Tomato (*Solanum lycopersicum* 'Mt Fresh Plus')
Bacterial speck; *Pseudomonas syringae pv. tomato*

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Efficacy of fungicides for managing bacterial speck in tomato, 2019.

An experiment was conducted at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY, in a field with Haven loam soil. Controlled release fertilizer (15-5-15) was applied at 675 lb/A product (101 lb/A N) with a 2-row fertilizer spreader over rows that subsequently were covered with plastic while drip tape was laid. Before transplanting, herbicide was applied between the plastic strips with a shielded sprayer. A tank mix of Devrinol DF (4 lb/A), Metribuzin (1.33 lb/A) and Roundup PowerMax (22 oz/A) was used. Seeds were sown on 28 May in the greenhouse. Seedlings were transplanted on 24 June by hand into holes opened in the plastic mulch by a Waterwheel transplanter that also placed in the holes a starter fertilizer (Black Label Zn [6-20-0] at 1 fl oz per gallon). Seedlings not growing well or that had died were replaced within two weeks of transplanting. Plots were single rows with 9 plants at 24-in spacing. Treatments were arranged in a randomized block design with four replications, each occupying one row. There was a 6-foot non-planted space between plots in a row and 8.5 feet between plants in adjacent rows. Plants were staked and trellised using a modified Florida weave as is standard practice in the region for fresh-market tomatoes. Source of inoculum for the experiment was an inoculated spreader row between the first and second row as well as the third and fourth rows. An isolate of *Pseudomonas syringae pv. tomato* from a New York farm was used. To ensure the isolate was virulent, a tomato seedling was inoculated and the isolate was cultured from symptomatic tissue. Seedlings for the spreader row were inoculated in the greenhouse on 12 Jun. They were kept in a different greenhouse from the experiment plants. They were given water with fertilizer to promote tender growth. Bacteria were removed from plates of PDA after 3 or 4 days by pouring deionized water on the plate and gently loosening the bacteria with a plastic scraper. A spray bottle was used to apply the inoculum on the upper surface of leaves late in the day, and then the plants, still in flats, were enclosed in plastic covers overnight to maintain moisture to promote infection. This process was repeated daily for 5 days until adequate disease development was achieved. Symptoms were seen eight days after the first inoculation. The inoculated plants were put outside to harden where they were overhead watered to promote additional disease development. Spreader row plants were transplanted to the field on 17 Jul, which was two days after the first treatment application. A line of overhead irrigation pipe with fine sprinkler nozzles was set up next to the spreader rows to promote speck development in the experiment by running irrigation late in the day at least once a week in between treatment applications. Treatments were made using a CO_2-pressurized backpack sprayer with a boom that has a single TwinJet 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. Applications were made weekly starting on 15 Jul and ending on 9 Sep. Disease assessments were taken weekly starting on 25 Jul. Disease severity and incidence were assessed visually on a plot by plot basis. Area Under Disease Progress Curve (AUDPC) values were calculated from 25 Jul to 26 Aug using the formula: $\sum n_{i=1}[(R_{i+1} + R_i)/2]\,[t_{i+1} - t_i]$, where R = disease severity rating (% of leaf surface with symptoms) at the ith observation, t_i = time (days) since the previous rating at the ith observation, and n = total number of observations. Data were analyzed with one-way ANOVA and Tukey's HSD to separate means using JMP statistical software. Average monthly high and low temperatures (^oF) were 86.3/71.3 in Jul, 82/68.8 in Aug, and 76/66.1 in Sep. Rainfall (in.) was 3.00, 1.52, and 1.83 for Jul, Aug, and Sep, respectively.

Bacterial speck was successfully established and maintained in the experiment, but disease pressure was affected by environmental conditions and combined with plant growth resulted in fluctuations in incidence and severity week to week. Results show that the two treatments with LifeGard and Kocide 3000-O plus Manzate Pro-Stick were significantly reducing disease severity and incidence compared to the untreated control during weeks when disease pressure was highest, while Kocide 3000-O plus Manzate Pro-Stick applied weekly was ineffective. AgriPhage was also ineffective. The manufacturer (OmniLytics) determined that the phage strains in the formulation used had limited activity against the pathogen isolate used in the experiment, which would affect efficacy. No phytotoxicity was observed.

Treatment and rate (application dates) [y]	Bacterial speck incidence (%) [z]				Bacterial speck severity (%) [z]				
	25 Jul [x]	31 Jul	5 Aug [x]	12 Aug	25 Jul [x]	31 Jul	5 Aug [x]	12 Aug	AUDPC
Untreated	1.5	17.5 ab	3.7	8.8 a	0.5	11.8 ab	0.6	4.0 a	109 a
AgriPhage 2 pt/100 gal (1-9)	1.5	20.0 a	4.9	4.8 ab	0.5	12.3 a	1.1	2.0 ab	102 ab
Kocide 3000-O 0.75 lb/A + Manzate Pro-Stick 2 lb/A (1-9)	0.1	10.0 bc	0.9	4.8 ab	0.1	5.0 bc	0.6	2.0 ab	54 abc
LifeGard 4.5 oz/100 gal (1,3,5,7,9), Kocide 3000-O 0.75 lb/A + Manzate Pro-Stick 2 lb/A (2,4,6,8)	1.2	8.8 c	0.9	2.9 b	0.5	4.8 bc	0.5	1.4 b	48 bc
LifeGard 4.5 oz/100 gal (1,3,5,7,9), Kocide 3000-O 0.75 lb/A + Manzate Pro-Stick 2 lb/A (1-9)	0.4	5.0 c	1.1	2.5 b	0.3	3.0 c	0.5	1.0 b	35 c
P-value (treatment)	0.1754	0.0003	0.0559	0.0248	0.2087	0.0026	0.3363	0.0097	0.0027

[z] Numbers in each column with a letter in common or no letter are not significantly different from each other (Tukey's HSD, P=0.05).

[y] Rate of formulated product. Application dates were 1=15 Jul, 2=22 Jul, 3=29 Jul, 4=5 Aug, 5=12 Aug, 6=19 Aug, 7=26 Aug, 8=3 Sep, 9=9 Sep.

[x] Values were square root transformed before analysis because raw data were not distributed normally. Table contains de-transformed values.