

# Thrips Management Update

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Agriculture and Natural Resources | Cooperative Extension

# Western Flower Thrips

## *Frankliniella occidentalis*

Primary thrips species associated with tomatoes in Central California



# Thrips Feeding Damage



# Symptoms of TSWV on Tomato Fruit



TRANSMISSION



Egg

ACQUISITION BY LARVAE IS CRUCIAL

TSWV must be acquired by the larvae to be transmissible.

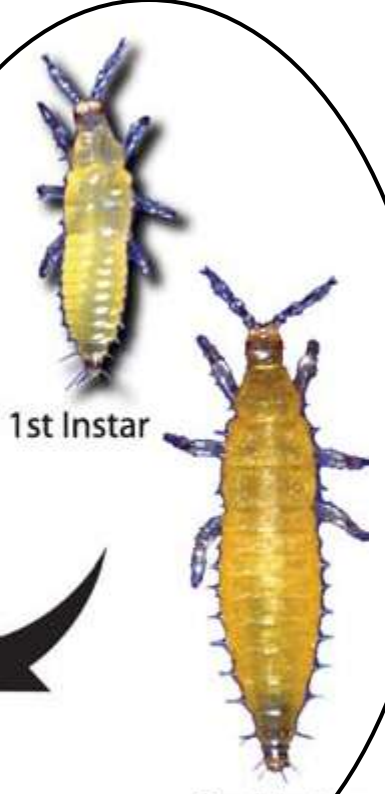
# TOSPOVIRUS TRANSMISSION CYCLE



Male Adult

Female Adult

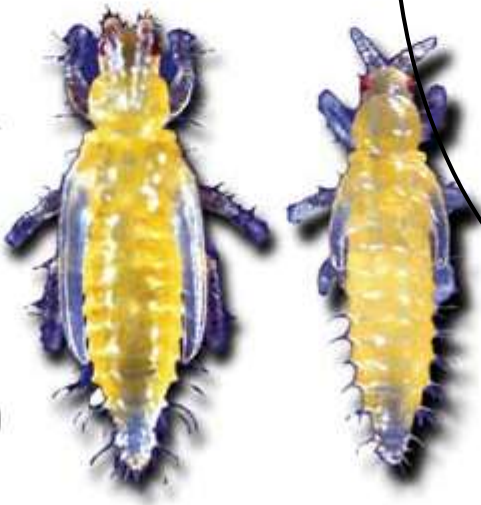
VIRUS PASSAGE (Transstadial)



1st Instar

2nd Instar

VIRUS PASSAGE (Transstadial)



Pupal Stages Do Not Feed

A. E. Whitfield, D. E. Ullman, and T. L. German. 2005. **TOSPOVIRUS-THRIPS INTERACTIONS**. *Annu. Rev. Phytopathol.* 2005. 43:459-89

