

CUCUMBER (*Cucumis sativus* 'Silver Slicer')
Downy mildew; *Pseudoperonospora cubensis*

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Fungicide sensitivity of the cucurbit downy mildew pathogen population on Long Island, NY, 2019.

A seedling bioassay was used to examine fungicide sensitivity in the local cucurbit downy mildew pathogen population. The cultivar used was selected because of its resistance to powdery mildew and susceptibility to downy mildew. Seeds were sown in a greenhouse on 20 Aug. Seedlings were transferred to 4-in. pots on 5 Sep. At approximately the 3-leaf stage, the seedlings were prepared for treatment by removing the growing tip with unexpanded leaves and then sprayed to coverage with one of 11 fungicides at full and half label rates on 11 Sep. The technical ingredient zoxamide was used rather than a formulated product because Gavel and Zing! contain another active ingredient. Applications were made with a backpack sprayer using a TJ60-4004EVS nozzle delivering 50 gal/A operated at 55 psi. On 13 Sep the seedlings were arranged in five replications and placed in a previously established field experiment to evaluate fungicides on cucumber for naturally-occurring downy mildew (PDMR 14:V074). Each replication had one seedling treated with each fungicide treatment plus two control seedlings treated with water. Plants were placed next to, but not touching leaves of, field plots where no fungicides had been applied. The treatments in the field experiment included Elumin, Ranman, Orondis Opti, V-10365, and Zing!. Seedlings were left there for two days for infection to occur, then the plants were moved into a greenhouse until symptoms developed. Seedlings were evaluated for disease severity on 19 and 23 Sep. Percent leaf coverage with visible symptoms and percent coverage with visible sporulation on the underside of the leaves was estimated for all three leaves of each plant, values were averaged to obtain a single value per plant for analysis. Values for the two control seedlings were averaged. Data were analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software.

Revus (FRAC code 40), Quadris (11), Presidio (43), and Forum (40) failed to significantly reduce both total severity and sporulation compared to the untreated control. Considering none of these fungicides or other fungicides in these FRAC groups had been applied in the field fungicide evaluation experiment where the bioassay was conducted, the bioassay results suggest that resistance to these chemistries was established in cucumber downy mildew populations on Long Island in 2019. Zoxamide (22), Bravo (M5), and Ranman (21) showed some indication of not effectively suppressing downy mildew based on sporulation assessment for at least the half rate; however, while not significantly different from the untreated control, these treatments were also not significantly different from the best treatments. Omega (29), Previcur Flex (28), Curzate (27), and Orondis Gold 200 (49) were the most effective chemistries tested. Similar results were obtained when the same bioassay was conducted in 2018 with notable difference that Forum was effective then. Results from the 2019 bioassay can be used to guide selection of fungicides for cucurbit downy mildew control on Long Island in 2020.

Treatment and rate	Total severity (%) ^{*, **}		Sporulation (%) ^{*, **}	
	19 Sep	23 Sep	23 Sep	
Untreated control	11.71 a	56.1 a	21.00 a	
Revus 8 fl oz/A	10.85 a	59.7 a	16.39 ab	
Revus 4 fl oz/A	8.25 ab	47.1 abc	6.87 abcdef	
Quadris 15.5 fl oz/A	5.23 abcd	47.8 abc	10.85 abcd	
Quadris 7.75 fl oz/A	6.12 abc	49.6 ab	13.93 abc	
Presidio 4 fl oz/A	2.53 bcdefg	31.5 abcd	4.99 abcdef	
Presidio 2 fl oz/A	2.84 bcde	32.5 abcd	6.16 abcdef	
Forum 6 fl oz/A	2.70 bcdef	25.4 abcde	7.76 abcdef	
Forum 3 fl oz/A	1.69 cdefgh	24.8 abcde	10.30 abcde	
Zoxamide 400 ppm	0.59 efgh	18.2 bcdef	5.78 abcdef	
Zoxamide 200 ppm	0.92 defgh	17.7 cdefg	3.70 abcdef	
Bravo Ultrex 1.4 lb/A	0.71 efgh	12.9 defgh	1.83 bcdef	
Bravo Ultrex 0.7 lb/A	0.99 defgh	14.4 defgh	2.50 abcdef	
Ranman 2.75 fl oz/A	0.26 efgh	6.9 efghij	0.66 cdef	
Ranman 1.3 fl oz/A	0.40 efgh	11.4 defghi	2.77 abcdef	
Omega 24 fl oz/A	0.08 efgh	2.0 ghij	0.48 cdef	
Omega 12 fl oz/A	0.04 gh	4.5 fghij	0.33 def	
Previcur Flex 19.2 fl oz/A	0.18 efgh	0.3 j	0.05 ef	
Previcur Flex 9.6 fl oz/A	0.34 efgh	1.6 hij	0.23 def	
Curzate 5 oz/A	0.00 h	0.3 ij	0.00 f	
Curzate 2.5 oz/A	0.04 gh	1.3 hij	0.01 f	
Orondis Gold 200 9.2 fl oz/A	0.00 h	0.0 j	0.00 f	
Orondis Gold 200 4.6 fl oz/A	0.05 fgh	0.1 j	0.00 f	
<i>P-value (treatment)</i>	<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.