Efficacy and influence of insecticide applications on Tomato spotted wilt virus in processing tomatoes, 2011.

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Two experiments were conducted at University of California West Side Research and Extension Center in Fresno County to compare activity of insecticides against thrips on tomatoes and to assess the impact of these programs on the thrips-transmitted virus, Tomato spotted wilt virus (TSWV) in 2011. Processing tomato transplants (cv. H8004) were transplanted on 17 May and sprinkled for two weeks, and irrigated with buried drip for the remainder of the season.

Seven treatments and an untreated control were compared in the efficacy study. Treatments are listed in table 1. A 4-treatment Randomized Complete Block experimental design was used and each plot was 40 ft long and one bed wide. Each plot was separated by one untreated bed between rows and a 10 ft buffer within rows, which no samples were collected from. Materials were applied on 27Jul and 6 Aug with a CO_2-pressurized backpack sprayer at 40 gal/acre. On 2 and 9 Aug, 25 flowers per plot were collected and placed in vials containing 70% ethanol. Flowers were dissected under a dissecting scope at 23x and nymph and adult thrips were recorded separately. Data was subjected to Analysis of variance and means were separated by Least Significant Difference at a probability of 5% ($LSD_{0.05}$).

In the study designed to enable us to see the influence of insecticides on TSWV incidence and tomato yield and quality, two drip-applied programs in combination with three foliar-applied insecticide programs were compared. Specific treatments and application timings appear in tables 2 and 3. The experimental design was a split plot with 4 replications arranged in a randomized complete block configuration. The drip-applied treatments were the main plots and each were 3 treated beds wide and 300 ft long, with all sampling coming from the center bed. Foliar/transplant dip programs were the sub-plot treatments, which were each 75 ft long by 3 beds wide. All drip applied materials were applied over 45 mins and water was run for1 hour after the injections. Foliar applications were made with a tractor-mounted sprayer at 30 gpa.

Yield was determined by mechanical harvest on 21 Sep. Twenty to 25 lbs samples were taken from a mechanical harvester, and hand sorted for red, green, sun burn, rot and blossom end rot. Fruit in each category were weighted and percentage by weight was calculated. This sort was performed on the day of the harvest. Fifty red fruit from each plot were tested for color solids and pH by Processing Tomato Advisory Board laboratory in Helm, CA. A factorial analysis was performed and mean separation was accomplished with $LSD_{0.05}$.

In 2011, several materials reduced the levels of thrips when compared with the untreated control (Table 1). These materials included Radiant either with or without Pre-Am, Athena with Beleaf and Venom. Results of the 2011 trial generally support results of earlier work in that Radiant has consistently been among the top performing materials and Beleaf either alone or tank mixed with a pyrethroid has provided a level of control. However, unlike 2007 and 08 results, but similar to 2010 results, Venom also reduced thrips population densities.

The 2011 evaluation of insecticide programs was conducted at the UC WSREC and treatments were similar to treatments tested in 2009 and 2010. In 2011, there were clearly differences among the foliar treatments in terms of yield, percentage of fruit with TSWV symptoms (Table 2) and in incidence of TSWV symptoms on plants (Table 3). While there were differences in terms of symptom incidence on plants in 2009, we did not see other differences that season. Furthermore, there were no differences seen in 2010. It is likely that the lower TSWV in the area surrounding the field station in 2011 resulted in a greater percentage of the viral symptom development in the field being attributable to spread within the field, which is more likely to be controlled by applications made within that field. In 2010, there were extremely high levels of virus in the vicinity of the field station and it was present at intermediate levels in 2009. Therefore, it is possible that the impact of insecticides is largely dependent upon whether the majority of the virus is due to spread within the field or with virus-carrying thrips from outside of the field. Regardless of the year, we have never seen a reduction in disease associated with the drip applied materials.

Table 1. Insecticide efficacy against Western flower thrips in processing tomatoes, Fresno Co., 2011.

Treatment	2 Aug, 2011 Nymphs	2 Aug, 2011 Adults	9 Aug, 2011 Nymphs		9 Aug, 2011 Adults
Radiant 6.0 fl oz + Prev-Am 1qt, no surfactant	10.750	50.500	6.0	c	60.5
Radiant 6.0 fl oz	9.750	37.500	7.3	c	59.8
Athena 17 fl oz	13.000	39.250	12.8	abc	84.3
Venom 70SG 0.895 lb	14.250	47.000	8.0	c	64.3
Athena 17 fl oz + Beleaf 50SG 2.8 oz	13.750	43.750	7.0	c	83.0
Requiem 64 fl oz	17.750	50.000	20.3	a	60.5
Radiant 6.0 fl oz	9.750	37.500	7.3	c	59.8
Radiant 6.0 fl oz + Prev-Am 1qt, no surfactant	10.750	50.500	6.0	c	60.5
HWG 86 10SE 20.5 fl oz	17.750	48.000	10.5	bc	67.5
Untreated control	18.750	38.000	17.0	ab	74.5

z Treated 27 Jul and 6 Aug with Co_2-pressurized back pack sprayer at 40 gal/acre.

y Collected 25 samples per plot in 70% EtOH and counted nymph and adults under dissecting scope.

