

Efficacy of fungicides for managing downy mildew in cucumber, 2012.

A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, on Haven loam soil. Fertilizer (N-P-K, 10-10-10) at 1000 lb/A (100 lb/A of nitrogen) was broadcast over the bed area and incorporated on 15 Jun. Beds were formed with drip tape and covered with black plastic mulch on 18 Jun. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer (20-20-20 Nutri-Leaf) plus insecticide on 18 Jun. Seeds were sown on 29 May in the greenhouse. Seedlings were transplanted by hand into the holes in the beds on 21 Jun. During the season, water was provided as needed via drip irrigation lines. Weeds were controlled between mulched rows by applying a tank mix of Strategy (3 pt/A), Sandea (0.5 oz/A), and Scythe (1.3 fl oz/gal spray mix) on 19 Jun, and by hand weeding. Cucumber beetles were managed with Admire Pro (7.5 fl oz/A) applied with the transplanter on 18 Jun. Plots were single 18-ft rows with 12 plants at 18-in. spacing. Rows were 8.5 ft apart. The plots were 9 ft apart within the row initially until plants began to vine. Vines were moved as needed to maintain plot separation. A randomized complete block design with four replications was used. Fungicides were applied weekly for 5 weeks beginning on 18 Jul, one day after symptoms were first observed, using a backpack CO₂-pressurized sprayer equipped with a single-nozzle boom and an 8006VS nozzle delivering 50 gal/A operated at 54 psi and 2.4 mph. It was intended that the treatments be applied on a preventive schedule. Downy mildew severity was assessed on 23 Jul and 1, 6, 14, and 21 Aug 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 used to estimate canopy severity. Percentage of leaves that died was assessed on 6 to 21 Aug. Fruit was removed from plants to maintain plant growth; yield was not assessed. Area Under Disease Progress Curve (AUDPC) values were calculated from 23 Jul through 21 Aug. Average monthly high and low temperatures (°F) were 78/61 in Jun, 85/68 in Jul, and 83/67 in Aug. Rainfall (inches) was 5.44, 4.35, and 3.24 for these months, respectively.

Downy mildew developed naturally in this experiment. Treatments were started 1 day after symptoms were first seen. Low in the canopy of a few plots there were 1-2 severely affected leaves on 17 Jul suggesting 1-2 disease cycles had occurred already. Infection likely occurred on 3-4 Jul when there was a low to moderate risk predicted for the area by the Cucurbit Downy Mildew *ipmPIPE* forecasting system. The fungicide treatments evaluated consisted of at least one mobile fungicide with targeted activity for *Pseudoperonospora cubensis* and other oomycete pathogens tank mixed with Bravo, a broad-spectrum fungicide for managing resistance development in the pathogen. All three treatments were effective based on severity on 6 Aug and AUDPC values. The treatment with Zampro was significantly more effective than the treatment with Ranman alternated with Forum, providing 71% control compared to 41% control based on AUDPC values. Except on 1 Aug, severity values were always numerically lower for plants treated with Zampro than with Presidio. Percentage of leaves that were necrotic paralleled the degree of control of downy mildew achieved with the treatments; on 21 Aug, 12 – 21% leaves were dead in fungicide-treated plots versus 76% in non-treated plots. Zampro was the only fungicide evaluated that was not registered for this use when the experiment was conducted.

Fungicide(s) and rate/A (application dates) ^y	Canopy severity of downy mildew (%) ^z						AUDPC ^x
	23 Jul	1 Aug	6 Aug	14 Aug	21 Aug		
Non-treated control.....	1.1	34.4 a	60.6 a	72.4 a	64.0 a	1398	a
Ranman ^w 2.75 fl oz + Bravo Ultrex 1.8 lb (1, 3, 5); Forum 6 fl oz + Bravo Ultrex 1.8 lb (2, 4).....	8.7	13.3 b	25.5 b	47.7 ab	57.8 ab	826	b
Presidio 4 fl oz + Bravo Ultrex 1.8 lb (1-5).....	2.2	9.4 b	21.7 b	41.9 ab	44.1 bc	674	bc
Zampro 14 fl oz + Bravo Ultrex 1.8 lb (1-5).....	0.9	10.8 ab	15.1 b	17.2 b	31.8 c	400	c
<i>P-value (treatment)</i>	0.374	0.024	0.001	0.008	0.001	0.001	

^z Numbers in each column followed by the same or no letter are not significantly different from each other (Tukey's HSD, P=0.05).

^y Rate of formulated product/A. Foliar application dates were 1 = 18 Jul, 2 = 26 Jul, 3 = 31 Jul, 4 = 9 Aug, 5 = 14 Aug.

^x AUDPC values were square root transformed before analysis. Table contains de-transformed values.

^w Ranman was applied with Silwet L-77 at 0.125% v/v.