

Evaluation of Cornell late blight Decision Support System for timing fungicide applications for foliar diseases in tomato, NY, 2014.

The goal of this experiment was to evaluate the Cornell Decision Support System (DSS) for naturally-occurring late blight on organically-grown tomato using an organic copper fungicide (Nordox 75WG) applied to a susceptible cultivar (Mountain Fresh Plus) and a moderately resistant cultivar with the *Ph2* gene for resistance to late blight (Legend). 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 organic research since 2001. A combination of Pro-Grow, Cheep Cheep, and Cotton seed blend fertilizers was spread at 700 lb/A (105 lb/A total N) over rows to be planted, then incorporated on 28 Apr. Drip irrigation tape was laid as the rows were covered with black plastic mulch. A living mulch of annual ryegrass was planted between rows by broadcasting seed with a hand-operated spreader, then lightly raking to incorporate on 6 May. The ryegrass plus weeds that grew were mowed routinely. Some weeds were removed by hand. Tomato seed were sown in an organic seeding mix in the greenhouse on 6 May. Seedlings were transplanted by hand on 9 into holes pre-made by a waterwheel transplanter that also applied starter fertilizer, Neptune's Harvest Benefits of Fish (2-4-1 N-P-K). Additional drench applications of this fertilizer to the base of plants were made on 8, 15, and 29 Aug, and 5 and 12 Sep. A completely randomized block design with four replications was used. Plots consisted of 10 plants in a single row with 24-in. plant spacing and 68-in. row spacing. Plots for each of the four replications were in two adjacent rows. Plants were staked and trellised using a Florida weave trellising system with 4-ft stakes according to standard commercial practices. Water was provided as needed through drip tape. Insect pests were managed by applying Entrust (8 oz/A) on 17 Jul, 25 Jul, 4 Aug, and 2 Sep. Treatment applications to foliage were made using a CO₂-pressurized backpack sprayer with a boom that has a single twin-jet nozzle (TJ60-11004VS), 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 the standard program. A total of 14 applications were made from 22 Jun through 24 Sep. Timing of applications made following the DSS (<http://blight.eas.cornell.edu/blight/>) were adjusted as needed to avoid weekend days. Leaves were examined for symptoms of any foliar disease twelve times from 16 Jul to 29 Sep. Late blight and other diseases observed were 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 by multiplying these values. Area Under Disease Progress Curve (AUDPC) was calculated for late blight severity from 26 Aug through 29 Sep for all entries. Average monthly high and low temperatures (°F) were 79/60 in Jun, 82/67 in Jul, 81/64 in Aug, 77/61 in Sep, and 66/53 in Oct. Rainfall (inches) was 2.47, 2.24, 2.42, 1.86, and 5.43 for these months, respectively.

Late blight was first observed on 20 Jun on Long Island, NY. Very few symptoms were found that day in a commercial potato crop in Suffolk County located about 5 miles from the research field for this experiment. Source of inoculum for this crop could not be determined. Symptoms were found in three additional crops before being found in this experiment on 15 Aug. US-23 was the only genotype of *P. infestans* found in the region, including at LIHREC. Late blight remained at a very low level across this experiment including in the untreated late blight-susceptible cultivar (Mountain Fresh Plus). This may have been partly due to plants not continuing to grow well through the season as a result of insufficient fertility compounded by competition from ryegrass living mulch. Compared to the weekly schedule, the DSS recommended two more applications (16 total) to the susceptible cultivar and four fewer (10 total) to the moderately resistant cultivar. The DSS spray intervals ranged from 3 to 8 days and 6 to 15 days for these cultivars, respectively. Following the DSS application schedule resulted in significantly lower late blight severity on Mountain Fresh Plus and powdery mildew on both cultivars compared to the untreated controls. Septoria leaf spot was numerically lower on Mountain Fresh Plus, and significantly lower on Legend. There were no significant differences between the DSS and weekly application schedules. Thus implementing the DSS for late blight on a moderately resistant cultivar did not compromise control of other diseases although four fewer applications were made. For Mountain Fresh Plus, disease severity values for plants receiving the DSS fungicide schedule were often numerically lower than for those treated with fungicides following a standard weekly application interval; however, two more applications were made.

Cultivar	Fungicide application timing ^y	Canopy severity (% canopy affected) ^z					
		Late blight		Powdery mildew		Septoria leaf spot	
		29 Sep	AUDPC ^x	29 Sep	AUDPC	22 Sep	AUDPC
Mountain Fresh Plus	Untreated	0.15 a	7.4 a	2.57	391.1 a	0.6 b	29.4
Mountain Fresh Plus	Weekly ^w	0.00 b	0.7 ab	0.04	41.9 b	0.0 b	1.3
Mountain Fresh Plus	DSS ^v	0.00 b	0.0 b	0.01	5.9 b	0.1 b	0.2
Legend	Untreated	0.04 ab	0.3 b	2.14	330.3 a	7.6 a	62.4
Legend	Weekly	0.00 b	0.0 b	0.03	0.8 b	0.5 b	0.4
Legend	DSS ^u	0.00 b	0.0 b	0.25	7.7 b	0.9 b	11.1
<i>P-value</i>		<i>0.0032</i>	<i>0.0063</i>	<i>0.5428</i>	<i>0.0001</i>	<i>0.0012</i>	<i>0.0697</i>

^z Numbers in each column with a letter in common are not significantly different from each other (Tukey's HSD, *P*=0.05).

^y The copper fungicide Nordox 75WG was applied at 2 lb/A for all applications.

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

^w Weekly foliar applications were made on 23 Jun; 1, 7, 17, and 25 Jul; 1, 7, 14, 22, and 28 Aug and 4, 12, 18, and 24 Sep.

^v Decision Support System foliar applications to the susceptible variety were made on 27 Jun; 1, 7, 14, 17, and 25 Jul; 1, 4, 7, 14, 22, and 28 Aug; 4, 12, 18, and 24 Sep.

^u Decision Support System foliar applications to the moderately resistant variety were made on 1, 7, and 17 Jul; 1, 7, 14, and 28 Aug and 4, 18, and 24 Sep.