TRANSMISSION

ACQUISITION BY LARVAE IS CRUCIAL

Egg

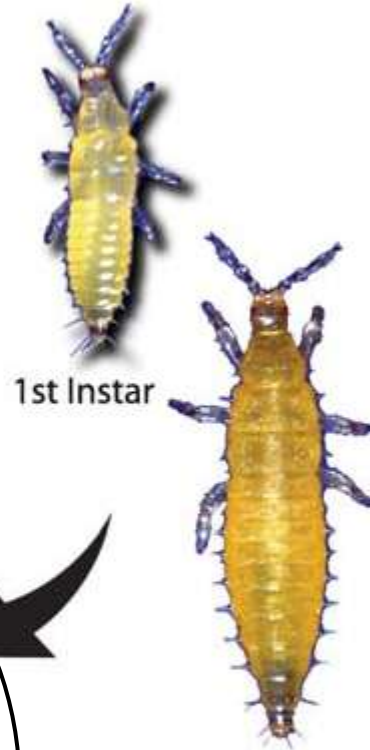
# TOSPOVIRUS TRANSMISSION CYCLE



Male Adult

Female Adult

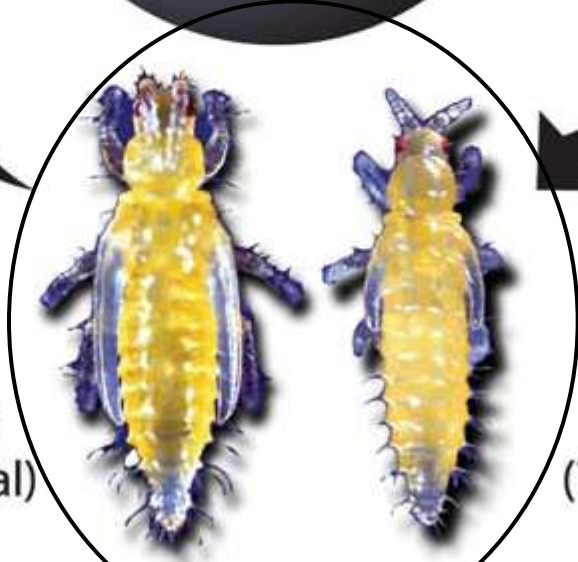
VIRUS PASSAGE (Transstadial)



1st Instar

2nd Instar

VIRUS PASSAGE (Transstadial)



Pupal Stages Do Not Feed

Western flower thrips develop through two quiescent, non-feeding pupal stages in the soil

TRANSMISSION

ACQUISITION BY LARVAE IS CRUCIAL

Egg

# TOSPOVIRUS TRANSMISSION CYCLE

Adults emerge and resume feeding on flowers, buds, and terminal foliage.

Adults can live 30 to 45 days and transmit the viruses to plants throughout their life.

Male Adult

1st Instar

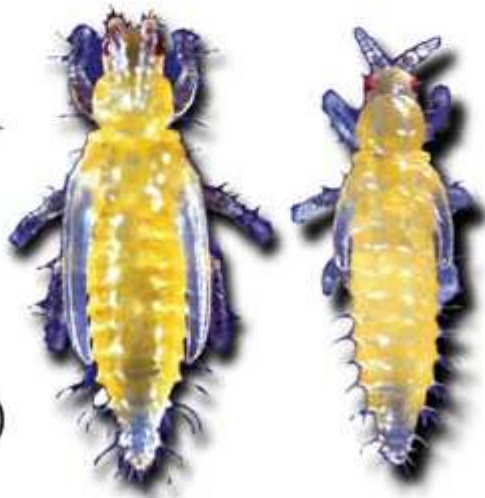
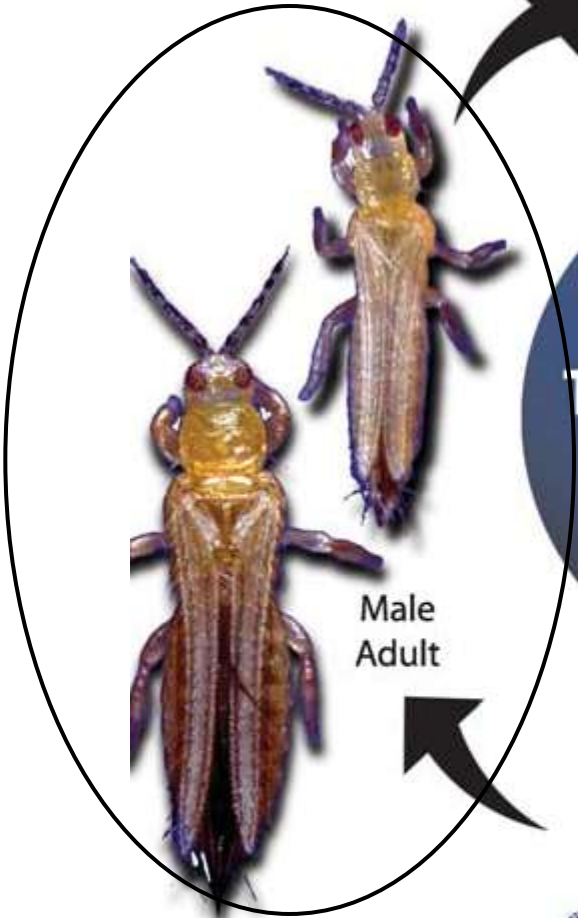
2nd Instar

Female Adult

VIRUS PASSAGE (Transstadial)

VIRUS PASSAGE (Transstadial)

Pupal Stages Do Not Feed



# Limitations of Thrips Control with Insecticides

- Thrips adults and immature stages generally prefer areas of the plant where they are sheltered.
- Thrips populations can increase very rapidly, 200-300 eggs/female.
- Insecticide resistance is a concern.

