BASIL, SWEET (*Ocimum basilicum*)
    Downy mildew; *Peronospora belbahrii*

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Evaluation of commercial cultivars of sweet basil resistant to downy mildew, 2020.

An experiment with field-grown basil was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with Haven loam soil. The objective was to evaluate recently released cultivars of sweet basil bred to be resistant to downy mildew. The field was mold-board plowed on 14 May. Controlled-release fertilizer (N-P-K, 19-10-9) was broadcast at 525 lb/A (101 lb/A N) over the bed area and incorporated on 1 Jul. Beds were formed with drip tape and covered with black plastic mulch on 1 Jul. Weeds between mulched beds were managed by applying Devrinol DF (4 lb/A) before transplanting, cultivating, covering the soil with landscape cloth, and by hand weeding. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer. A late planting date was used for the experiment to increase the likelihood of downy mildew developing during the experiment. The primary source of initial inoculum in this area is considered to be sporangia dispersed by wind from infected plants potentially a long distance away. Basil for the experiment was seeded in trays in a greenhouse on 11 Jun. Since cultivar 'Amazel' is sterile, it was propagated through plant cuttings taken from established plants on 18 Jun. All plants were placed outdoors to harden for a few days and then transplanted in the field by hand on 9 Jul. No fungicides were applied. A randomized complete block design with four replications was used. Each plot had 8 plants in 6-ft rows with 9-in. in-row plant spacing. The plots were 3 ft apart in the row. Plots with the susceptible cultivar were examined for downy mildew on 3, 7, 10, 13, and 17 Aug. Downy mildew was assessed in each plot weekly from 28 Aug through 9 Oct. Incidence of plants with symptoms and sign of the pathogen (sporulation of the pathogen visible on the underside of leaves) was recorded and percentage of leaves per plant with symptoms was estimated for each plant in each plot. Area under the disease progress curve (AUDPC) values were calculated from 28 Aug to 9 Oct using the formula: $\sum_{i=1}^{n} [(R_{i+1} + R_i)/2] [t_{i+1} - t_i]$, where R = disease incidence rating (% leaves with symptoms on affected plants) at the ith observation, t_i = time (days) since the previous rating at the ith observation, and n = total number of observations. Defoliation was assessed on 30 Sep and was mostly due to downy mildew. Data were analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software. Average monthly high and low temperatures (^{o}F) were 86.3 and 69.6 in Jul, 84.3 and 68.2 in Aug, 75.7 and 60.9 in Sep, and 65 and 51.7 in Oct, respectively. Rainfall (in.) was 3.80, 3.33, 2.70 and 4.75 for these same months, respectively. Plants lost many leaves and some branches due to heavy winds from tropical storm Isaias on 4 Aug but recovered. Amazel appeared to have more broken branches than the other cultivars.

Downy mildew was first observed in this experiment on 17 Aug. Eleonora, one of the first resistant cultivars commercialized, initially exhibited some suppression of downy mildew having significantly lower percentage of leaves with symptoms than DiGenova through 9 Sep, but there were no significant differences between these two beginning with the 17 Sep assessment (data not shown). All other resistant cultivars had significantly fewer affected plants than DiGenova at least on 28 Aug and significantly lower percentage of leaves with symptoms at all seven assessments with the exception of Rutgers Devotion DMR at the last assessment (9 Oct). Amazel (Proven Winners), Genesis N, and Prospera (both Genesis Seeds) exhibited a very high degree of resistance. Based on AUDPC values, these three cultivars provided 99-100% control while the four Rutgers cultivars (Van Drunen Farms Specialty Seeds) provided 52-79% control, and Eleonora provided 26% control. Data in the table is organized based on AUDPC values. Defoliation on 30 Sep was associated with AUDPC values. Percentage of leaves that had dropped was 0-3% for Amazel, Genesis N, and Prospera, 19-39% for the Rutgers cultivars, 58% for Eleonora, and 98% for DiGenova (data not shown). Commercialized Prospera ILL2 (Italian large leaf) is an advanced version of Genesis N.

Cultivar (reaction to downy mildew)	Incidence of downy mildew *													
	Affected plants (%)						Affected leaves on affected plants (%)							
	28 Aug		9 Sep		30 Sep		28 Aug		9 Sep		24 Sep		9 Oct**		AUDPC
DiGenova (susceptible)	100.0	a	100	a	100	a	88.6	a	99.0	a	99.1	a	100.0	a	4133 a
Eleonora (intermediately resistant)	93.8	a	100	a	100	a	16.5	b	74.3	b	79.8	ab	90.4	ab	3049 b
Rutgers Devotion DMR (resistant)	0.0	c	100	a	100	a	0.0	c	21.9	cde	69.8	b	86.2	ab	1977 c
Rutgers Thunderstruck DMR (resistant)	15.6	bc	100	a	100	a	0.4	c	31.6	c	65.9	b	82.7	b	1940 c
Rutgers Obsession DMR (resistant)	28.1	b	100	a	100	a	0.7	c	22.8	cd	62.2	b	85.0	b	1830 c
Rutgers Passion DMR (resistant)	0.0	c	100	a	100	a	0.0	c	10.6	cde	14.3	c	68.7	c	848 d
Genesis N (resistant)	0.0	c	54	b	33	b	0.0	c	3.3	de	0.4	c	3.9	d	54 e
Amazel (resistant)	0.0	c	0	c	0	c	0.0	c	0.0	e	0.0	c	0.3	e	2 e
Prospera (resistant)	0.0	c	0	c	0	c	0.0	c	0.0	e	0.0	c	0.1	e	1 e
P-value (cultivar)	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001

* Numbers in each column with a letter in common are not significantly different from each other (Tukey's HSD, *P*=0.05).

** Values were square root transformed before analysis because raw data were not distributed normally. Table contains de-transformed values.