

Evaluation of biopesticides for managing foliar diseases in organically-produced tomato, 2011.

The experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, in a field with Haven loam soil dedicated to research on evaluating fungicides for organically-produced crops. Tomatoes were grown in a reduced-tillage system. Rye cover crop was flail chopped and baled when it was about 4-ft tall and heading. An Unverferth zone builder was used to prepare rows for planting. ProGro 5-3-4 organic fertilizer was banded at 50 lb/A nitrogen in the tilled strips using the fertilizer applicator on a vacuum seeder. Fish emulsion fertilizer was placed in the transplant hole before planting. Seeds were sown on 6 May in the greenhouse. Seedlings were transplanted on 14 Jun by hand into manually-opened holes. The baled straw was spread around and between the transplants. Plots consisted of 10 plants in a single row with 24-in. plant spacing and 68-in. row spacing. There was 8-ft spacing between plots in a row. Plots for each of the 4 replications were in 2 adjacent rows. A driveway separated replication 1 from 2 and 3 from 4. A spreader row was planted in the center of the field. Plants were staked and trellised following standard procedure for fresh-market tomato production. Weeds were managed by manually removing in planted rows and mowing between rows. There was an early outbreak of late blight in the region, which included this experiment starting in early July. Fungicides were selected with targeted activity for the late blight fungus (*Phytophthora infestans*) to minimize impact on powdery mildew. A mefenoxam-sensitive strain (US-23) was present. Fungicides applied were Ridomil Gold (0.25 pt/A) on 6 Jul; Previcur Flex (1.5 pt/A) on 6 Jul, 27 Jul, and 4 Aug; Revus (8 fl oz/A) on 6 Jul, 15 Jul, and 20 Aug; Presidio (4 fl oz/A) on 25 Aug; Ranman (2.75 fl oz/A) on 20 Aug; and Curzate (5 oz/A) on 2 Sep. Serenade Soil was applied on 1 Aug as a drench around the base of plants. Foliar treatment applications were made using a CO₂-pressurized backpack sprayer with a boom that has a single 8006VS nozzle delivering 51 gal/A at 55 psi. Each side of the planted row was treated with the boom held sideways to obtain thorough coverage of foliage mimicking a drop nozzle on a tractor sprayer. A preventive 7-day application schedule was used. Applications were made on 8, 15, 22, and 29 Aug and on 5, 12, and 19 Sep. Leaves were examined routinely for disease symptoms. Disease severity was assessed by estimating the percentage of leaves in each plot with symptoms (incidence) and the severity of symptoms on these affected leaves. Canopy severity was calculated with these values. Ripe fruit were harvested on 16 and 26 Sep. Average monthly high and low temperatures (°F) were 79/61 in Jun, 87/68 in Jul, 82/66 in Aug, and 76/63 in Sep. Rainfall (inches) was 6.1, 2.35, 10.61, and 6.88 for these months, respectively. There was a hurricane (28 Aug) and several atypical intensive rain events during the 2011 growing season on Long Island.

Environmental conditions were atypical for the region during late Aug and Sep, when this experiment was being conducted, with a hurricane plus rain occurring on many more days than usual. This provided very favorable conditions for disease development but not for applying fungicide treatments or for plant growth. Research plants were damaged by the strong winds and intensive rainfall occurring during the storms, especially during Hurricane Irene on 28 Aug. The main damage was defoliation. Rain fell on 10 days during Aug, delivering a total of 10.6 inches. Another major rainfall of 3.4 inches occurred over 6-8 Sep. Rainy weather is very favorable for Septoria leaf spot as splashing water disperses pathogen spores and wet leaf tissue is favorable for infection. Symptoms of powdery mildew were first observed in this experiment on 12 Sep. Septoria leaf spot was observed on 24 Aug. No significant differences were detected among treatments. None of the treatments provided significant suppression of either disease that developed, including Bravo (active ingredient is chlorothalonil), the conventional fungicide included as a check primarily for assessing application timing. These results with Bravo provide support for the conclusions that environmental conditions impacted the success of this experiment. Severity of powdery mildew on 27 Sep was numerically lower than the non-treated control for all treatments. The value was lowest for MilStop. Bravo was next lowest, then Timorex Gold. Severity of Septoria leaf spot on 27 Sep was numerically lower than the non-treated control for plants treated with Bravo, Sonata alternated with Nordox, and Nordox alone.

Treatment and rate/A (application time) *	Powdery mildew						Septoria leaf spot on 27 Sep		
	Incidence (%)**		Leaf severity (%)		Canopy severity (%)		Incidence (%)	Leaf severity (%)	Canopy severity (%)
	12 Sep	27 Sep	12 Sep	27 Sep	12 Sep	27 Sep			
Nonntreated control.....	12.5	30.0	6.3	15.0	0.9	6.3	52.5	26.3	16.6
Serenade Soil 2 qt (1); Sonata ASO 4 qt + Nu-Film P (2-8).....	15.8	17.5	7.9	10.0	2.3	3.1	52.5	26.3	17.1
Sonata 4 qt + Nu-Film P (2, 4, 6, 8); Nordox 75WG 1.25 lb (3, 5, 7).....	11.0	18.8	3.9	9.4	0.7	2.7	40.0	20.0	10.8
Nordox 75WG 1.25 lb (2-8).....	7.3	13.8	3.3	7.5	0.5	1.6	37.5	18.8	11.4
Sonata 4 qt.+ Nu-Film P (2-8).....	2.8	11.3	1.4	5.6	0.1	1.4	65.0	32.5	23.8
MilStop 2 lb (2, 4, 6, 8); Serenade ASO 4 qt + Nu-Film P (3, 5, 7).....	5.2	15.9	2.4	7.7	0.3	1.2	70.0	34.9	25.2
Timorex Gold 0.75% v/v (2-8).....	9.3	7.5	4.6	4.4	1.3	1.0	66.3	32.5	23.2
MilStop 2 lb (2-8).....	5.8	2.6	2.9	1.9	0.5	0.1	61.3	30.0	20.7
Bravo Ultrex 1.3 lb (2-8).....	2.7	4.5	1.4	2.3	0.0	0.3	32.0	15.6	7.7
<i>P-value (treatment)</i>	0.3737	0.1087	0.4252	0.1298	0.6164	0.1207	0.1295	0.1199	0.2430

* Rate of formulated product/A. Applications dates were 1=1 Aug, 2=8 Aug, 3=15 Aug, 4=22 Aug, 5=29 Aug, 6=5 Sep, 7=12 Sep, and 8=19 Sep. Nu-Film P was applied at 0.03% v/v.

** Numbers in each column followed by the same letter or no letter are not significantly different from each other according to Tukey's HSD ($P=0.05$)