

### **Evaluation of pepper breeding lines and cultivars for tolerance to the crown rot phase of *Phytophthora* blight and development of skin separation or 'silvering' in fruit, 2013.**

This experiment, arranged as a randomized complete block design with 4 replications, was conducted in a field with a history of *Phytophthora* blight (*P. capsici*) at the Rutgers Agricultural Research and Extension Center (RAREC), Bridgeton, New Jersey. All peppers were grown by a local transplant producer located in Vineland, NJ. On 21 Jun, bell pepper breeding lines or cultivars were hand transplanted into double rows (18 in. in row) on black plastic mulch on 5-ft-centers (18 plants per plot) with drip irrigation. All treatment plots were 15-ft-long with *Phytophthora*-susceptible bell pepper 'Tomcat' planted in 5-ft breaks between plots. Fertility schedule and management of insect and weeds were done according to local recommendation guidelines. Each week, the number of *Phytophthora*-infected plants (out of a total number of 18) were counted and recorded from each 15-ft plot. All mature pepper fruit from 15 ft of each treatment row were harvested on 13 Sep and 2 Oct. All fruit were graded, separated and weighed for statistical analysis. Area Under Disease Progress Curve (AUDPC) values based of the percentage of plants killed by week per plot by *P. capsici* during the trial were calculated. Rainfall (in.) for the months of Jun, Jul, Aug, and Sep were 9.59, 7.25, 4.25, and 2.02 in., respectively.

Transplanting was extremely late (21 Jun) due to excessive rainfall which led to fewer harvests and lower than normal yields (Tables 1 and 2). The number and weight of marketable fruit, fruit with silvering, and boxes per acre varied significantly at both harvests (Tables 1 and 2). At the first harvest yield ranged from 94 to 434 boxes per acre. Boxes per acre were highest in 9504PB, FPP1718, FPP2476, Vanguard, and Aristotle (Table 1). Boxes per acre were lowest in Currier, Intruder, PS1635-, Alliance and Camelot (Table 1). Marketable fruit with silver ranged from 0 to 56% in the first harvest (Table 1). Breeding lines RPP30627, FPP1459, FFP 2476 had a higher percentage of fruit with 'silvering' than Paladin and significantly higher than most other breeding lines and cultivars (Table 1). Most other breeding lines, although lower, produced a similar percentage of fruit with 'silvering' compared to Paladin, our standard *Phytophthora*-resistant/tolerant cultivar check known to produce a high amount of 'silvering' in fruit (Table 1). 'Silvering' was lowest in Currier (0%), Camelot (1%), Alliance (4%), Revolution and Declaration (6%) (Table 1). Camelot and Alliance are both *phytophthora*-susceptible cultivars and Declaration and Revolution are *phytophthora*-tolerant (intermediate resistance) cultivars, all which are used as standard 'silvering' checks in this trial. Currier is listed as having intermediate resistance to *P. capsici*.

At the second harvest yield ranged from 101 to 400 boxes per acre (Table 2). Boxes per acre were highest in FPP2476, FPP1718, RPP30627, SQ8930 and 9504PB (Table 2). Boxes per acre were lowest in Currier, SQ6517, PS1635- (Table 2). Marketable fruit with silver ranged from 0 to 65% in the second harvest (Table 2). Breeding line RPP30627 had a higher percentage of fruit with 'silvering' than Paladin and significantly higher than most other breeding lines and cultivars (Table 2). 1819, FPP2476, and RPP30974 produced a similar percentage of fruit with 'silvering' compared to Paladin (Table 2). Like harvest one, 'silvering' was lowest in Declaration (8%), Revolution (6%), Currier (2%), Camelot (1%), and Alliance (0%) (Table 1).

Although rainfall was significant in June, season-long pressure due to the crown rot phase of phytophthora blight was low for most of this trial. This was most likely due to a cooler than normal production season in southern New Jersey. Area Under Disease Progress Curve (AUDPC) values were calculated for each cultivar/breeding line based on the percentage of plants killed by phytophthora blight by week (17 weeks total) (Figure 1) and presented in Table 2. AUDPC values varied between cultivars/breeding lines although differences were not generally significant (Table 2 and Figure 1). This was most likely due to the low disease pressure.

Table 1. Number and weight of total marketable fruit, number and weight of marketable fruit with 'silvering', percentage of marketable fruit with 'silvering', number and weight of phytophthora-infected fruit, and marketable boxes per acre at harvest 1 on 13 Sep at the Rutgers Agricultural Research and Extension Center in 2013.

