

Evaluation of conventional fungicides for downy mildew in sweet basil, 2016.

An experiment with field-grown basil was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with 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 7 Jul. Beds were formed, drip irrigation tape was laid, and beds were covered with black plastic mulch on 7 Jul. Weeds between mulch strips were managed early in the season with Devrinol DF-XT (2 lb/A) applied before transplanting and afterwards by cultivation and hand-weeding. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer. Basil was seeded on 20 Jun in trays in a greenhouse, placed outdoors to harden for about a week, then transplanted by hand on 21 Jul. Basil was planted late in the season since downy mildew incidence is more prevalent during that time and would increase the likelihood of disease development during the experiment. The primary source of initial inoculum in this area is considered to be long-distance wind-dispersed spores from infected plants. Additionally, to provide a source of natural inoculum within the experimental area, a border row of non-fungicide-treated basil plants that extended the length of this experiment was transplanted on 11 Jul. These plants were not inoculated. A randomized complete block design with four replications was used. Each plot had 10 plants in 8-ft rows with 9-in. in-row plant spacing. The plots were 4 ft apart in the row. Treatment applications were made with a CO₂-pressurized backpack sprayer. Soil drench treatments were applied around the base of plants immediately after transplanting, followed by drip irrigation to incorporate the fungicide. Foliar applications were made using a boom with a single twin-jet nozzle (TJ60-4004evs) delivering 50 gal/A at 55 psi and 2 mph on 22 Jul, 28 Jul, and 4 Aug when basil plants were small. A boom with three twin-jet nozzles (TJ60-8006vs), one delivering spray over the top of the plant plus a drop nozzle directed to each side, delivering 82 gal/A, was used on 11, 18, 25, and 31 Aug. Downy mildew was assessed in each plot on 15 and 22 Aug, and 2, 8, and 15 Sep. Incidence of plants with symptoms (sporulation of the pathogen visible on the underside of leaves) and percentage of leaves per plant with symptoms was estimated for 10 plants in each plot. These two values were multiplied together to calculate incidence of symptomatic leaves in the plot. Area Under Disease Progress Curve (AUDPC) values were calculated for incidence from 22 Aug to 15 Sep. Average monthly high and low temperatures (°F) were 86/70 in Jul, 86/71 in Aug, and 77/61 in Sep. Rainfall (in.) was 2.93, 2.19, and 3.23 for these months, respectively.

Downy mildew developed naturally in the plots and became severe as is typical for the area. Symptoms were first observed on 15 Aug in 6 of the 28 plots. On 22 Aug, symptoms were observed in all non-treated plots on an average of 80% of plants, but very few leaves had symptoms. Foliar fungicide applications were started 1 day after transplanting and 3 weeks before symptoms were seen. All three treatments containing a rotation of Orondis Ultra, Revus, and Prophyt at various timings were equally highly effective in controlling downy mildew and exhibited good residual activity, providing more than 99% control compared to the non-treated plots two weeks after the final application. The treatment containing a rotation of Revus and Prophyt was similarly effective at controlling downy mildew, providing 99% control compared to the non-treated plots. These four highly effective fungicide programs started with a soil drench treatment of Ridomil Gold or Orondis Gold at transplanting which was 21 days before symptoms were first seen. The treatment containing a rotation of Ranman, Revus, and K-Phite was less effective at controlling downy mildew compared to the most effective treatments but still provided significant control when compared to the non-treated plots: 89% control one week after the final application. The treatment containing successive applications of an experimental fungicide, F9177-1, was much less effective than any other fungicide treatment but still provided significant control when compared to the non-treated plots: 43% control one week after the final application. The four best treatments also continued to provide stellar control of downy mildew (>99% compared to non-treated plots) two weeks after the final fungicide application, while other treatments began to decline in their effectiveness.

Treatment and Rate/A ^x (Application dates)	Incidence (% symptomatic leaves in plot) ^{y,z}				
	22 Aug	2 Sep	8 Sep	15 Sep	AUDPC
Non-treated control	2.7 a	46.0 a	84.3 a	87.0 a	1260.8 a
F9177-1 0.325 lb (2-8)	1.6 ab	4.6 b	47.4 b	71.4 a	599.1 b
Ranman 400SC 3 oz ^w (2,4,6,8) Revus 250SC 8 oz ^w + K-Phite 7LP 1 qt (3,5,7)	0.3 b	1.3 c	8.8 c	15.1 b	122.4 c
Orondis Gold 200 13.7 oz (1) Revus 250SC 8 oz ^w (2,4,6,7,8) Prophyt 4L 4 pt (3,5)	0.3 b	0.0 d	0.2 c	1.0 c	7.8 d
Ridomil Gold SL 16 oz (1) Orondis Ultra B 5.5 oz ^w (2,5,8), Revus 250SC 8 oz ^w (3,6) Prophyt 4L 4 pt (4,7)	0.5 b	0.0 d	0.1 c	0.2 c	3.8 d
Ridomil Gold SL 16 oz (1) Prophyt 4L 4 pt (2,5,8) Orondis Ultra B 5.5 oz ^w (3,6) Revus 250SC 8 oz ^w (4,7)	0.5 b	0.0 d	0.0 c	0.2 c	3.5 d
Ridomil Gold SL 16 oz (1) Revus 250SC 8 oz ^w (2,5,8) Prophyt 4L 4 pt (3,6) Orondis Ultra B 5.5 oz ^w (4,7)	0.2 b	0.0 d	0.0 c	0.0 c	1.8 d
<i>P-value (treatment)</i>	0.001	<0.0001	<0.0001	<0.0001	<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 Some data was square root transformed before analysis. Table contains de-transformed means.

^x Rate of formulated product/A. Soil drench application date was 1=21 Jul. Drip irrigation was run afterward to mimic a chemigation application. Application dates were 2=22 Jul, 3=28 Jul, 4=4 Aug, 5=11 Aug, 6=18 Aug, 7=25 Aug, and 8=31 Aug.

^w Ranman, Revus, and Orondis Ultra were applied with Induce (non-ionic surfactant) 0.125 % v/v.