Evaluation of Different Products to Control of Bacterial Spot on Tomato Seedlings

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Introduction

Bacterial spot (BLS) on tomato is caused by various Xanthomonas species (X. *vesicatoria, X. euvesicatoria, X. perforans and X. gardneri* (Jones et al. 2004; Stall et al. 2009). The pathogen enters healthy plants through stomata or wounds and maximum infection occurs under very moist conditions in warm weather (68 to 95°F), especially when night temperatures are warm (75 to 82°F). The bacteria are seed-borne. Growers may experience considerable losses, especially when the diseases affect young, developing fruit. The bacteria cause spotting, blemishing, and distortion and thereby seriously reduce marketability of the fruit. Fruit lesions are superficial and rarely develop into extensive soft rot. Bacterial spot leaf symptoms begin as small circular to irregular greasy spots most visible on the underside of the leaflets. As these water-soaked regions enlarge, colors change from dark green to purplish-gray, accompanied by a distinctive black center. Affected tissue becomes thin and may crack. The infected regions may be surrounded by a white to yellowish halo. In wet weather, infected leaves appear scorched. Large lesions result in defoliation. The objective of the study was to evaluate several products efficacy on bacterial spot *Xanthomonas perforans* on tomato seedlings in the transplant house.

Materials and Methods

The greenhouse experiments were conducted in October 2011 at the University of Florida's Southwest Florida Research and Education Center in Immokalee. Treatments were applied to a 2-week old 'Soraya' tomato transplants (Table 1). The experimental design was a randomized complete block with four replications. Each treatment was applied to plants in a 200 cell Styrofoam transplant tray. Treatments were applied seven days before inoculation with bacterial spot starting on 28 October, 2011 for all treatments. Four infected tomato seedlings per tray or treatment were introduced on 3 November, 2011 as shown in Figure 1. Post-inoculation treatments with similar products were applied for 21 days (Table 1) and the experiment terminated and evaluated on 25 November, 2011 when visual symptoms of BLS were apparent in control inoculation treatment. The data collection consisted in number of plants with BLS symptoms per tray or treatment. The data was expressed as percent disease incidence defined as number of infected BLS seedlings as a percent of the total plants per tray or treatment. Data were analyzed using ANOVA and Duncan's Multiple Range Test at 5%. Bacterial spot percentage was transformed by Arcsin distribution before the ANOVA, Duncan's Multiple Range Test (SAS, 2008).

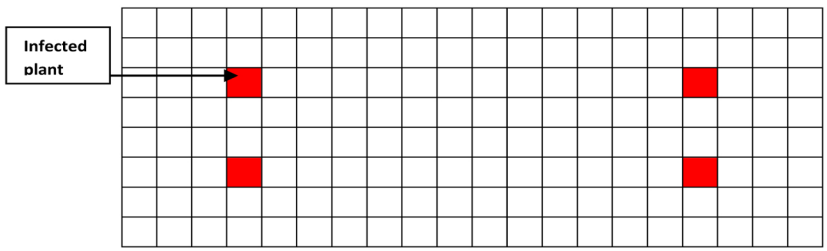


Figure 1. Position of the infected bacterial spot tomato transplants in the Styrofoam trays.

Results

In general results indicated that the highest percent incidence of BLS was in the plants that were not treated (none) as compared to any BLS treatments (Table 2 and Figure 2). The lowest percent incidence of BLS was observed in Kocide 3000 and Manzate Pro-Stick (grower standard treatment). The effectiveness of the others treatment against BLS were higher than 'none', but lower than Kocide 3000/Manzate Pro-Stick.

Table 1. Products, rate and application frequency used to control bacterial spot on tomato seedling 'Soraya'.

Products	Rate	Application frequency
Non–treated (control)	None	None
Kocide 3000 + Manzate Pro-Stick (Grower)	2 lb and 2 lb/100 gal water	Weekly
Cu-Quick + Manzate Pro-Stick	12 fl. oz and 2 lb/100 gal water	Weekly
NAS II (micronutrient blende)	16 fl. oz/100 gal water	Twice/week
Cu-Quick + Soil-Set	8 and 16 fl. oz/100 gal water	Twice/week
Griffin green	2 qt/100 gal water	Twice/week
Quintec*	4 fl. oz/100 gal water	Weekly
MBI 10620	0.25%	Weekly
MBI 110830 B	0.25%	Weekly
MBI 110830 C	0.25%	Weekly
Quantum	0.5 gal/20 gal water	Twice/week (before inoculum)
	2.0 gal/20 gal water	Twice/week (at inoculum)
	0.5 gal/20 gal water	Twice/week (after inoculum)

*T7 Plants were stunting and yellowish after first Quintec application, therefore not evaluated.

Table 2. Effects of different products on bacterial spot incidence on tomato seedlings 'Soraya'.

