Beet Curly Top Virus Control in Commercial Tomatoes, 2012

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Figure 1. Tomato plants were planted in double 30" rows spaced eight feet apart.

Background

Beet curly top virus (BCT) can have significant impact on commercial and home garden tomato production in Western Colorado. In severe years there can be total loss of some varieties, especially Roma types. The virus is transmitted by beet leafhopper. Management of the virus is difficult given that a brief feeding period by the leafhopper is all that is required for transmission. We conducted research in 2012 to evaluate a systemic insecticide for curly top control in commercial tomatoes.

Materials and Methods

2012 trials were conducted at the Western Colorado Research Center at Orchard Mesa. Plants of two varieties of tomatoes, Monica (Roma) and Shady Lady (slicer), were purchased from a local greenhouse grower and transplanted during the first week of May. Each variety was planted in a block of four 30" paired rows, eight feet apart. There were approximately 340 plants per paired row at 18" within-row spacing. The field was fertilized preplant with 100 lbs./acre 18-46-0 broadcast and incorporated with a roller harrow. Trifluralin HF pre-emergent herbicide was applied at a rate of 2 pt/acre and incorporated with the same harrow pass as the fertilizer, a week before planting. The plots were hand weeded once during the growing season. The field was furrow irrigated every 7-10 days during the heat of the summer, watering three 30" furrows on each row-pair.

The experiment was arranged in a randomized complete block, split plot design with four replications. Each paired row was divided into three 100 plant plots. One of three insecticide treatments (foliar, soil, or untreated) was randomly assigned to each plot.

Dinotefuran (Scorpion insecticide, Gowan Corp.) was used at a rate of 0.27 lb a.i. /A (10.5 fl. oz./A) in both the foliar and soil treatments. The foliar treatment was sprayed in three applications of 0.09 lb a.i. 3.5 fl. oz./acre) each. They were applied on May 30, June 12 and June 21 using a hand held CO_2 sprayer with 7.5' boom mounted with four 04F80 nozzles. The sprayer was calibrated to apply 30 gal/A of spray material at 40 PSI.

The soil treatment was applied on May 17, using a soil injection needle calibrated to

deliver 0.0009 fl. oz. of insecticide per plant. This rate was calculated to correspond to a planting of 11,616 plants per acre or 3.75 sq. ft. per plant. The insecticide was injected into the root zone of the transplants.

Virus infection rate was evaluated on 6 dates (Jun 15, Jun 20, Jun 26, Jul 2, Jul 6, and Jul 13) with a visual inspection. Plants with BCT symptoms were counted and removed on each date. Symptoms used to verify BCT were whole plant color change, rolling of leaves and purple coloration of veins. Any plants with questionable symptoms were left in the field until more symptom development occurred in the next sample date.

Figure 2 Curly top virus expresses whole plant symptoms, with color change, rolled leaves and purpling of the veins.

Analysis of variance was conducted on cumulative virus infection rate data using MSTAT-C. Means were separated using LSD method.

Leafhopper populations were monitored with 4 x 5 ½" yellow sticky cards, stapled to wooden lath and placed randomly within a tomato row. Two cards were placed in each variety block; the cards were placed at plant height, facing south. Cards were set out May 21 and changed every 5-8 days. After collection, they were taken back to the lab and beet leafhoppers counted.

Results

Variety	Treatment	% BCT
Monica		20.3 A
Shady Lady		12.1 B
p-Value		0.0000
	Foliar	16.6 B
	Soil	10.7 A
	Untreated	21.3 C
p-Value		0.0001
Monica	Foliar	23.9 A
Monica	Soil	12.7 C
Monica	Untreated	24.3A
Shady Lady	Foliar	9.4 C
Shady Lady	Soil	8.6 C
Shady Lady	Untreated	18.2 B
p-Value		0.0254

Table 1. Curly top virus infection rates in tomatoes. Means within a section followed by the same letter are not significantly different.

There was a relatively severe BCT infection in the experimental area. The loss in untreated tomatoes due to BCT was 21.3% overall, with 24.3% of Monica and 18.2% of Shady Lady plants being removed due to BCT infection.

