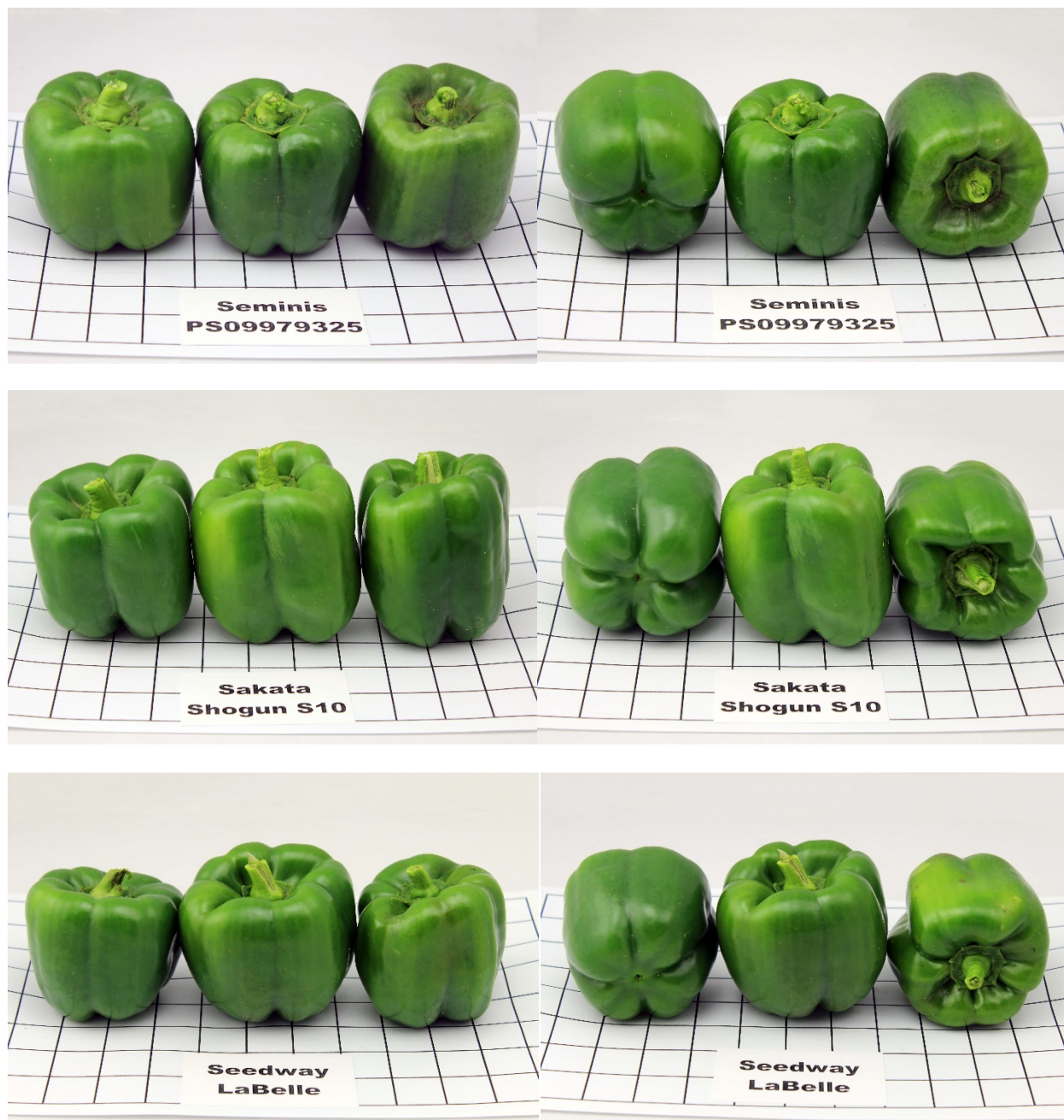


Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

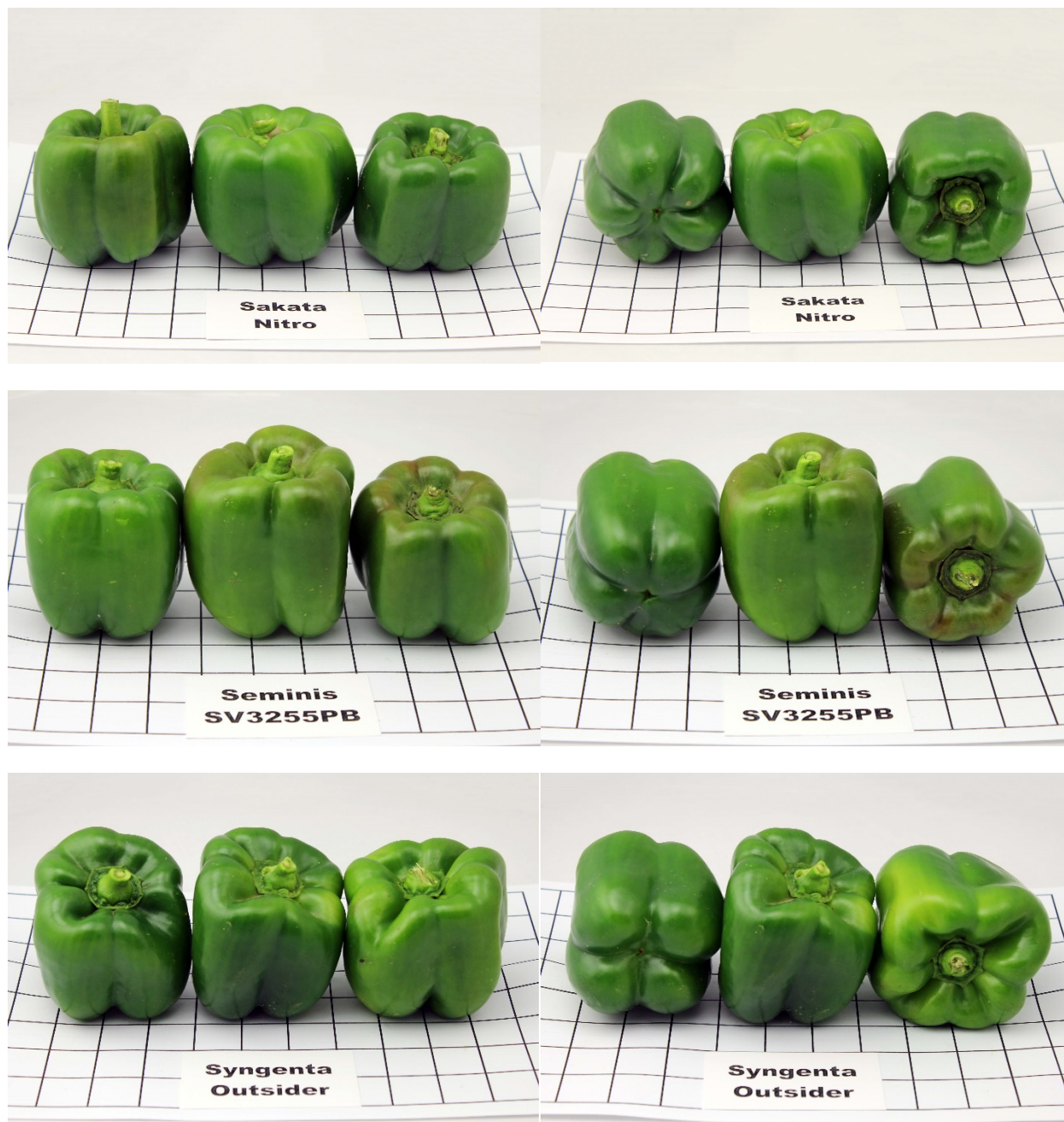




Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

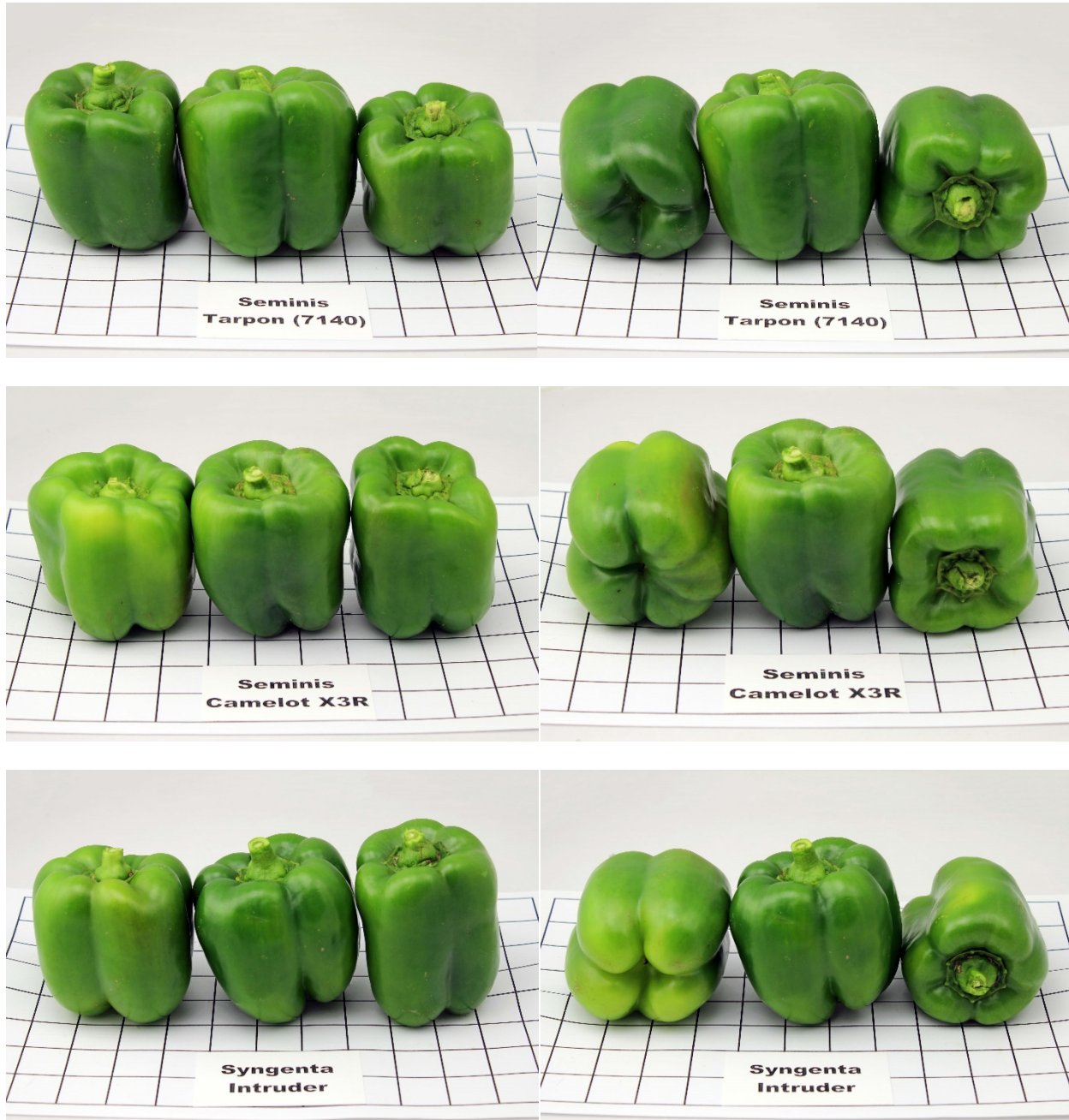


Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