# Closely read all labels before writing a recommendation

- Not all materials tested are currently registered.
- Some materials have restrictions that could influence practicality of use in some situations.

Group #	Chemical sub-group	Primary target site of action	Trade name	Active ingredient
1A	Carbamate	Acetylcholine esterase inhibitors	Lannate LV	methomyl
1B	Organophosphate		Dimethoate 4EL	dimethoate
3A	Pyrethroids	Sodium channel modulators	Mustang	Zeta-cypermethrin
			Warrior with Zeon	Lambda-cyhalothrin
4A	Neonicotinoids	Nicotinic acetylcholine receptor agonists	Admire, Assail, Platinum, Venom	Imidacloprid, acetamiprid, thiamethoxam, dinotefuron
5	Spinosyns	Nicotinic acetylcholine receptor allosteric activators	Radiant Entrust	spinetoram spinosad
6	Avermectins, Milbemycins	Chloride channel activators	Agri-Mek SC	abamectin
9C	Flonicamid	Selective homopteran feeding blockers	Beleaf	flonicamid
21	Pyrazole		Torac	tolfenpyrad
23	Tetronic and Tetramic acid derivatives	Inhibitors of acetyl CoA carboxylase.	Movento	spirotetramat
28	Diamide	Ryanodine receptor modulators	Cyazypyr	cyantraniliprole

# Methods Efficacy Trial

- University of California West Side Research and Extension Center, Fresno Co., CA.
- H8004 was transplanted and irrigated on 2 May
- Drip irrigation
- All materials were applied on 10, 18 and 26 Jul
- Applications were made with a CO<sub>2</sub>-powered sprayer at 40 psi and 40 gpa.
- Collected 25 flowers/plot and placed in vials containing 70% ethanol.
- Dissected flowers and recorded thrips nymph and adult numbers.

# Thrips Efficacy Trial in Fresno County 2012

Thrips/25 flowers. H8004 transplanted 2 May. Treated 10, 18 and 26 Jul.

Treatment <sup>z</sup>	25 Jul:7 days after treatment (dat)						30 Jul:4 dat						4 Aug:9 dat			
	Nymphs			Adults			Nymphs			Adults			Nymphs	Adults		
Grandevo 3.0 lbs + organo-silicone 0.25%	0.3	ab	(2)	9.5	bc	(4)	0.3	ab	(2)	38.5	c	(9)	1.5	47.5	a	(1)
Torac 15EC 21 fl oz	0.3	ab	(2)	9.0	abc	(3)	0.5	ab	(3)	15.5	a	(1)	0.0	50.5	ab	(2)
Radiant 7.0 fl oz	0.0	a	(1)	5.3	a	(1)	0.5	ab	(3)	18.3	a	(2)	0.8	56.3	ab	(3)
Entrust SC 7 floc/acre + MSO 0.5%	0.0	a	(1)	11.8	bc	(6)	0.0	a	(1)	20.5	ab	(3)	0.8	59.0	ab	(4)
Cyazypyr 20.5 fl oz	0.3	ab	(2)	12.5	c	(8)	0.3	ab	(2)	31.8	bc	(5)	0.0	59.8	ab	(5)
Agri-Mek SC 3.0 fl oz	0.8	ab	(4)	11.0	bc	(5)	1.0	b	(4)	35.8	c	(7)	1.5	67.3	ab	(6)
Venom 70SG 0.9 lb	0.0	a	(1)	7.8	ab	(2)	0.3	ab	(2)	34.5	c	(6)	0.5	72.8	ab	(7)
Torac 15EC 21 fl oz + Agri-Mek SC 3.0 fl oz	0.5	ab	(3)	12.0	c	(7)	0.5	ab	(3)	21.8	ab	(4)	0.0	74.0	ab	(8)
Untreated Control	1.0	b	(5)	12.5	c	(9)	0.3	ab	(2)	37.0	c	(8)	1.8	77.5	b	(9)
<b>LSD<sub>0.05</sub></b>	0.7			4.3			0.9			11.8			NS	28.2		
<b>CV (%)</b>	157.8			29.0			161			28.6			135	30.8		

# Thrips Efficacy Trial in Fresno County 2012

Thrips/25 flowers. H8004 transplanted 2 May. Treated 10, 18 and 26 Jul.

