

Evaluation of biopesticides for managing foliar diseases in organically-produced tomato, 2012.

The experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, in a field with Haven loam soil that has been dedicated to research on evaluating fungicides on organically-produced crops. Pro-Grow 5-3-4 organic fertilizer at 2000 lb/A (100 lb/A N) was spread over rows to be planted, then incorporated on 31 May. Next, drip tape was laid as the rows were being covered with black plastic mulch. Annual ryegrass was planted between plastic mulch to establish a living mulch by broadcasting seed with a hand-operated spreader, then lightly raking to incorporate on 6 Jun. The ryegrass plus weeds that grew were mowed routinely. Some weeds were removed by hand. Tomato seeds were sown on 15 May in the greenhouse. Seedlings were transplanted on 19 Jun by hand into holes opened in the plastic mulch by a waterwheel transplanter that also placed in the holes a starter fertilizer, Neptune's Harvest Benefits of Fish (2-4-1 N-P-K). Plants were staked and trellised following standard procedure for fresh-market tomato production. The following conventional fungicides with targeted activity for oomycetes were applied on a 7-day, preventive schedule due to an early outbreak of late blight in the region: Forum 4.16SC (6 oz/A) on 27 Jul, 21 Sep; Presidio (4 fl oz/A) on 27 Jul, 23 Aug, 7 Sep; Previcur Flex 6 F (1.5 pt/A) on 18 Jul, 8 Aug; Revus (8 oz/A) on 14 Aug, 31 Aug, 14 Sep; and Ridomil Gold EC (0.25 pt/A) on 31 Jul. Late blight, a very destructive and difficult to manage disease, was not a target disease for this experiment. Insects were managed by applying Abba (12 fl oz/A) on 27 Jul and Entrust (2 oz/A) on 31 Jul and 8 Aug. 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 four replications were in two adjacent rows. There was a spreader row planted between each replication and to the west of the last row of plots. A completely randomized block design with four replications was used. Serenade Soil was applied on 2 Jul as a drench around the base of plants using a CO₂-pressurized backpack sprayer with a boom that has a single twin-jet nozzle (TJ60-11003). Foliar treatment applications were made using this sprayer and boom calibrated to deliver 50 gal/A when operated at 54 psi and 2.4 mph. Each side of the planted row was treated with the boom held sideways to obtain thorough coverage of foliage and to mimic the coverage obtained with a drop nozzle on a tractor sprayer. A preventive 7-day application schedule was used. Applications were made on 26 Jul; 1, 8, 14, 21, and 29 Aug; and 7, 13, and 26 Sep. Leaves were examined routinely for disease symptoms. All diseases that occurred started from naturally-occurring inoculum; artificial inoculation was not done. Disease was assessed by counting number of plants with symptoms (incidence) and estimating severity of symptoms on affected plants. Canopy severity was calculated by multiplying these values. Defoliation was assessed on 25 Sep as percent of leaves that had died. Ripe marketable and unmarketable fruit were harvested on 20 Sep and 2 Oct. Average monthly high and low temperatures (°F) were 78/61 in Jun, 85/68 in Jul, 83/67 in Aug, 75/60 in Sep, and 66/52 in Oct. Rainfall (inches) was 5.44, 4.35, 3.24, 3.75, and 2.17 for these months, respectively.

Tomato plants did not grow well perhaps because the fertilizer used did not provide adequate nutrients and/or the ryegrass living mulch was able to utilize fertilizer placed under the plastic mulch. This likely affected disease development. Both Septoria leaf spot and powdery mildew (caused by *Oidium lycopersicum*) have been severe in previous experiments in this location. However, disease was low during this experiment. Powdery mildew was found in only six plots. Late blight was also assessed to determine if control achieved with the conventional fungicides applied to the entire experiment was improved by any of the treatments. Symptoms of late blight were first seen on 31 Jul. No significant differences in disease severity or defoliation were detected among treatments (defoliation data not shown). Disease ratings and defoliation were numerically among the lowest for plants treated with Nordox. Disease ratings were also low for plants treated with Regalia + Nordox. Disease ratings and defoliation were numerically highest for the Double Nickel and the SerenadeSoil + Sonata treatments. There were no significant differences among treatments in yield (data not shown). Timorex Gold is the only product evaluated that is not yet registered for use in the USA.

Treatment and rate/A (application dates) ^z	Canopy severity (%)							
	Septoria leaf spot				Late blight			
	13 Aug	29 Aug	12 Sep	AUDPC	13 Aug	29 Aug	12 Sep	AUDPC
Non-treated.....	0.0	1.0	0.0	2.4	0.000	0.002	0.016	0.0174
Sonata ASO 4 qt ^y (1-9).....	0.0	1.3	1.3	15.3	0.000	0.001	0.004	0.0010
Serenade Soil 2 qt. (soil drench) + Sonata ASO 4 qt ^y (1-9).....	0.0	1.3	3.8	28.8	0.000	0.001	0.039	0.0795
Sonata ASO 4 qt ^y (1,3,5,7) alt Nordox 75DF 1.25 – 2.5 lb ^x (2,4,6,8).....	0.0	0.5	0.3	4.9	0.000	0.000	0.002	0.0002
Double Nickel 6 qt (1-9).....	0.0	0.8	4.0	18.5	0.000	0.000	0.044	0.0963
MilStop 2.5 lb + Serenade ASO 4 qt (1-9)....	0.3	0.3	1.5	9.6	0.000	0.001	0.002	0.0003
Regalia 1 qt + Nordox 75WG 2 lb (1-9).....	0.0	0.3	0.0	0.7	0.000	0.000	0.003	0.0005
Regalia 2 qt (1,3,5,7) alt Nordox 75WG 2 lb (2,4,6,8).....	0.3	1.0	0.0	8.1	0.000	0.001	0.007	0.0032
Timorex Gold 0.75% v/v (1-9).....	0.0	0.3	1.0	4.4	0.000	0.000	0.001	0.0001
Nordox 75DF 2 lb (1-9) (Organic Standard).....	0.0	0.3	0.0	0.7	0.000	0.001	0.002	0.0004
Badge X2 1.25 lb (1-9).....	0.0	1.0	0.3	4.9	0.002	0.001	0.013	0.0123
Bravo Ultrex 1.3–1.8 ^x (1-9) (Conventional Std.).....	0.5	0.3	0.3	3.4	0.000	0.000	0.008	0.0033
<i>P-value (treatment)</i>	0.1097	0.9384	0.2812	0.2959	0.4671	0.1342	0.5828	0.5818

^z Rate of formulated product/A. Soil drench applied on 12 Jul. Foliar application dates were 1=6 Jul, 2=1 Aug, 3=8 Aug, 4=14 Aug, 5=21 Aug, 6=29 Aug, 7=7 Sep, 8= 13 Sep, and 9=26 Sep.

^y Sonata ASO and Serenade ASO were applied with Nu-Film P at 0.25% v/v.

^x Rate increased over time.