Cultivar/Breeding Line	Company	Marketable fruit <sup>z</sup>		Marketable fruit with silvering <sup>y</sup>		% marketable fruit with silvering <sup>x</sup>	Marketable boxes/A <sup>v</sup>
		No	Wt	No	Wt		
RPP 30627	Syngenta	20.50 d-g <sup>v</sup>	8.91 c-h	11.00 ab	5.02 ab	56 a	289 a-f
FPP1459	Sakata	21.75 b-g	9.34 b-h	9.25 a-c	4.12 ab	47 ab	279 b-f
FPP2476	Sakata	32.00 a-d	12.59 a-e	14.00 a	5.30 a	44 a-c	371 ab
Paladin	Rogers	25.25 a-e	9.16 b-h	9.50 ab	3.75 a-c	35 a-d	268 b-f
FPP1718	Sakata	33.25 a-c	14.00 ab	9.50 ab	4.21 ab	28 b-e	378 ab
9504 PB	Seminis	37.00 a	16.50 a	9.25 a-c	4.45 ab	27 b-f	434 a
SQ 8930	Seedway	26.50 a-e	11.25 b-f	8.25 a-d	3.69 a-c	26 b-g	310 a-e
RPP 30974	Syngenta	18.25 e-g	7.61 e-h	4.50 b-e	2.10 b-f	26 b-g	201 c-h
RPP 31181	Syngenta	23.00 b-g	10.23 b-f	6.25 b-e	3.16 a-d	25 c-g	278 b-f
Aristotle	Seminis	33.75 ab	13.03 a-d	8.00 a-d	3.07 a-e	22 c-h	334 a-c
PS0994-1819	Seminis	22.25 b-g	9.91 b-f	4.50 b-e	2.43 af	20 d-h	256 b-g
Vanguard	Harris Moran	28.00 a-e	13.46 a-c	5.25 b-e	2.79 a-f	19 d-h	337 a-c
Archimedes	Seminis	24.25 b-f	9.59 b-g	6.25 b-e	2.33 a-f	19d-h	247 b-g
Intruder	Syngenta	12.50 fg	4.73 gh	2.00 de	0.84 c-f	16 d-h	115 gh
SQ 3613	Seedway	33.75 ab	13.11 a-d	6.00 b-e	2.28 b-f	15 d-h	319 a-d
SQ 6517	Seedway	27.50 a-e	11.71 a-e	2.25 c-e	0.99 c-f	9 e-h	263 b-f
PS 16351609	Seminis	17.00 ef	6.56 f-h	1.25 de	0.57 d-f	7 e-h	148 f-h
Declaration	Harris Moran	26.00 a-e	10.25 b-f	1.75 de	0.87 c-f	7 e-h	231 b-h
Revolution	Harris Moran	27.50 a-e	11.20 b-f	1.50 de	0.65 def	6 f-h	246 b-g
Alliance	Harris Moran	20.25 d-g	7.80 e-h	0.75 e	0.31 d-f	4 gh	168 e-h
Camelot	Seminis	21.25 c-g	8.40 d-h	0.25 e	0.11 ef	1 h	177 d-h
Currier	Harris Moran	11.50 g	4.51 h	0.00 e	0.00 f	0 h	94 h

<sup>z</sup> Number and weight (in lb/plot) of extra-large (>0.5 lb), large (.33-.49 lb), and medium-sized (.25-.32 lb) marketable fruit with and without 'silvering' per 15 ft plot.

<sup>y</sup> Number and weight (lb/plot) of extra-large, large, and medium-sized marketable fruit with 'silvering' per 15 ft plot.

<sup>x</sup> Percentage of marketable fruit (extra-large, large, and medium) with 'silvering' per 15 ft plot.

<sup>w</sup> Number of boxes (28 lb) per acre of extra-large, large, and medium-sized marketable fruit with and without 'silvering'.

<sup>v</sup> Fisher's Least Significant Difference (LSD) test ( $P=0.05$ )

Table 2. Number and weight of total marketable fruit, number and weight of marketable fruit with 'silvering', percentage of marketable fruit with 'silvering', number and weight of phytophthora-infected fruit, marketable boxes per acre at harvest 2 on 2 Oct and AUDPC value for the percentage of plants killed by week by *P. capsici* at the Rutgers Agricultural Research and Extension Center in 2013.

