CUCUMBER, SLICER (*Cucumis sativus* 'Straight Eight')
Downy mildew; *Pseudoperonospora cubensis*

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Efficacy of fungicides for managing downy mildew in cucumber, 2019.

A field experiment was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, on Haven loam soil. The field was plowed on 4 Jun. 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 10 Jul. Beds were formed with drip tape and covered with black plastic mulch on 10 Jul. Seeds were sown on 2 Jul 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 17 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 2-ft spacing. Rows were 8.5 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. Fungicide treatments followed the standard grower recommendation of a protectant fungicide when there was a forecasted risk at cdm.ipmpipe.org of the pathogen being dispersed successfully to the area, switching to targeted fungicides once symptoms were found in the planting. Manzate Pro-Stick was applied weekly for 3 weeks beginning on 30 Jul for all fungicide treatments; other fungicides were applied starting on 20 Aug after symptoms were observed. Applications were made with a backpack CO_2-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 occurrence was assessed on 27 Aug, 5 Sep, and 10 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. Area Under Disease Progress Curve (AUDPC) values were calculated from 27 Aug through 10 Sep using the formula: $\sum n_{i=1}[(R_{i+1} + R_i)/2] [t_{i+1} - t_i]$, where R = disease severity rating (% of leaf surface with symptoms) at the ith observation, t_i = time (days) since the previous rating at the ith observation, and n = total number of observations. Data was 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 86.3/71.3 in Jul, 82/68.8 in Aug, and 76/66.1 in Sep. Rainfall (in.) was 3.00, 1.52, and 1.83 for these months, respectively.

Downy mildew symptoms were first observed in this experiment on 19 Aug at low levels. All treatments were effective based on AUDPC values. The treatment containing fungicide V-10365 alone was unable to significantly reduce downy mildew incidence and severity when compared to the untreated control at the Sep assessment dates when disease pressure was more severe. The fungicide program with an alternation of Orondis Opti, V-10365, and Elumin was the most effective treatment at reducing both downy mildew incidence and severity. Treatments may have been more effective if the targeted fungicides were applied starting before disease onset. 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.

	Downy mildew incidence (%) [z]			Downy mildew canopy severity (%) [z]			
Treatment and rate/A (application dates) [y,x,]	27 Aug	5 Sep	10 Sep [w]	27 Aug [w]	5 Sep	10 Sep	AUDPC
Untreated	76.25 a	96.3 a	100.0 a	40.1 a	91.3 a	98.8 a	1092 a
V-10365 0.83SC (1-3)	32.75 b	77.5 ab	97.5 a	6.6 b	61.3 ab	76.3 ab	660 b
V-10365 0.83SC 12.1 fl oz (1,3), Manzate Pro-Stick 75DG 3 lb (1,3), Elumin 4SC 8 fl oz (2)	45.00 ab	62.5 b	93.7 a	6.6 b	37.5 bc	57.5 b	441 b
V-10365 0.83SC 12.1 fl oz (1,3), Elumin 4SC 8 fl oz (2)	28.75 b	58.8 b	95.0 a	5.6 b	42.5 bc	65.0 ab	492 b
Orondis Opti 32 fl oz (1), Zing! 4.9SC 36 fl oz (2), Ranman 3.33SC 2.75 fl oz (3)	10.38 b	53.8 b	94.9 a	1.3 b	31.3 bc	62.5 b	382 b
Orondis Opti 32 fl oz (1), V-10365 0.83SC 12.1 fl oz (2), Manzate Pro-Stick 75DG 3 lb (2), Elumin 4SC 8 fl oz (3)	13.13 b	52.5 b	78.1 b	3.4 b	27.5 c	43.8 b	323 b
P-value (treatment)	0.0006	0.0018	0.004	0.0039	<0.0001	0.0023	<0.0001

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

[y] Rate of formulated product/A. Application dates were 1=20 Aug, 2=27 Aug, 3=5 Sep.

[x] All treatments (except the untreated) received Manzate Pro-Stick applications (3 lb/A) prior to disease detection. Treatment dates were 30 Jul, 6 Aug, and 12 Aug.

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