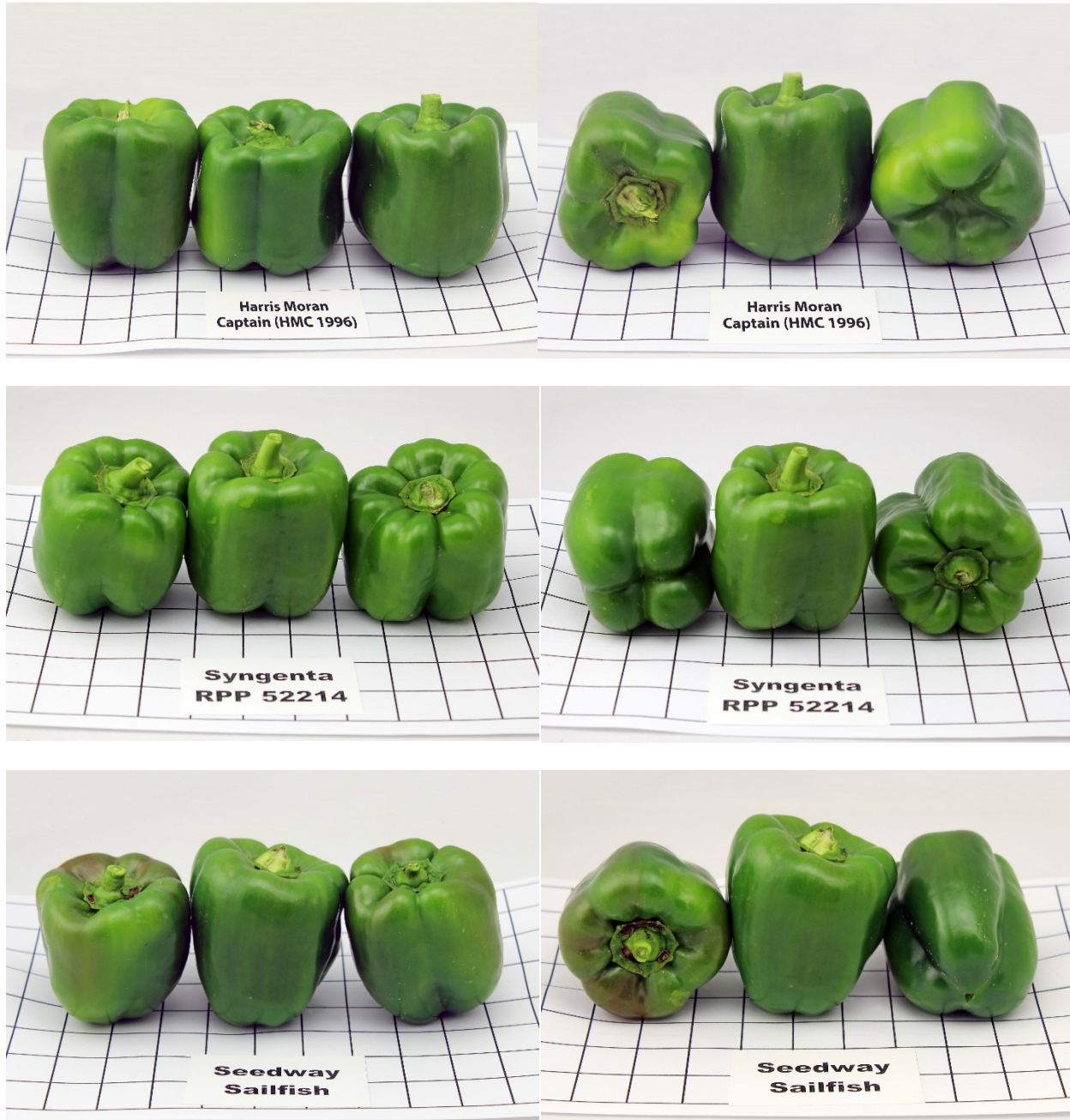




Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)



Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)



Appendix 1. Images of varieties and breeding lines taken at harvest two of the BLS trail on 8/30/2021 at Upper Deerfield, NJ. (Note: One inch grid in photo)