	10 Jul:4 dat						30 Jul:4 dat						4 Aug:9 dat			
	Nymphs			Adults			Nymphs			Adults			Nymphs	Adults		
Grandevo 3.0 lbs + organo-silicone 0.25%	0.3	ab	(2)	9.5	bc	(4)	0.3	ab	(2)	38.5	c	(9)	1.5	47.5	a	(1)
Torac 15EC 21 fl oz	0.3	ab	(2)	9.0	abc	(3)	0.5	ab	(3)	15.5	a	(1)	0.0	50.5	ab	(2)
Radiant 7.0 fl oz	0.0	a	(1)	5.3	a	(1)	0.5	ab	(3)	18.3	a	(2)	0.8	56.3	ab	(3)
Entrust SC 7 floz/acre + MSO 0.5%	0.0	a	(1)	11.8	bc	(6)	0.0	a	(1)	20.5	ab	(3)	0.8	59.0	ab	(4)
Cyazypyr 20.5 fl oz	0.3	ab	(2)	12.5	c	(8)	0.3	ab	(2)	31.8	bc	(5)	0.0	59.8	ab	(5)
Agri-Mek SC 3.0 fl oz	0.8	ab	(4)	11.0	bc	(5)	1.0	b	(4)	35.8	c	(7)	1.5	67.3	ab	(6)
Venom 70SG 0.9 lb	0.0	a	(1)	7.8	ab	(2)	0.3	ab	(2)	34.5	c	(6)	0.5	72.8	ab	(7)
Torac 15EC 21 fl oz + Agri-Mek SC 3.0 fl oz	0.5	ab	(3)	12.0	c	(7)	0.5	ab	(3)	21.8	ab	(4)	0.0	74.0	ab	(8)
Untreated Control	1.0	b	(5)	12.5	c	(9)	0.3	ab	(2)	37.0	c	(8)	1.8	77.5	b	(9)
LSD <sub>0.05</sub>	0.7			4.3			0.9			11.8			NS	28.2		
CV (%)	157.8			29.0			161			28.6			135	30.8		

# Thrips Efficacy Trial in Fresno County 2012

Thrips/25 flowers H8004 transplanted 2 May Treated 10, 18 and 26 Jul

Grandevo (*Chromobacterium subtsugae*) looked good in the 4 Aug evaluation, but it did not separate from the control in other evaluations

4 Aug:9 dat

	Nymphs			Adults			Nymphs			Adults			Nymphs	Adults		
Grandevo 3.0 lbs + organo-silicone 0.25%	0.3	ab	(2)	9.5	bc	(4)	0.3	ab	(2)	38.5	c	(9)	1.5	47.5	a	(1)
Torac 15EC 21 fl oz	0.3	ab	(2)	9.0	abc	(3)	0.5	ab	(3)	15.5	a	(1)	0.0	50.5	ab	(2)
Radiant 7.0 fl oz	0.0	a	(1)	5.3	a	(1)	0.5	ab	(3)	18.3	a	(2)	0.8	56.3	ab	(3)
Entrust SC 7 floz/acre + MSO 0.5%	0.0	a	(1)	11.8	bc	(6)	0.0	a	(1)	20.5	ab	(3)	0.8	59.0	ab	(4)
Cyazypyr 20.5 fl oz	0.3	ab	(2)	12.5	c	(8)	0.3	ab	(2)	31.8	bc	(5)	0.0	59.8	ab	(5)
Agri-Mek SC 3.0 fl oz	0.8	ab	(4)	11.0	bc	(5)	1.0	b	(4)	35.8	c	(7)	1.5	67.3	ab	(6)
Venom 70SG 0.9 lb	0.0	a	(1)	7.8	ab	(2)	0.3	ab	(2)	34.5	c	(6)	0.5	72.8	ab	(7)
Torac 15EC 21 fl oz + Agri-Mek SC 3.0 fl oz	0.5	ab	(3)	12.0	c	(7)	0.5	ab	(3)	21.8	ab	(4)	0.0	74.0	ab	(8)
Untreated Control	1.0	b	(5)	12.5	c	(9)	0.3	ab	(2)	37.0	c	(8)	1.8	77.5	b	(9)
LSD <sub>0.05</sub>	0.7			4.3			0.9			11.8			NS	28.2		
CV (%)	157.8			29.0			161			28.6			135	30.8		

