University of California
Agriculture and Natural Resources

Cooperative Extension in Fresno County

550 E. Shaw Avenue, Ste. 210
Fresno, CA 93710
(559) 241-7515 office
(559) 241-7539 fax
cefresno@ucanr.edu
http://cefresno.ucanr.edu

Effect of Insecticide Treatments on Beet curly top virus Incidence in Processing Tomato, 2015-2023

Thomas A. Turini – University of California Vegetable Crops Advisor, Fresno County

Comparisons of insecticides and insecticidal programs for of beet curly top virus incidence in processing tomatoes were conducted at the University of California West Side Research and Extension Center from 2015 to 2023. The trial site is in a major tomato production area where the virus occurs annually. All studies were reliant upon natural infection.

Methods

Transplants of commercial varieties were planted into single plant line 60-inch beds center-to-center. All irrigations, including pre-plant irrigations were through sub-surface drip at a 10-inch depth. Irrigation water, fertility, weed, and disease management were consistent with commercial practices. The experimental design was a four-replication randomized complete block. Dates, plot size and varieties varied by year as detailed in Table 1.

Treatments were applied as follows:

- TRANSPLANT DRENCH: Verimark transplant treatments were applied to transplants in the equivalent of the specified per acre rate based on 8,712 plants per acre 72 to 24 hours before transplanting.
- TRANSPLANT WATER: Insecticides were applied with the transplant water were applied into the furrow where the transplants are set with the equivalent of 500 gallons per acre.
- DIRECTED FOLIAR: Within three weeks of transplanting, directed sprays were applied with a CO_2-pressurized back-pack sprayer at 30 psi with two TeeJet 8003EVS nozzles 19-inches apart at an equivalent volume of 20 gallons per acre.
- SUB-SURFACE DRIP: Generator-powered electric metering pumps (A-1600 FlexFlo® Peristaltic Pump Blue and White Industries, Huntington Beach, CA) were used to inject insecticides into the drip irrigation system over 30 minutes, which was followed by 1 to 2 hours of additional irrigation time.
- BROADCAST SPRAYS: CO_2-pressurized back-pack sprayer at 30 psi with three TeeJet 8003EVS nozzles 19-inches apart at an equivalent volume of 30 gallons per acre were used to apply foliar materials to a developed canopy.

Evaluations included inspections of plants for symptoms. Shoots from plants showing representative symptoms were taken for verification and tested of beet curly top virus. Percentage of symptomatic plants was calculated. In 2015 and 2016 yields were calculated based on hand harvests. Analysis of Variance and mean separation tests were performed on disease and yield data.

Table 1. Annual trial details are as follows:

	2015	2016	2018	2022	2023
Plant date	22 May	17 May	17 May	27 May	9 Jun
Variety	N6366	N6366	N6366	H5608	H5608
Plot size	Single 60-inch bed x 300 ft	Single 60-inch bed x 300 ft	Single 60-inch bed x 75 ft	Single 60-inch bed x 75 ft	Single 60-inch bed x 75 ft
Evaluation dates	22 Jun, 1, 14, 28 Jul, 12 Aug	10, 17, 23, 30 Jun, 6 Jul	28 Jun, 2 Aug	13 Jun, 22 Jul, 8 Aug	29 Jun, 20 Jul, 11 Aug
Harvest	11 Sep hand harvest 20 ft per plot	18 Sep hand harvest 20 ft per plot	No yield data	No yield data	No yield data

Results and Discussion

Programs that contained insecticides that included Admire Pro, Platinum and Verimark most consistently reduced incidence of beet curly top under the conditions of these studies (Table 2). However, when infection occurs at later stages of plant development, the applications made at or shortly after planting are less likely to affect transmission efficiency. In 2022, a 33 percent increase in incidence of disease expression occurred 56 days after transplanting (data not presented): That season, Verimark treated plants that otherwise had very low disease, had incidence of beet curly top virus that was like the untreated control. Furthermore, although in 2015, the yield differences were not statistically significant $p=0.05$, numerically, the average yield of all areas receiving insecticide treatments was numerically 6.3 tons heavier than the untreated control (data not presented).