Cultivar/Breeding Line	Company	Marketable fruit <sup>z</sup>		Marketable fruit with silvering <sup>y</sup>		% marketable fruit with silvering <sup>x</sup>	Marketable boxes/A <sup>w</sup>	AUDPC value <sup>v</sup>
		No	Wt	No	Wt			
RPP 30627	Syngenta	25.25a-d <sup>u</sup>	10.51 a-d	13.50 a	5.25 a	65 a	347 a-c	1980 ab
Paladin	Rogers	22.75 a-d	8.55 a-d	11.50 ab	4.70 a-c	50 ab	275 a-f	1860 ab
PS0994-1819	Seminis	15.75 b-d	6.45 d-d	4.25 c-f	1.93 c-f	35 bc	174 c-f	2536 a
FPP2476	Sakata	33.50 a	13.52 a	13.50 a	5.75 ab	33 b-d	400 a	1505 ab
RPP 30974	Syngenta	13.75 cd	5.95 cd	4.75 b-f	2.27 c-f	33 b-d	170 d-f	2298 ab
FPP1718	Sakata	33.50 a	14.17 a	9.00a-c	4.39 a-d	25 c-e	385 ab	2056 ab
Archimedes	Seminis	24.25 a-d	9.81 a-d	5.50 c-f	2.39 c-f	23 c-e	253 a-f	1606 ab
Aristotle	Seminis	22.75 a-d	9.37 a-d	8.25 a-d	3.83 a-e	22 c-f	274 a-f	1947 ab
9504 PB	Seminis	26.75 a-c	11.65 a-c	7.25 a-e	3.43 a-e	22 c-f	313 a-e	2225 ab
Intruder	Syngenta	23.00 a-d	9.54 a-d	4.50 b-f	2.01 c-f	20 c-h	240 a-f	1346 ab
SQ 8930	Seedway	34.25 a	14.23 a	5.50 b-f	2.27 c-f	19 c-h	342 a-d	1893 ab
FPP1459	Sakata	33.00 a	31.71 a	6.50 a-f	2.99 b-f	15 c-h	347 a-c	2531 a
SQ 3613	Seedway	18.50 b-d	7.39 b-d	3.25 c-f	1.42 d-f	15 c-h	183 c-f	2753 a
RPP 31181	Syngenta	21.25 a-d	8.62 a-d	3.50 c-f	1.53 c-f	14 d-h	211 b-f	2258 ab
PS 16351609	Seminis	17.50 b-d	6.59 b-d	3.00 -c-f	1.24 d-f	13 d-h	162 ef	2725 a
SQ 6517	Seedway	14.75 cd	5.88 cd	1.75 d-f	0.79 ef	11 e-g	138 ef	1615 ab
Vanguard	Harris Moran	21.50 a-d	9.77 a-d	2.00 c-f	0.93 ef	11 e-g	222 b-f	946 b
Revolution	Harris Moran	29.50 ab	12.15 ab	2.75 c-f	1.21 d-f	8 e-h	277 a-e	2205 ab
Declaration	Harris Moran	23.75 a-d	9.67 a-d	1.50 d-f	0.69 ef	6 e-h	215 c-f	1697 ab
Currier	Harris Moran	12.25 d	4.67 d	0.50 ef	0.18 f	2 f-h	101 f	2470 a
Camelot	Seminis	26.75 a-c	8.81 a-d	0.50 ef	0.17 f	1 gh	207 c-f	1679 ab
Alliance	Harris Moran	24.25 a-d	9.34 a-d	0.00 f	0.00 f	0 h	194 c-f	2534 a

<sup>z</sup> Number and weight (in lb/plot) of extra-large (>0.5 lb), large (.33-.49 lb), and medium-sized (.25-.32 lb) marketable fruit with and without 'silvering' per 15 ft plot.

<sup>y</sup> Number and weight (lb/plot) of extra-large, large, and medium-sized marketable fruit with 'silvering' per 15 ft plot.

<sup>x</sup> Percentage of marketable fruit (extra-large, large, and medium) with 'silvering' per 15 ft plot.

<sup>w</sup> Number of boxes (28 lb) per acre of extra-large, large, and medium-sized marketable fruit with and without 'silvering'.

<sup>v</sup> Area Under Disease Progress Curve (AUDPC) value for the percentage of plants killed by week by *P. capsici*.

<sup>u</sup> Fisher's Least Significant Difference (LSD) test ( $P=0.0$ )

Figure 1. Disease progress curves for cultivars and breeding lines evaluated for resistance to the crown rot phase of Phytophthora blight at the Rutgers Agricultural Research and Extension Center in Bridgeton, NJ in 2013.