Soil applied dinotefuran significantly reduced the overall BCT infection rate by 49.7%, with a 47.7% reduction in Monica and a 52.7% reduction in Shady Lady when compared with the untreated plots.

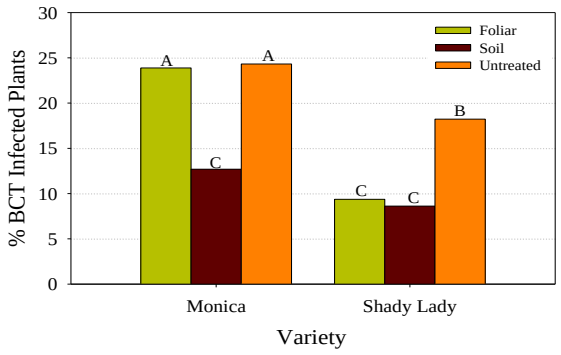

Figure 3. Soil applied dinotefuran reduced BCT infection rate; foliar applications had greater effect in Shady Lady than Monica.

Foliar applications reduced the incidence of BCT by 48.3% in Shady Lady's, but only 1.6% in Monica. The reduction was 22.1% averaged over the entire experiment.

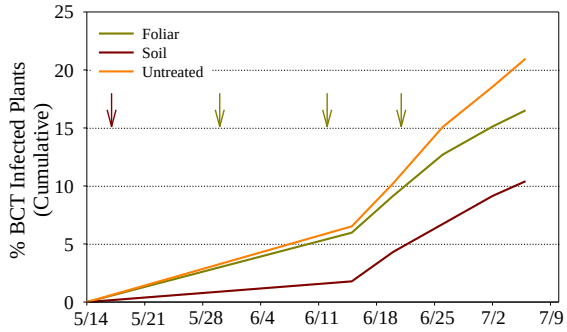

Figure 4. Cumulative BCT infection rate in three insecticide treatments. Arrows denote application dates.

The BCT infection rate was significantly lower in the Shady Lady (12.1%) than in the Monica (20.3%). This confirms many years of field observations in which Roma types were much more susceptible to the virus than slicer types.

The initial BCT infected plants appeared in early June, before the first evaluation date (June 1). Symptomatic plants continued to appear in the field until the second week of July, after which there were no new infections.

The first beet leafhoppers were captured in late May, and the population peaked in late June. The peak capture was on 21 June, when more than 25 leafhoppers per day were captured. This is more beet leafhoppers per day that we have caught in total during the past two years.

Discussion

The soil applied dinotefuron appeared to be more effective in reducing the incidence of BCT than foliar applications. It must be noted that the application method used in this trial concentrated the insecticide in the tomato root zone and represented the maximum allowable rate. Differences in infection rate between the soil treatment and the foliar and untreated plots were apparent from the time the initial symptoms appeared in the field.

There were no apparent differences in BCT infection rate in the foliar and untreated plots until mid June, at which time there were great increases in beet leafhopper flights. The June 12 and June 21 applications appeared to have the greatest effect on reducing BCT incidence.

Dinotefuran appears to be an effective treatment to reduce losses due to BCT in tomatoes. Soil applications are more effective than foliar treatments and have the advantage of giving early season control while leafhopper populations are too low to detect in sticky traps, but high enough for early season transmission of the virus.

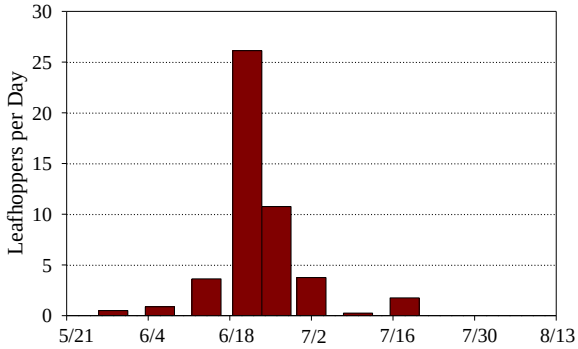

Figure 5. Beet leafhopper captures on yellow sticky traps set in the tomato field. Average capture on four traps is displayed.

Acknowledgements

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