

Evaluation of downy mildew resistance in experimental hybrids of cucumber, 2014

A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, on Haven loam soil. Controlled release fertilizer (N-P-K, 15-5-15) was used at 675 lb/A (101 lb/A N). Drip irrigation tape was laid as the rows were covered with black plastic mulch on 3 Jun. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer (20-20-20 Nutri-Leaf) plus insecticide on 24 Jun. Seeds were sown on 3 Jun in the greenhouse. Seedlings were transplanted by hand into the holes in the beds on 25 Jun. During the season, water was provided as needed via drip irrigation lines. Weeds were controlled between mulched rows by applying a tank mix of Strategy (3 pt/A), Sandea (0.5 oz/A), Scythe (1% 1.3 fl oz/gal spray mix), and Roundup WeatherMAX (22 oz/A) on 4 Jun, and by hand weeding. Cucumber beetles were managed with Admire Pro (7.5 fl oz/A) applied with the transplanter on 24 Jun. These plus thrips were managed by applying Assail (5.3 oz/A) on 21 and 30 Jul; and Lannate (1 pt/A) on 12 Aug. The following fungicides were applied for *Phytophthora* blight, powdery mildew, and anthracnose: Regalia (2 qt/A) on 12, 21 and 29 Jul, 5 and 12 Aug; K-Phite (1 qt/A) on 12 and 21 Jul; ProPhyt (3 pt/A) on 29 Jul and 12, 19 and 25 Aug; Presidio (4 fl oz/A) on 12 and 21 Jul and 5 Aug; Torino (3.4 fl oz/A) on 21 Jul, and 5 and 25 Aug; Procure 480SC (8 fl oz/A) on 29 Jul, and 12 and 19 Aug; Topsin (0.5 pt/A) on 25 Aug; Quadris (1.5 fl oz/A) on 25 Aug. Fungicides selected have limited activity for downy mildew and were applied before downy mildew occurred. Plots were single 15-ft rows with 10 plants at 18-in. spacing. Rows were 8.5 ft apart. The plots were 9 ft apart within the row initially until plants began to vine. Vines were moved as needed to maintain plot separation. A randomized complete block design with four replications was used. Downy mildew occurrence was assessed on 8, 11, 16, and 29 Sep by estimating incidence of symptomatic leaves in each plot and rating severity on nine representative affected leaves. Incidence and average severity for symptomatic leaves were used to estimate canopy severity by multiplying these values. Area Under Disease Progress Curve (AUDPC) values were calculated from 8 Sep through 29 Sep. Defoliation was assessed as percentage of leaves that had died in each plot. Fruit of at least marketable size were harvested from the plants on 28 Jul, and 4, 11, 18, and 25 Aug. Average monthly high and low temperatures (°F) were 79/60 in Jun, 82/67 in Jul, 81/64 in Aug, 77/61 in Sep, and 66/53 in Oct. Rainfall (inches) was 2.47, 2.24, 2.42, 1.86, and 5.43 for these months, respectively.

Natural inoculum was depended on for this experiment. Downy mildew appeared in the area much later than in recent years, reflecting reduced occurrence in much of the eastern USA in 2014. Symptoms were first found in the *ipm*PIPE sentinel plots at LIHREC on 2 Sep 2014 versus 1 Aug 2010, 17 Jul 2011, and 22 Jul 2013. Symptoms were first found in this experiment on 8 Sep in one plot of Straight Eight. Symptoms were not found through the last assessment on 29 Sep on the three PIs evaluated, DMR-NY264, and Marketmore 97. Marketmore 97 and Ivory Queen, which developed few symptoms in this experiment, have also exhibited good resistance in other evaluations. DMR-NY264 is based on a cross between these two made by Cornell University plant breeders Michael Mazourek and William Holdsworth. They had found the PIs to be a good source of resistance, thus they were included in this experiment to further document this. The two commercially available cucumbers marketed as having resistance to current strains of the downy mildew pathogen, SV4719CS and SV3462CS, had numerically but not significantly less severe symptoms than the two susceptible cultivars included for comparison, Straight Eight and Speedway. Similar results were obtained in a previous evaluations conducted at LIHREC (PDMR 7:V018). Marketmore 76 and Stonewall were included in this experiment because growers in eastern NY had observed these to be affected less by downy mildew than other cultivars they were growing and this experiment has confirmed this. Defoliation, which was due to anthracnose and natural senescence as well as downy mildew, was numerically lowest for DMR-NY264. Plants were old and past the harvest period when downy mildew developed; therefore yield data obtained reflects yielding ability of the cultivars in the absence of downy mildew. DMR-NY264 was the only entry that did not have marketable fruit on the first and second harvest dates (28 Jul and 4 Aug). Total yield for DMR-NY264 was significantly less than the other entries reflecting the fact its harvest period was not extended to compensate for the fact it began producing fruit later than the others.

Entry name	Canopy severity (%) ^z		Defoliation (%) ^z		Yield (no. fruit/plant) ^z		Yield (lb/plant) ^z	
	16 Sep	AUDPC ^y	11 Sep	16 Sep	28 Jul	All	28 Jul	All
Straight Eight	11.21 a	88.36 a	16.3 abc	48.8 a-d	2.5 d	12.4 c	2.1	6.5
Speedway	8.08 ab	56.63 ab	20.0 abc	37.5 a-d	6.5 ab	20.0 a	2.7	10.3
Marketmore 76	2.22 b	4.95 bc	38.8 ab	65.0 ab	3.6 cd	17.1 ab	3.1	8.0
Stonewall	0.02 b	0.11 c	15.0 abc	25.0 bcd	7.4 a	19.5 a	2.8	10.8
Ivory Queen	0.00 b	0.23 c	20.0 abc	38.8 a-d	7.3 a	21.0 a	2.8	9.5
Marketmore 97	0.00 b	0.00 c	7.8 bc	13.8 cd	3.6 cd	13.0 bc	1.8	4.8
SV4719CS	3.19 ab	22.80 abc	13.8 abc	26.3 bcd	5.0 bc	14.6 bc	3.2	13.8
SV3462CS	2.07 b	9.77 abc	5.3 bc	13.8 cd	4.4 cd	14.4 bc	3.2	8.3
DMR-NY264	0.00 b	0.00 c	4.0 c	8.8 d	0.0 e	6.1 d	1.3	5.3
PI 330628	0.00 b	0.00 c	45.0 a	83.8 a	N/D ^x	N/D	N/D	N/D
PI 197088	0.00 b	0.00 c	33.8 abc	61.3 abc	N/D	N/D	N/D	N/D
PI 197085	0.01 b	0.02 c	6.5 bc	26.3 bcd	N/D	N/D	N/D	N/D
<i>P-value</i>	<i>0.0007</i>	<i>0.0001</i>	<i>0.0012</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.0001</i>	<i>0.8551</i>	<i>0.2093</i>

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

^y AUDPC values were square root transformed before analysis. Table contains de-transformed values.

^x ND=not determined