Table 2. Influence of insecticide programs for control of thrips on incidence of fruit expression of Tomato spotted wilt virus and yield and other quality parameters in Fresno Co., 2011.

Treatment[z] Injections into drip irrigation system buried to 10 in	Yield (tons/ acre)[w]	Fruit quality (% by weight)[y] red	grn	rot	sun brn	TSWV	PTAB[x] color	solids	pH
Platinum75SG 3.7 oz (22 Jun), Venom 6.0 oz (12 Jul)	29.5	55.6	6.3	12.6	5.4	19.6	23.42	5.833	4.56
Platinum75SG 3.7 oz (22 Jun), Venom 6.0 oz (22 Jul)	29.2	61.4	8.1	9.3	3.3	17.9	24.17	5.508	4.45
Untreated	33.9	62.7	7.0	9.1	3.1	18.2	24.17	5.667	4.54
Drip injection, probability[v]	NS	NS	NS	NS	NS	NS	NS	NS	NS

Foliar applications: Trans-plant drnch	24 Jun	6 Jul	14 Jul	21 Jul	Yield (tons/ acre)	Fruit quality (% by weight) red	grn	rot	Sun brn	TSWV	PTAB color	solids	pH
HGW	Radiant 10.0 fl oz	Dimeth 4EL 1pt.	Radiant 10.0 fl oz	Dimeth 4EL 1pt.	38.0	64.3	7.6	9.5	2.8	15.9	24.11	5.522	4.53
	Radiant 10.0 fl oz	Dimeth 4EL 1pt.	Radiant 10.0 fl oz	Dimeth 4EL 1pt.	30.4	59.6	9.0	11.0	4.7	15.7	23.44	5.622	4.55
	Radiant 10.0 fl oz	Dimeth 4EL 1pt.			30.2	61.1	7.4	9.5	3.1	18.9	24.44	5.667	4.53
Untreated					25.0	54.6	5.2	11.3	5.1	23.8	23.66	5.862	4.58
$LSD_{0.05}$[v]					4.72	NS	NS	NS	NS	6.193	NS	NS	NS
AB					NS	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)					15.4	13.8	49.2	55.5	71.8	33.66	4.20	4.61	1.10

z Experimental area was transplanted on 17 May with cv. H8004 processing tomato plants at UC West Side Research and Extension Center. Foliar applications were made with a backpack sprayer at 30 gpa.

y Twenty to 25 lbs samples were taken from a mechanical harvester, and hand sorted. Fruit in each category were weighed and percentage by weight was calculated.

x A sample of 50 red fruit from each plot were tested for color solids and pH by Processing Tomato Advisory Board laboratory in Helm, CA.

w Yields per acre were calculated based on machine-harvests on 21 Sep.

v Least significant difference at probability of 0.05. NS signifies that there is no significant difference.

Table 3. Influence of insecticide programs for control of thrips on incidence of Tomato spotted wilt virus symptomatic plants, Fresno Co., 2011.

Treatment[z]					Thrips densities (thrips/25 flowers)						TSWV %[y]			
Injections into drip irrigation system buried to 10 in					23 Jun		18 Jul		28 Jul		22 Jun	12 Jul	12 Aug	25 Aug
					nymph	adult	nymph	adult	nymph	adult				
Platinum75SG 3.7 oz (22 Jun), Venom 6.0 oz (12 Jul)					6.75	56.75	8.69	17.25	6.44	23.06	2.0	14.4	51.2	50.0
Platinum75SG 3.67 oz (22 Jun), Venom 6.0 oz (22 Jul)					------	--------	11.75	19.88	8.00	23.06	1.6	12.8	52.9	41.7
Untreated					4.38	54.13	7.38	19.63	10.00	22.13	2.3	12.1	56.8	43.5
LSD, P=0.05					NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Foliar applications					Thrips densities (thrips/25 flowers)						TSWV %			
Trans. drench	24 Jun	6 Jul	14 Jul	21 Jul										
HGW	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	4.63	53.63	4.17	10.83	7.58	22.08	1.5	9.3	40.2	32.4
	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	------	------	3.92	12.58	9.00	22.75	2.2	15.0	48.4	40.3
	Radiant 10 fl oz	Dimth 4EL 1pt.			------	------	12.08	22.42	8.08	22.25	2.0	14.4	54.9	40.6
Untreated					6.50	57.25	16.92	29.83	7.92	23.92	2.1	13.8	71.0	66.8
LSD, P=0.05					0.12	NS	0.00	0.00	NS	NS	NS	5.2	8.5	7.6
AB					NS	NS	0.01	NS	NS	NS	NS	NS	NS	0.033
CV (%)					37.33	27.07	52.69	44.84	43.76	39.65	91.27	39.93	16.04	16.98

[z] Experimental area was transplanted on 17 May with cv. H8004 processing tomato plants at UC West Side Research and Extension Center. Foliar applications were made with a backpack sprayer at 30 gpa.

[y] Percentage of plants exhibiting Tomato spotted wilt virus symptoms per plot (n=55 to 65)

[xv] Least significant difference at probability of 0.05. NS signifies that there is no significant difference.