# Thrips Efficacy Trial in Fresno County 2012

Thrips/25 flowers H8004 transplanted 2 May Treated 10, 18 and 26 Jul

Torac and Radiant reduced the thrips levels at 4 and 7 days after treatment, but was similar to untreated at 9 dat

4 Aug:9 dat

	Nymphs			Adults			Nymphs			Adults			Nymphs	Adults		
Grandevo 3.0 lbs + organo-silicone 0.25%	0.3	ab	(2)	9.5	bc	(4)	0.3	ab	(2)	38.5	c	(9)	1.5	47.5	a	(1)
Torac 15EC 21 fl oz	0.3	ab	(2)	9.0	abc	(3)	0.5	ab	(3)	15.5	a	(1)	0.0	50.5	ab	(2)
Radiant 7.0 fl oz	0.0	a	(1)	5.3	a	(1)	0.5	ab	(3)	18.3	a	(2)	0.8	56.3	ab	(3)
Entrust SC 7 floz/acre + MSO 0.5%	0.0	a	(1)	11.8	bc	(6)	0.0	a	(1)	20.5	ab	(3)	0.8	59.0	ab	(4)
Cyazypyr 20.5 fl oz	0.3	ab	(2)	12.5	c	(8)	0.3	ab	(2)	31.8	bc	(5)	0.0	59.8	ab	(5)
Agri-Mek SC 3.0 fl oz	0.8	ab	(4)	11.0	bc	(5)	1.0	b	(4)	35.8	c	(7)	1.5	67.3	ab	(6)
Venom 70SG 0.9 lb	0.0	a	(1)	7.8	ab	(2)	0.3	ab	(2)	34.5	c	(6)	0.5	72.8	ab	(7)
Torac 15EC 21 fl oz + Agri-Mek SC 3.0 fl oz	0.5	ab	(3)	12.0	c	(7)	0.5	ab	(3)	21.8	ab	(4)	0.0	74.0	ab	(8)
Untreated Control	1.0	b	(5)	12.5	c	(9)	0.3	ab	(2)	37.0	c	(8)	1.8	77.5	b	(9)
<b>LSD<sub>0.05</sub></b>	0.7			4.3			0.9			11.8			NS	28.2		
<b>CV (%)</b>	157.8			29.0			161			28.6			135	30.8		

# Thrips Efficacy Trial in Fresno County 2012

Thrips/25 flowers H8004 transplanted 2 May Treated 10, 18 and 26 Jul

Torac with Agri-Mek and Entrust reduced adult thrips levels at 4 after treatment, but was similar to untreated in other evaluations

4 Aug:9 dat

	Nymphs			Adults			Nymphs			Adults			Nymphs	Adults		
	Mean	SE	DF	Mean	SE	DF	Mean	SE	DF	Mean	SE	DF	Mean	SE	DF	
Grandevo 3.0 lbs + organo-silicone 0.25%	0.3	ab	(2)	9.5	bc	(4)	0.3	ab	(2)	38.5	c	(9)	1.5	47.5	a	(1)
Torac 15EC 21 fl oz	0.3	ab	(2)	9.0	abc	(3)	0.5	ab	(3)	15.5	a	(1)	0.0	50.5	ab	(2)
Radiant 7.0 fl oz	0.0	a	(1)	5.3	a	(1)	0.5	ab	(3)	18.3	a	(2)	0.8	56.3	ab	(3)
Entrust SC 7 floc/acre + MSO 0.5%	0.0	a	(1)	11.8	bc	(6)	0.0	a	(1)	20.5	ab	(3)	0.8	59.0	ab	(4)
Cyazypyr 20.5 fl oz	0.3	ab	(2)	12.5	c	(8)	0.3	ab	(2)	31.8	bc	(5)	0.0	59.8	ab	(5)
Agri-Mek SC 3.0 fl oz	0.8	ab	(4)	11.0	bc	(5)	1.0	b	(4)	35.8	c	(7)	1.5	67.3	ab	(6)
Venom 70SG 0.9 lb	0.0	a	(1)	7.8	ab	(2)	0.3	ab	(2)	34.5	c	(6)	0.5	72.8	ab	(7)
Torac 15EC 21 fl oz + Agri-Mek SC 3.0 fl oz	0.5	ab	(3)	12.0	c	(7)	0.5	ab	(3)	21.8	ab	(4)	0.0	74.0	ab	(8)
Untreated Control	1.0	b	(5)	12.5	c	(9)	0.3	ab	(2)	37.0	c	(8)	1.8	77.5	b	(9)
<b>LSD<sub>0.05</sub></b>	0.7			4.3			0.9			11.8			NS	28.2		
<b>CV (%)</b>	157.8			29.0			161			28.6			135	30.8		