Table 2. Performance of insecticides in reducing incidence of beet curly top virus in processing tomato, Fresno County in five studies (2015-2023)

Insecticide trade name, rate per acre and application method[z]	2015	2016	2018	2022	2023
Admire Pro 10.5 fl oz *Transplant Water (TW)*[y]	+ +[x]				
Admire Pro 4 fl oz *TW* with Sivanto 2 fl oz DIRECTED FOLIAR (*DF*)[w] at planting *followed by* (*fb*) Admire Pro 6.5 fl oz *DRIP*[v] (4 weeks)[u]	+ +				
Admire Pro 4.0 fl oz *TW fb* Verimark 10 fl oz *DRIP* (3 weeks) *fb* Verimark 10 fl oz *DRIP* (6 weeks)		+ 15.4 t/a[t]			
Admire Pro 4.0 oz TW *fb* Platinum 3.67 oz DRIP (3 weeks)		+ +			
Admire Pro 4.0 oz TW *fb* Admire Pro 6.5 oz DRIP (2 weeks)				-[s]	
Admire Pro 6.5 fl oz DRIP (4 weeks)	-				
Admire pro 8 fl oz DRIP (1 week)			+ +		
Admire Pro at 10 fl oz *TW fb* Radiant 10 fl oz (2 weeks) *fb* dimethoate 1 pt (5 weeks)				+ +	-
Admire Pro at 10 fl oz *TW fb* Radiant 10 fl oz (2 weeks) *fb* dimethoate 1pt (5 weeks) *fb* BeLeaf 4.28 oz DRIP (7 weeks) *fb* Exirel 20.5 fl oz (9 weeks)				-	
Exirel 20.5 fl oz/a DS (3 weeks)					-
Movento 5.0 fl oz (2 & 4 weeks)				-	
Plinazolin 5.13 fl oz (3 & 5 weeks)				-	
Plinazolin 6.16 fl oz (3 & 5 weeks)				-	-
Radiant 10.0 fl oz (1 week)			-		
Radiant 6.0 fl oz (4 weeks)					-
Sequoia 2.5 fl oz + Radiant 6.0 fl oz (1 week)			-		
Sequoia 2.5 fl oz TRANSPLANT DRENCH (TD)[r]			-		
Sequoia 4.5 fl oz DS (1 week)			-		
Sequoia 4.5 fl oz TD			-		
Silvanto 2 fl oz DF *fb* Admire Pro 6.5 fl oz DRIP (4 weeks)	-				
Sivanto 10.5 fl oz (2 weeks) *fb* Platinum 3.67 oz DRIP (3 weeks) *fb* Venom 6.0 oz (6 weeks)		+ 15.4 t/a			
Sivanto 28 oz drip application					-
Sivanto 7 fl oz & 21 fl oz DRIP (2 weeks)				-	-
Sivanto Prime 28 oz DRIP (2 weeks)				-	
Verimark 13.5 fl oz *TD*	+ +	+ 15.4 t/a	+ +	-	-
Verimark 13.5 fl oz *TD fb* Platinum 3.67 oz DRIP (3 wks)		+ 18.5 t/a			
Verimark 13.5 fl oz *TD fb* Radiant 10 fl oz (2 wks) *fb* dimethoate 1pt (5 wks) *fb* BeLeaf 4.28 oz (7 wks) fb Exirel 20.5 fl oz (9 wks)				-	
Verimark 13.5 fl oz *TD fb* Radiant 10 fl oz (2 wks) *fb* dimethoate 1 pt (5 wks) *fb* BeLeaf 4.28 oz *DRIP* (7 wks) *fb* Exirel 20.5 fl oz (9 wks)				+ +	-
Verimark 13.5 fl oz/a *TD fb* BeLeaf foliar 4.28 oz/a					-
Verimark 13.5 fl oz/a *TD fb* Mustang Maxx foliar 4 fl oz/a					-
Verimark 13.5 fl oz/a *TD fb* Sivanto 28 oz drip					-
Disease Level in non-treated control	12.28	27.25	8.66	14.66	2.90
Disease *P value*	0.0076	0.0002	0.0062	0.0498	0.0659
Yield *P value*	0.1125	0.0445	--------	--------	--------

[z] Unless otherwise specified, insecticides were broadcast applied to the foliage in the equivalent of 30 gal/acre.

[y] *TRANSPLANT WATER (TW)* insecticides were applied where the transplants are set with the equivalent of 500 gallons/acre.

[x] "+ +" appear right of treatments with significantly lower disease incidence than the untreated during the season of the column.

[w] DIRECTED FOLIAR (DF) applications were in the equivalent of 20 gal/acre with a single nozzle.

[v] DRIP system applications were made with electric metering pumps over 30 minutes followed by an additional 1-hour irrigation.

[u] Number of weeks specified in parenthesis refers to the period after planting that the application was made.

[t] Treatment yields were significantly higher than the untreated control at p=0.05, and the average yield increase is listed.

[s] No treatment differences compared to the untreated control were observed at p=0.05.

[r] TRANSPLANT DRENCH (TD) treatments were applied in the equivalent of the specified per acre rate based on 8,712 plants per acre 72 to 24 hours before transplanting.

December 22, 2023