

**ORGANIC
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Organic farming research project report submitted to the Organic Farming Research Foundation:

Project Title:

Tomato Foliar Disease Control Using OMRI-Approved Materials

FINAL PROJECT REPORT

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Introduction

Seven materials approved for organic production were tested for foliar disease control on tomatoes on a certified organic farm in western New York. Four were commercial products registered for disease management on tomatoes (Plantshield, Mycostop, Trilogy, Champion WP). Three were materials thought to strengthen plant health and disease resistance through either soil or foliar application (CaCO₃, SW-3, Humega).

Plantshield is a formulation of the beneficial fungus *Trichoderma harzianum* labeled for foliar and soil drench applications. In previous trials, a Plantshield drench treatment at transplanting reduced levels of early blight (*Alternaria solani*) on tomato, possibly by acting as a plant resistance inducer. Mycostop is a formulation of the beneficial actinomycete *Streptomyces griseoviridis* labeled for seed treatment, potting soil amendment, and drench applications that had also significantly reduced early blight in a previous trial. Trilogy is a neem oil extract labeled for disease and mite control on a variety of fruit and vegetable crops. Trilogy significantly reduced early blight levels in one of two previous trials. Champion WP is a fixed copper fungicide widely used for control of fungal and bacterial pathogens. We included the CaCO₃ treatment to address the hypothesis that plants grown in soils with high calcium base saturation levels are more resistant to insects and diseases. We drenched the plants with a suspension of finely ground high calcium limestone three days after planting. We did not test the soil base saturation after the drench application, so don't know if Ca levels were elevated compared with other treatments. SW-3 is a cold processed homogenized kelp product that is advertised to maximize plant growth and root development through the action of macronutrients, trace elements, cytokinins, and betaines. Humega is a liquid humic acid derivative that is advertised to increase the availability of micronutrients, promote soil aeration and water penetration, and enhance the photosynthetic rate of plants. We hypothesized that the SW-3 and Humega applications may decrease foliar disease through increased plant vigor or by acting as resistance inducers.

Methods

Tomatoes of the variety Daybreak were transplanted into black plastic with trickle irrigation on June 17. The field rotation for the previous two years had been barley underseeded with clover followed by a year of clover hay. Composted chicken manure was broadcast over the field at a rate of 1T/A, and an additional 1.5T/A was rototilled into the beds before the plastic was laid. Between-row spacing was 6 ft. and in-row spacing was 18 inches. The plants were not staked. Plots consisted of 15 ft of a single row of plants, and blocks were in adjacent rows. Treatments were replicated four times and randomized in a complete block design. Fungicides were not applied to the plants surrounding the trial until mid-September, when late blight was found in the trial.

Treatment	Rate
Plantshield drench at transplanting	10 oz./100 gallons
Mycostop drench at transplanting	.01% suspension
Trilogy foliar application	1% solution
CaCO ₃ drench at transplanting	100 lb./A (9.4 g per plant)
SW-3 Seaweed drench + foliar application	Drench 1:200, foliar 2 qt./A
Humega drench at transplanting	40 gallons per acre
Champion WP foliar application	4 lb./A
Untreated control	

Plants in plots receiving the drench treatments were drenched three days after transplanting with approximately 4 oz. of solution per plant, enough to saturate the root ball. This treatment is comparable to a grower drenching the flats of plants before transplanting. Foliar treatments were applied with a CO₂ backpack sprayer and 38 inch handheld boom with three Teejet 8002VS nozzles at 19 inch spacing, in the equivalent of 60 gallons of water per acre. Each foliar treatment was applied four times, at approximately two-week intervals, starting on July 25 and ending on September 3. Each plot was visually rated as percent of the foliage with disease for six consecutive weeks, starting August 21.

Results

The 2003 growing season was relatively wet and cool, with a total of 12.67 inches of rain falling during the months of June through September. The weather was more favorable for foliar diseases than in the previous two years that tomato disease management trials had been conducted. The first disease symptoms appeared the week of August 28, and were diagnosed as Septoria leaf spot, caused by *Septoria lycopersici*. Septoria was the predominant foliar

disease in the trial. Early blight (caused by *Alternaria solani*) was also seen at low levels, and late blight (*Phytophthora infestans*) was discovered in one of the control plots on September 10. Late blight infections were not distributed evenly across the trial, and spread relatively slowly from the point of initial infection. On September 24 we rogued out many of the infected plants to slow inoculum production and spread into the rest of the field. Figure 1 shows the disease progression for the season. For the last two observations, Septoria leaf spot, late blight, and early blight were rated together.