# Based on Insecticide Efficacy Trials in Fresno Co. (2007-12)

## Consistent Control

- Radiant
- Lannate
- Dimethoate
- Beleaf  
(moderate)

## Promising based on 2012 data

- Torac
- Grandevo

# Insecticide Program Evaluations

2009 -12

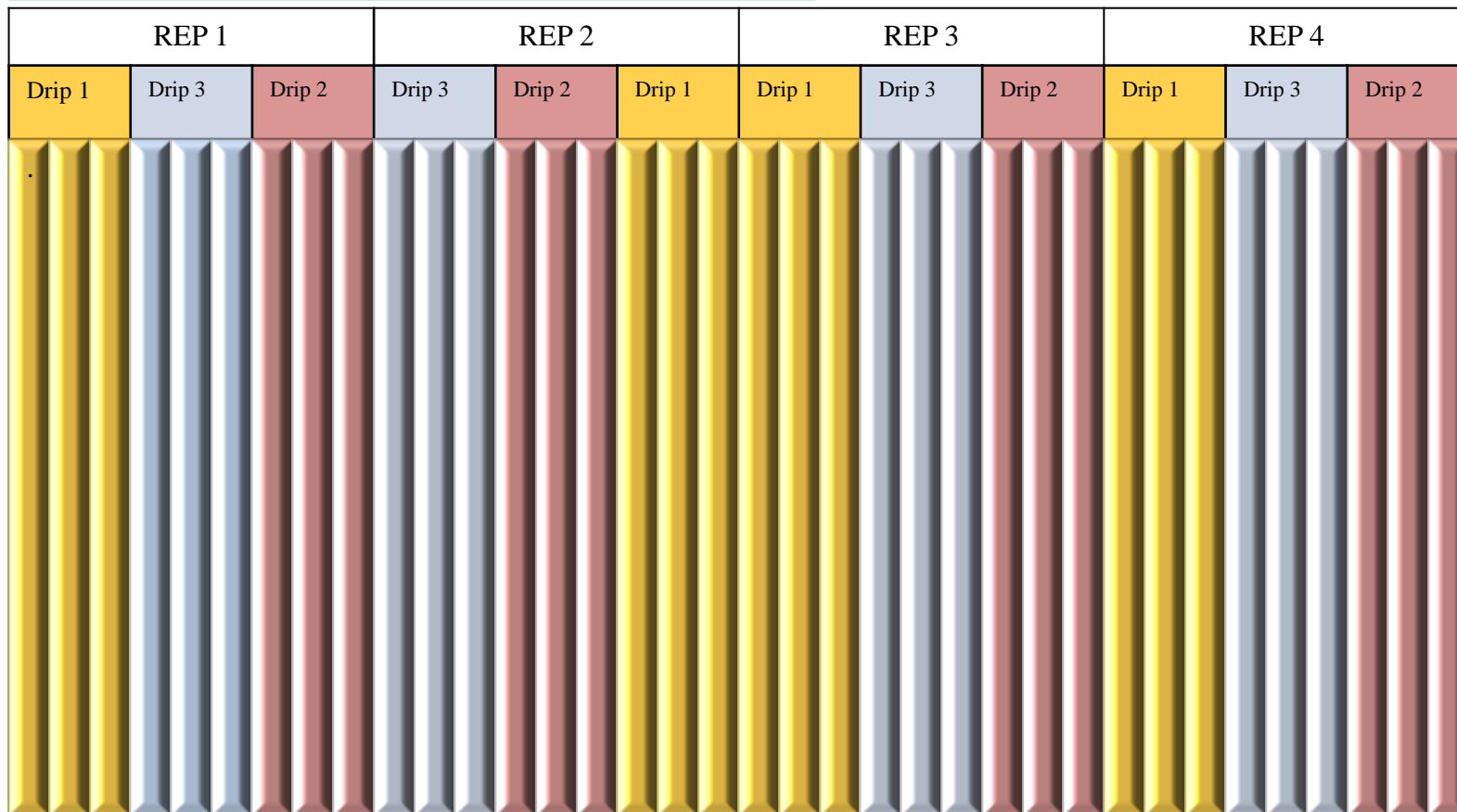
**DRIP INJECTION** (Main Plot Treatments): Platinum and/or Platinum and Venom, and an untreated.

