TOMATO (*Lycopersicon esculentum* 'Red Sun')
Powdery mildew; *Leveillula taurica*
Septoria leaf spot; *Septoria lycopersici*

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Evaluation of a health-promoting product and a copper fungicide on foliar diseases in organically-produced tomato, 2006.

The objective of this study was to evaluate applications of AgriLife and an OMRI-approved copper fungicide (Champion) for control of foliar diseases of tomato. AgriLife, a citrus acid product that reportedly promotes plant health, was applied to the ground early in plant growth as well as to foliage throughout the growing season. The experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead, NY, in a field of Haven loam soil that has been assigned to research on organic vegetable production. Hairy vetch and rye were seeded on 20 Sep 2005 to the entire experiment area. Non-fungicide-treated tomato seed was planted in an organic soil-less mix on 7 May in a greenhouse. On 13 Jun the field was flail chopped to form a mulch layer. Seedlings were put outside to harden on 12 May and were no-till transplanted on 23 Jun with Neptune's Harvest Benefits of Fish (2-4-1 N-P-K) applied as a starter fertilizer. A tractor equipped with a fluted coulter and an S-tine was used to cut 4 in. deep strips through the field. Seedlings were planted in the opening by hand. There were 10 plants spaced 2 ft. apart in each single-row plot and plots were spaced 5 ft. apart. A randomized complete block design with four replications was used. Drip irrigation tube was laid on the soil surface next to the plants. Plants were irrigated as needed. Peanut meal was applied at 625 lb/A (equivalent to 50 lb/A of N) and straw was placed around the base of plants (1/2 bale/plot) in all plots on 12-13 Jul. In addition to the straw, weeds were managed throughout the growing season by mowing between plots and hand weeding in the planted rows. Plants were pruned, staked, and trellised. AgriLife was applied using a CO_2-pressurized backpack sprayer with a single flat-fan nozzle boom (50 psi, 43 gal/A, 8004 nozzle). Each side of the planted row was treated with the boom held sideways to obtain thorough coverage of foliage, and then a second pass was made around the plot with the boom directed on the soil on each side of the plot. AgriLife treatments were applied a total of 11 times: 7 Jul, 14 Jul, 25 Jul, 1 Aug, 8 Aug, 15 Aug, 22 Aug, 31 Aug, 6 Sep, 13 Sep, and 19 Sep. Champion was only applied 4 times: 31 Aug (when first fruit were ready for harvest), 6 Sep, 13 Sep, and 19 Sep. This treatment was applied with the same sprayer with directed sprays on each side of the planted row, but this treatment was not applied to the ground around the plot. Entrust was applied to help control thrips and worms on 13 Jul, 14 Aug, 5 Sep, and 21 Sep. Upper and lower surfaces of leaves were assessed for powdery mildew beginning on 20 Sep, one week after symptoms were first observed and weekly thereafter on 27 Sep, 4 Oct, and 11 Oct. Ten mid-aged leaves were selected in each plot based on leaf physiological appearance and position in the canopy. Powdery mildew colonies (individual spots) were counted; severity was assessed by visual estimation of percent leaf area affected when colonies could not be counted accurately because they had coalesced and/or were too numerous. Colony counts were converted to severity values using the conversion factor of 1 colony/leaf = 2%. Average severity for the entire canopy was calculated from the individual leaf assessments. These canopy severity values were used to calculate area under disease progress curves (AUDPC) to obtain a measure of severity over the entire season. A square root transformation was used when needed prior to analysis to achieve homogeneity of variance. Septoria leaf spot incidence (percentage of infected plants per plot) and severity (percentage of infection on each plant per plot) were rated on 14 Sep, 22 Sep and 2 Oct. Red and pink fruit were harvested seven times on a weekly basis from 1 Sep to 12 Oct. Fruit were graded by size, counted, and weighed. Average monthly high and low temperatures (^oF) were77/62 in Jun, 84/69 in Jul, 82/67 in Aug, 73/58 in Sep, and 64/48 in Oct. Rainfall (in.) was 5.83, 3.79, 5.48, 3.66, and 5.53 for these months, respectively.

Powdery mildew and Septoria leaf spot were first observed in the field on 13 Sep, powdery mildew was found in 8 of the 16 plots and Septoria leaf spot was found in 7 of 16 plots when assessed on 14 Sep. All treatments were ineffective on all assessment dates for Septoria leaf spot, a disease occurring commonly in organically-produced tomatoes on Long Island. Powdery mildew occurs more sporadically in these production fields, but can become quite severe. On the upper leaf surface all treatments managed powdery mildew at the same level according to the AUDPC value. On the lower leaf surface, AgriLife (1:50) and Champion WP (2 lb/A) were the most effective treatments and AgriLife (1:100) provided significantly less control but still reduced disease compared to the control based on the AUDPC. Although these products reduced powdery mildew compared to the nontreated control, yield was not increased, most likely because powdery mildew did not infect the tomato plants until late in the growing season. In fact, plants treated with AgriLife (1:50) yielded significantly lower than the other treatments suggesting this dose applied throughout the growing season was too high. The total number of fruit per plant was statistically equivalent between treatments. No phytotoxicity was observed.

	Septoria leaf spot[z]		Powdery mildew severity (%)[y]							
	Incidence	Severity	Upper leaf surface			Lower leaf surface			Yield/ plant	Number of fruit/ plant
Treatment[x]	4-Oct	4-Oct	27-Sep	11-Oct	AUDPC	27-Sep	11-Oct	AUDPC	(lb)	
Champion WP 2 lb.	65.6	3.3	16.0 bc[w]	9.5 b	166 b	19.7 bc	15.1 c	236 c	8.4 a	14.4
AgriLife 1:50.....	83.8	7.9	4.9 c	20.6 b	186 b	12.0 c	17.8 bc	319 c	5.8 b	10.6
AgriLife 1:100.....	76.4	8.1	19.7 ab	22.2 b	278 b	34.5 ab	35.3 b	525 b	7.9 a	14.1
Nontreated ……	77.5	5.6	32.5 a	59.3 a	873 a	42.3 a	60.0 a	1060 a	9.1 a	15.3
P-value	0.7756	0.2097	0.0165	0.0016	0.0001	0.0297	0.0012	0.0001	0.024	0.0762

[z] Septoria leaf spot incidence is the percentage of infected plants per plot and severity is the percentage of Septoria infection per plant per plot.
[y] Exact colony counts were made when possible and severity was estimated using the conversion factor of 1 colony/leaf = 2%. Severity data is for mid-aged leaves on 27 Sep and 11 Oct.
[x] Rate expressed per acre for Champion and as a dilution for AgriLife..
[w] Numbers in each column with a letter in common are not significantly different according to Fisher's Protected LSD (*P* = 0.05).