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

M. T. McGrath and Z. F. Sexton
Plant Pathology & Plant-Microbe Biology Section
SIPS, Cornell University, LIHREC
Riverhead, NY 11901

Fungicide sensitivity of cucurbit downy mildew pathogen population on Long Island, NY, determined with seedling bioassay, 2017.

A seedling bioassay was used to examine fungicide sensitivity in the local cucurbit downy mildew pathogen population. 'Silver Slicer' cucumber was used because it is resistant to powdery mildew and has no resistance to downy mildew. Seed were sown in a growth chamber on 2 Aug. When at the cotyledon stage, seedlings were transferred individually to pots in a greenhouse. On 25 Aug, when seedlings had three leaves with two fully expanded, they were each sprayed with one of ten fungicides at full and half label rates. Control plants were treated with water. Fungicide applications were made to leaf coverage with a backpack sprayer using a handheld boom with a single Twin-jet nozzle delivering 50 gal/A operated at 55 psi. The growing tip was removed. On the following day, the seedlings were placed in a previously established field experiment to evaluate cucumber cultivars for resistance to downy mildew (PDMR 12:V069). These plants had been naturally infected. No fungicides had been applied in the field experiment. A randomized block design with four replications was used to organize the seedlings. Each replication was in a different area of the field experiment and had one seedling from each treatment plus two nontreated seedlings. There were two control seedlings because severity data from this treatment is essential for interpreting results with treated plants; thus, having two control seedlings guarded against unusable data in the event a control plant was damaged. Seedlings were left in the field for two days for infection to occur before being returned to the greenhouse. Seedlings were evaluated for disease severity on 1 and 7 Sep. Plants were assessed for disease severity by estimating percent coverage with visible symptoms on each of the three leaves. Data analysis was performed for average disease severity on all leaves and for disease severity on the second leaf. Before the second rating on 7 Sep, plants were placed in plastic bags over night to promote sporulation thereby confirming the lesions were due to downy mildew. Data was analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software.

Plants in the two control treatments became severely affected by downy mildew; there were no significant differences between these treatments. The most effective fungicides, at both full and half rates, were Bravo Ultrex, Zing!, Zampro, and Ranman. These treatments provided consistent control of downy mildew when compared to the controls at both one week and two weeks after treatment, with the exception of one rating of Ranman at half rate that was not significantly different from the controls. Forum, Curzate, and Previcur Flex were effective at the first rating one week after treatment but not at the second rating with the exception of Forum at full rate. Based on the first rating, the pathogen population can be concluded to be sensitive to cyazofamid (Active Ingredient in Ranman), dimethomorph (AI in Forum and Zampro), propamocarb hydrochloride (active ingredient [AI] in Previcur Flex), and cymoxanil (AI in Curzate). A conclusion cannot be drawn for zoxamide and ametoctradin because the products tested with these, Zing! and Zampro, also have another AI, chlorothalonil and dimethomorph, respectively, that used alone were effective. Presidio, Revus, and Quadris were ineffective at both rates. Therefore, the pathogen population was insensitive (resistant) to these chemistries. It is important to note that there had been no fungicides applied to exert selection pressure for resistant isolates in the field.

	1 Sep (6 days from start of disease exposure)				7 Sep (12 days from start of disease exposure)			
Treatment and Rate/A	Average severity *		Second leaf *		Average severity *		Second leaf *	
Control 1	38.8	a	58.8	a	80.1	a	98.8	a
Control 2	31.8	ab	40.0	ab	82.1	a	95.0	ab
Presidio 4SC 2 fl oz/A	15.9	bcde	17.5	bcdef	58.7	abcde	71.0	abcd
Presidio 4SC 4 fl oz/A	21.5	bcde	24.0	bcdef	78.3	ab	96.3	ab
Revus 2.08SC 8 fl oz/A	18.8	bcd	27.5	bcde	68.3	abcd	73.0	abcd
Revus 2.08SC 4 fl oz/A	23.0	abc	35.0	abc	77.7	abc	98.8	a
Quadris 2.08F 7.75 fl oz/A	22.0	abc	31.3	bcd	66.7	abcd	77.5	abc
Quadris 2.08F 15.5 fl oz/A	16.5	bcde	15.0	bcdef	71.7	abcd	82.5	abc
Curzate 50DF 2.5 oz/A	4.3	de	6.5	def	58.9	abcde	65.0	abcde
Curzate 50DF 5 oz/A	0.5	e	1.3	ef	48.3	abcde	34.3	abcde
Previcur Flex 6SL 9.6 fl oz/A	2.0	de	0.5	f	53.4	abcde	47.5	abcde
Previcur Flex 6SL 19.2 fl oz/A	0.0	e	0.0	f	42.8	abcdef	30.0	bcde
Forum 3 fl oz/A	14.0	cde	8.3	cdef	74.2	abcd	66.3	abcde
Forum 6 fl oz/A	1.3	e	2.5	ef	37.2	cdef	21.3	cde
Ranman 400SC 1.375 fl oz/A	0.3	e	0.3	f	38.1	bcdef	34.8	abcde
Ranman 400SC 2.75 fl oz/A	0.0	e	0.1	f	25.4	ef	21.3	cde
Zampro 525SC 7 fl oz/A	1.4	e	1.5	ef	34.7	def	31.5	bcde
Zampro 525SC 14 fl oz/A	0.8	e	1.9	ef	23.8	ef	20.5	cde
Zing! 36 fl oz/A	0.0	e	0.0	f	24.3	ef	7.3	de
Zing! 18 fl oz/A	0.0	e	0.0	f	23.8	ef	3.5	e
Bravo Ultrex 1.4 lb/A	0.0	e	0.0	f	6.5	f	4.0	e
Bravo Ultrex 0.7 lb/A	0.0	e	0.0	f	5.0	f	8.0	de
P-value (treatment)	<0.0001		<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, $P=0.05$).