

Susceptibility to downy mildew of slicer-type cucumber cultivars, 2009.

The purpose of this study was to evaluate select cucumber cultivars that have exhibited relatively low susceptibility to downy mildew, compared to other cultivars, in cucumber evaluations conducted at North Carolina State University since 2005. Straight Eight was included because it was developed decades ago and lacks known genetic resistance to downy mildew. The other seven cultivars evaluated were bred to have resistance for the strains of *Pseudoperonospora cubensis* that dominated the pathogen population before 2004. This evaluation was conducted as a component of an integrated management program for organically-produced cucumber by regularly applying an OMRI-listed botanical oil plus a copper fungicide. An integrated approach was taken because cucumber cultivars bred with resistance to pathogen strains present before 2004 no longer provide sufficient suppression of downy mildew to achieve adequate control without also applying fungicides. Cucumber was seeded on 17 Jul and transplanted on 30 Jul into beds with black plastic mulch and drip irrigation in a field with Haven loam soil at the Long Island Horticultural Research and Extension Center in Riverhead. A late planting date was used to increase the likelihood of downy mildew developing during the experiment. Organic production practices were used. A blend of Pro-Gro 5-3-4 organic fertilizer at 1000 lb/A plus peanut meal at 625 lb/A was spread on 23 Jul over the rows to be planted and then incorporated by disking before laying plastic mulch. Neptune's Harvest hydrolyzed fish emulsion fertilizer (0.094 fl oz in 6 fl oz water) was poured into each transplant hole before planting. Weeds were controlled by hand weeding. Plots consisted of two 12-ft rows spaced 34 in. apart each with 6 plants at 24-in spacing. A randomized complete block design with four replications was used. Organocide at 1 oz/gal plus Kocide 3000 at 1 lb/A were applied on 24 and 31 Aug; and 8, 14, 22, and 30 Sep using a tractor-mounted boom sprayer operated at 100 psi and 96 gal/A (D5-25 hollow cone nozzles spaced 17 in. apart). It was intended that this treatment be applied on a preventive schedule. Therefore, to obtain some initial suppression of downy mildew, a conventional fungicide with some curative activity but limited residual activity, Curzate 60DF (2.75 oz/A), was applied early on 26 Aug to the entire experiment. Downy mildew severity was assessed on 24 and 31 Aug; 8, 15, and 23 Sep; and 8 Oct 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 multiplied to estimate canopy severity. Marketable fruit and culls were harvested on 5 and 13 Oct. Average monthly high and low temperatures (°F) were 83/68 in Aug, 74/58 in Sep, and 62/47 in Oct. Rainfall (in.) was 2.01, 2.39, and 5.78 for these months, respectively.

Downy mildew symptoms were first observed on 24 Aug following over 3 weeks of warm, dry weather. There were only 5 days of rain during Aug before disease onset, and total rainfall was only 0.83 in.: 0.45 in. on 1 Aug, 0.07 in. on 2 Aug, 0.04 in. on 10 Aug, 0.09 in. on 13 Aug, and 0.18 in. on 22 Aug. Conditions were favorable for downy mildew development during the experiment. There were four consecutive days of rain, with a total of 1.18 in., starting on 27 Aug. Subsequently rain fell on 6 Sep (0.01 in.), 9 Sep (0.05 in.), 11-13 Sep (0.66, 0.17, and 0.14 in.), 16 Sep (0.17 in.), 24 Sep (0.06 in.), 27 Sep (0.97 in.), and 29 Sep (0.16 in.). Straight Eight, which has no known genetic resistance to downy mildew, was more severely affected initially than the other cultivars and experimentals. Severity on this cultivar was numerically the highest until the last assessment on 5 Oct (data not shown). It was also more severely affected in a similar experiment conducted in 2008 (PDMR 3:V115). This further documents that the resistance in modern cultivars, which was highly effective for pathogen strains present before 2004, does provide some suppression of downy mildew caused by strains that are currently present. Cultivars in the table are sorted by AUDPC value. Poinsett 76, Marketmore 76, and an experimental cultivar, HMX 7421, were the least severely affected cultivars based on AUDPC values. Based on analysis of canopy severity values on 28 Sep, Marketmore 76 was the cultivar least severely affected by downy mildew, and all cucumbers examined except HMX 4453 were significantly less severely affected than Straight Eight. HMX 4453 also had the highest canopy severity value in a similar experiment conducted in 2008 (PDMR 3:V115). There were no significant differences among cultivars in number of marketable fruit, total number of fruit, or weight of fruit (data not shown).

Cultivar/experimenta 1	Downy mildew canopy severity *							
	24-Aug	31-Aug	8-Sep	15-Sep	23-Sep	28-Sep	AUDPC	
Poinsett 76	0.41 b **	0.88 b	5.4 b	25 ab	43 bc	54 bc	948 c	
Marketmore 76	0.81 b	6.53 b	18.5 b	29 ab	35 c	50 c	1060 bc	
HMX 7421	0.30 b	1.08 b	14.0 b	19 b	48 bc	63 bc	1081 bc	
General Lee	0.54 b	2.85 b	12.8 b	31 ab	53 abc	59 bc	1220 bc	
Dasher II	1.90 b	4.15 b	18.8 b	25 ab	46 bc	64 bc	1225 bc	
HMX 4453	0.95 b	7.03 b	20.5 b	23 b	58 ab	72 ab	1331 b	
Stonewall	0.35 b	3.99 b	21.8 b	30 ab	62 ab	66 bc	1379 b	
Straight Eight	14.14 a	43.11 a	61.8 a	39 a	74 a	87 a	2306 a	
<i>P</i> -value (cultivar)	<.0001	<.0001	<.0001	0.0094	0.0003	<.0001	<.0001	

* Percentage of leaves with symptoms of downy mildew (incidence) was estimated and severity was assessed for the affected leaves. Canopy severity was calculated from these values.

** Means followed by the same letter are not statistically different from each other (Tukey's HSD, P=0.05).F