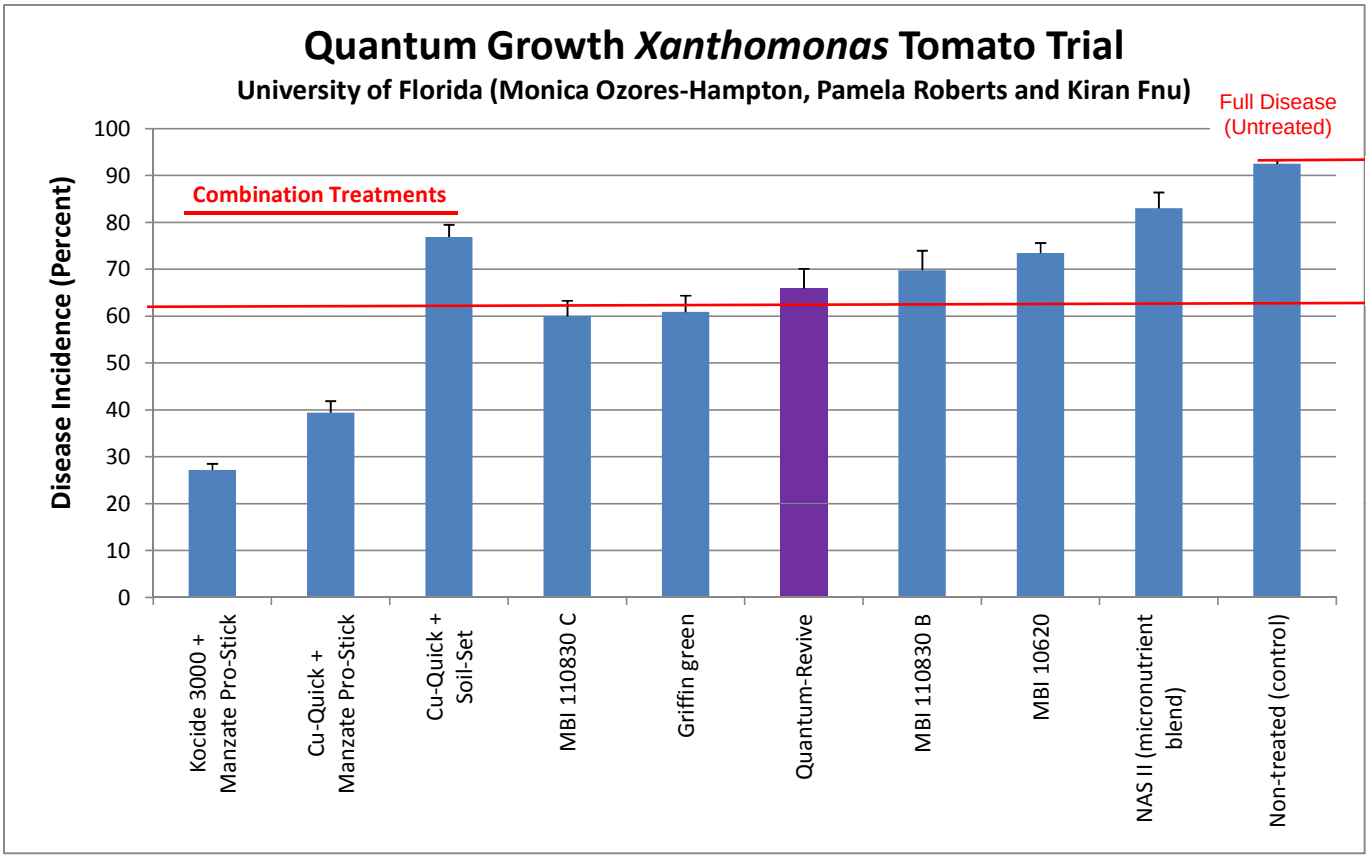
Treatment	Bacterial spot Incidence (%)[z]	SEM[x]
Non–treated (control)	92.5a[y]	0.8
Kocide 3000 + Manzate Pro-Stick (Grower)	27.2h	1.3
Cu-Quick + Manzate Pro-Stick	39.4g	2.5
NAS II (micronutrient blende)	83.0b	3.4
Cu-Quick + Soil-Set	76.9bc	2.6
Griffin green	60.8ef	3.5
MBI 10620	73.5cd	2.1
MBI 110830 B	69.8cde	4.2
MBI 110830 C	60.0f	3.3
Quantum	65.9def	4.22
P value	0.0001	-
Sig.	**	-

[z]Number of infected BLS seedlings as a percent of the total plants per tray or treatment.

[y] Within columns, means followed by different letters are significantly different according to Duncan's Multiple Range Test at 5%.

[x] Standard Error mean.

**Significance at $P \leq 0.01$. *Significance at $P \leq 0.05$. ns Non-significance.



The natural, biological product Quantum Growth performed as well or better than any of the chemical controls used alone in this University of Florida study. Only combination treatments or "chemical cocktails" performed better.