**FOLIAR APPLICATIONS** (Sub Plot Treatments): Three treatments 2 to 5 applications (cyazypyr transplant drench evaluated in 2010-12) and an untreated control.

# Plot Design

## DRIP INJECTION (Main Plot Treatments): Platinum and Venom, Platinum and cyazypyr, and an untreated

Each drip treatment plot = 3 beds x 300 ft



# Plot Design

## FOLIAR APPLICATIONS (Sub Plot Treatments): Three treatments 2 to 4 applications and an untreated

75 ft-long plots x 3 beds over each drip treatment receive each foliar treatment

REP 1			REP 2			REP 3			REP 4		
Drip 1	Drip 3	Drip 2	Drip 3	Drip 2	Drip 1	Drip 1	Drip 3	Drip 2	Drip 1	Drip 3	Drip 2
F1	F2	F3	F1	F4	F3	F2	F4	F1	F3	F1	F4
F4	F3	F1	F3	F1	F2	F3	F2	F3	F4	F2	F1
F2	F1	F4	F2	F2	F4	F1	F3	F4	F1	F3	F2
F3	F4	F2	F4	F3	F1	F4	F1	F2	F2	F4	F3

# Influence of insecticide programs for control of thrips on incidence of Tomato spotted wilt virus symptomatic plants, Fresno Co., 2012

Treatment <sup>z</sup>						TSWV % <sup>y</sup>			
Injections into drip irrigation system buried to 10 in						6 Jun	20 Jun	18 Jul	23 Aug
Platinum75SG 3.7 oz (7 Jun), Venom 6.0 oz (27 Jun)						0.1	5.4	28.7	19.8
Platinum75SG 3.7 oz (7 Jun) cyazypyr 13.5 oz (27 Jun)						0.1	5.8	14.1	17.9
Untreated						0.2	4.3	21.7	21.2
Probability						NS	NS	NS	NS
Foliar applications						TSWV %			
Trans. drench	12 Jun	22 Jun	29 Jun	9 Jul	18 Jul				
cyazypyr	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.3	4.3	13.7	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.0	5.2	31.9	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.				0.3	4.5	16.8	18.6
Untreated						0.0	6.6	23.7	33.5
LSD <sub>0.05</sub>						NS	NS	NS	9.4
AB						NS	NS	NS	NS
CV (%)						317.1	67.38	108.6	36.87

# Influence of insecticide programs for control of thrips on incidence of Tomato spotted wilt virus symptomatic plants, Fresno Co., 2012

Treatment <sup>z</sup>						TSWV % <sup>y</sup>			
Injections into drip irrigation system buried to 10 in						6 Jun	20 Jun	18 Jul	23 Aug
Platinum75SG 3.7 oz (7 Jun), Venom 6.0 oz (27 Jun)						0.1	5.4	28.7	19.8
Platinum75SG 3.7 oz (7 Jun) cyazypyr 13.5 oz (27 Jun)						0.1	5.8	14.1	17.9
Untreated						0.2	4.3	21.7	21.2
Probability						NS	NS	NS	NS
Foliar applications						TSWV %			
Trans. drench	12 Jun	22 Jun	29 Jun	9 Jul	18 Jul				
cyazypyr	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.3	4.3	13.7	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.0	5.2	31.9	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.				0.3	4.5	16.8	18.6
Untreated						0.0	6.6	23.7	33.5
LSD <sub>0.05</sub>						NS	NS	NS	9.4
AB						NS	NS	NS	NS
CV (%)						317.1	67.38	108.6	36.87

## Influence of insecticide programs for control of thrips on incidence of Tomato spotted wilt virus symptomatic plants, Fresno Co., 2012