Tomato Disease Management Trial 2003

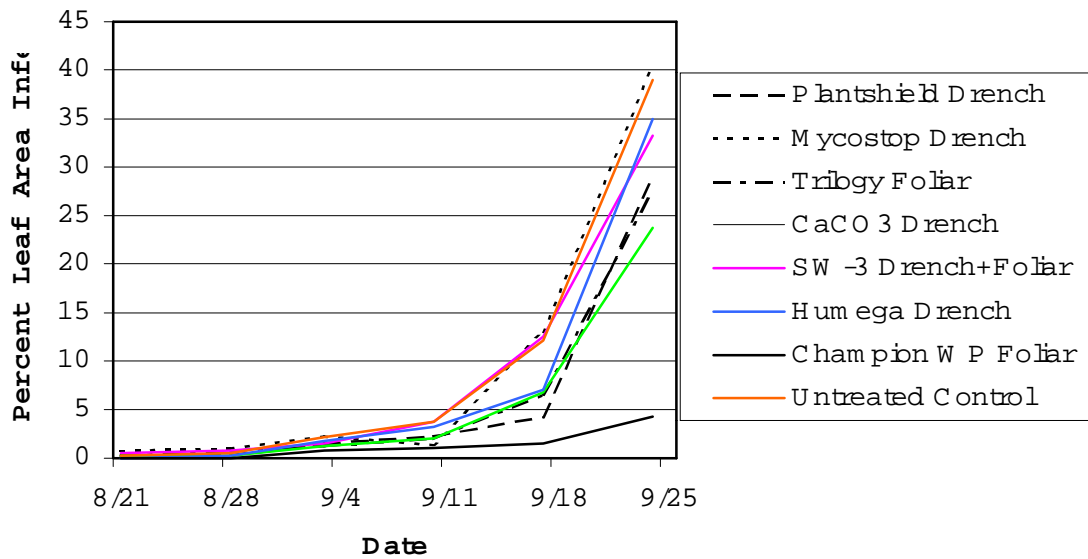


Figure 1. Treatment means from the 9/17 rating date were separated using analysis of variance and Least Significant Difference (LSD) tests (SAS Institute). Results are presented in Table 1. Means with the same letter are not significantly different at $p \leq 0.05$. We did not analyze the data from the final disease rating because of the uneven distribution of late blight infection.

Table 1.

Treatment	Percent Foliage Infected 9/17
Plantshield drench at transplanting	4.25 ab
Mycostop drench at transplanting	13.00 a
Trilogy foliar application	6.50 ab
CaCO ₃ soil treatment	12.50 a
SW-3 Seaweed drench + foliar application	6.75 ab
Humega soil treatment	7.00 ab
Champion WP foliar application	1.50 b
Untreated control	12.13 a

Discussion

Only the Champion WP treatment reduced foliar symptoms significantly compared with the untreated control. Plantshield, Trilogy foliar application, SW-3, and Humega were statistically equivalent to Champion, but not better than the check. The Plantshield drench treatment, which had significantly reduced foliar disease levels in both previous trials, in which early blight was the only disease present, was not significantly different from the untreated check when Septoria leaf spot was the predominant disease, although disease levels in this treatment were the next lowest after the Champion WP treatment. Levels of disease in the Mycostop and CaCO₃ treatments were very similar to the untreated control. Disease levels in the Trilogy, SW-3, and Humega treatments were intermediate.

When results from all three years of trials are considered, the Plantshield drench treatment would probably be worthwhile given its ease of use and low cost, and significant disease reduction under low or moderate disease pressure when early blight is the predominant disease. Growers should be aware that this treatment is less effective against Septoria leaf spot and late blight, and monitor fields carefully when weather conditions are wet. The Champion WP treatment was very effective against Septoria leaf spot, and no late blight was found in the Champion treated plots. Growers may want to reserve fixed copper products for use under high-pressure conditions, to minimize possible phytotoxicity, buildup of copper in the soil, and to avoid resistance development from repeated long-term use.

Thanks to AgBio, Bioworks, Certis, and Global Organics for supplying products for this trial.

Photos

Tomato Plots at Porter Farms, Elba, New York; and conducting spray applications of OMRI-approved materials with a backpack sprayer. (3 images.)





