

Efficacy of conventional and organic fungicides for managing downy mildew in cucumber, 2018.

A field experiment was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, on Haven loam soil. Main objective was to evaluate LifeGard, a plant activator approved for organic production, applied to three cultivars differing in susceptibility to downy mildew. The field was plowed on 4 Jul. Controlled-release fertilizer (N-P-K, 15-5-15) at 675 lb/A (101 lb/A N) was broadcast over the bed area and incorporated on 6 Jul. Beds were formed with drip tape and covered with black plastic mulch on 6 Jul. Seeds were sown on 28 Jun in the greenhouse. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer. Seedlings were transplanted by hand into the holes in the beds on 11 Jul. During the season, water was provided as needed via drip irrigation lines. Weeds were managed between the mulched beds by applying Strategy 3 pt/A, Sandea 0.5 oz/A, and Roundup PowerMax 22 oz/A on 6 Jul with a tractor-sprayer, covering the soil with landscape cloth, and by hand weeding. The primary source of initial inoculum of *Pseudoperonospora cubensis* in this area is considered to be long-distance wind-dispersed spores from affected plants. Plots were single 18-ft rows with 9 plants at 24-in. spacing. Rows were 4 ft apart. The plots were 6 ft apart within the row initially until plants began to vine partly filling the area. Vines were moved as needed to maintain plot separation. A randomized complete block design with four replications was used. Fungicides were applied weekly for 8 weeks beginning on 19 Jul for some treatments and 14 Aug for the rest of the treatments with a backpack CO₂-pressurized sprayer equipped with a single-nozzle boom and a TJ60-4004EVS nozzle delivering 50 gal/A operated at 55 psi and 2.4 mph. Downy mildew severity was on 20 Aug, 28 Aug, 4 Sep, and 11 Sep by estimating incidence of symptomatic leaves in each plot and rating severity on nine representative affected leaves. Canopy severity was calculated by multiplying incidence by average severity. Fruit that had reached marketable size were harvested from each plot, counted, and weighed weekly from 10 Aug to 11 Sep. Area Under Disease Progress Curve (AUDPC) values were calculated from 20 Aug through 11 Sep. Data was analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software. Average monthly high and low temperatures (°F) were 85/70 in Jul, 84/72 in Aug, and 77/66 in Sep. Rainfall (in.) was 3.76, 6.04, and 5.81 for these months, respectively.

Downy mildew symptoms were first observed in this experiment on 14 Aug at low levels. Severity usually was numerically, but never significantly, lower in plots treated with LifeGard than untreated plots for each cultivar. LifeGard was tested alone for a clear evaluation, but it is recommended used with other fungicides. Susceptible (Straight Eight), moderately resistant (Bristol), and highly resistant (DMR 401) cultivars were used to determine if systemic acquired resistance response is affected by innate resistance. Severity numerically differed more between LifeGard and untreated plots of DMR 401 than other cultivars, suggesting that resistant cultivars may respond more to plant activators. The two organic treatments tested on Bristol were ineffective while the conventional treatment was effective based on the last assessment and AUDPC values. The two conventional treatments with the new fungicide Elumin tested on Straight Eight were effective. Yield was numerically, but not significantly, greater for all but one of the treatments compared to the untreated for each cultivar. No phytotoxicity was observed. This report includes work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Hatch under NYC-153409.

Cultivar	Treatment and Rate (application dates) ^x	Canopy severity (% symptomatic tissue in plot) ^{y,z}				Fruit per plant
		28 Aug	4 Sep	11 Sep	AUDPC	
Straight Eight	Untreated	27.3 ab	58.0 a	74.2 a	915 a	13.8 cd
Straight Eight	LifeGard 4.5 oz/100 gal (1-8)	49.4 a	51.6 a	57.5 ab	1010 a	11.1 d
Straight Eight	Bravo Weather Stik 2 pt/A (1-8), Orondis Ultra 8 fl oz/A (5,8), Elumin 8 fl oz/A (6), Ranman 2.5 fl oz/A (7)	6.8 bc	28.6 b	49.3 b	425 b	15.9 bcd
Straight Eight	Bravo Weather Stik 2 pt/A (1-8), Ranman 2.5 fl oz/A (5,7), Elumin 8 fl oz/A (6,8)	2.0 c	16.5 bc	42.0 bc	268 bcd	16.5 abcd
Bristol	Untreated	4.8 c	12.5 bc	50.7 b	306 bc	19.1 abcd
Bristol	LifeGard 4.5 oz/100 gal (1-8)	2.2 c	14.6 bc	45.0 bc	281 bcd	20.4 abc
Bristol	LifeGard 4 oz/A (1-5), Regalia 3 qt/A (5,7), Double Nickel 1.5 lb/A (6,8), Cueva 2 qt/A (6,8)	4.9 c	8.7 bc	47.7 b	270 bcd	20.8 abc
Bristol	Regalia 3 qt/A (5,7), Double Nickel 1.5 lb/A (6,8), Cueva 2 qt/A (6,8)	4.7 c	10.8 bc	42.2 bc	268 bcde	20.9 abc
Bristol	Ranman 2.5 fl oz/A (5,8) Zampro 14 fl oz/A (6), Previcur Flex 1.2 pt/A (7)	1.0 c	2.8 c	24.7 cd	115 de	23.6 ab
DMR 401	Untreated	0.4 c	4.2 c	25.6 cd	120 cde	20.7 abc
DMR 401	LifeGard 4.5 oz/100 gal (1-8)	0.0 c	3.6 c	17.8 d	87 e	24.3 a
<i>P-value (treatment)</i>		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

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

^y Some data was square root transformed before analysis. Table contains back-transformed means.

^x Rate of formulated product. Application dates were 1=19 Jul, 2=26 Jul, 3=2 Aug, 4=9 Aug, 5=14 Aug, 6=21 Aug, 7=29 Aug, and 8= 5 Sep.