Treatment <sup>z</sup>						TSWV % <sup>y</sup>			
Injections into drip irrigation system buried to 10 in						6 Jun	20 Jun	18 Jul	23 Aug
Platinum75SG 3.7 oz (7 Jun), Venom 6.0 oz (27 Jun)						0.1	5.4	28.7	19.8
Platinum75SG 3.7 oz (7 Jun) cyazypyr 13.5 oz (27 Jun)						0.1	5.8	14.1	17.9
Untreated						0.2	4.3	21.7	21.2
Probability						NS	NS	NS	NS
Foliar applications						TSWV %			
Trans. drench	12 Jun	22 Jun	29 Jun	9 Jul	18 Jul				
cyazypyr	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.3	4.3	13.7	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	0.0	5.2	31.9	13.2
	Radiant 10 fl oz	Dimth 4EL 1pt.				0.3	4.5	16.8	18.6
Untreated						0.0	6.6	23.7	33.5
LSD <sub>0.05</sub>						NS	NS	NS	9.4
AB						NS	NS	NS	NS
CV (%)						317.1	67.38	108.6	36.87

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., 2012.

Treatment <sup>z</sup>						Yield (tons/ acre) <sup>w</sup>	Fruit quality (% by weight) <sup>y</sup>					PTAB <sup>x</sup>		
Injections into drip irrigation system buried to 10 in							red	grn	rot	sun brn	TSWV	color	solids	pH
Platinum75SG 3.7 oz (7 Jun), Venom 6.0 oz (27 Jun)						29.5	57.1	5.2	28.4	3.6	5.7	21.9	5.34	4.48
Platinum75SG 3.7 oz (7 Jun), cyazypyr 13.5 oz (27 Jun)						26.7	48.3	4.8	33.8	2.2	10.9	22.1	5.30	4.45
Untreated						24.3	47.6	5.9	35.2	3.2	8.1	22.3	5.41	4.45
Drip injection, probability <sup>v</sup>						2.46	NS	NS	NS	NS	NS	NS	NS	NS
Foliar applications						Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Trans. drench	12 Jun	22 Jun	29 Jun	9 Jul	18 Jul		red	grn	rot	Sun brn	TSWV	color	solids	pH
cyazypyr	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	29.0	54.9	5.9	31.5	2.3	5.3	22.3	5.38	4.45
	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	Dimth 4EL 1pt.	Radiant 10 fl oz	28.3	54.7	5.8	27.9	3.4	8.2	21.8	5.26	4.44
	Radiant 10 fl oz	Dimth 4EL 1pt.				26.6	51.1	4.3	33.0	2.8	8.6	21.8	5.43	4.47
Untreated						23.0	43.1	5.2	37.5	3.4	10.9	22.6	5.34	4.48
LSD <sub>0.05</sub> <sup>v</sup>						3.07	NS	NS	NS	NS	NS	NS	NS	NS
AB						0.03	NS	NS	NS	NS	NS	NS	NS	NS
CV (%)						13.7	22.7	40.6	28.3	58.9	52.7	4.8	6.43	1.30

# Observations/Status

- Foliar application have shown promise as a component of a TSWV management plan.
- Under conditions of extremely high virus/thrips pressure, insecticides alone may not provide commercially acceptable levels of control.
- Drip applied materials did not reduce TSWV under the conditions of these studies.

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**Diane Ullman**



# Thrips Efficacy Trials 2007-12

Treatment quantity fp/ acre	9 Aug, '07 Nymphs	Trt 24 Jul '08 Smpled 28 Jul	Trt 17 Jun '09 Smpled 21 Jun	Trt 16 Jul '10 Smpled 20 Jul	Trt 4 Aug '11 Smpled 9 Aug	Trt 26 Jul '12 Smpled 30 Jul
Radiant 6.0 fl oz	8.8 c (1)	0.3 bc (3)	0.8 f (1)	0.3 c (1)	7.3 c (3)	18.3 c (2)
Radiant 6.0 fl oz + Prev-Am 1qt					6.0 c (1)	
Torac 15EC 21 fl oz						15.5c (1)
Dimethoate 4 EL 1 pt	9.0 c (2)	0.0 c (1)		2.0 c (3)		
Lannate SP 1 lb	9.2 c (3)	0.5 bc (4)				
Torac 15EC (tolfenpyrad) 21 fl oz + Agri-Mek SC 3.0 fl oz						21.8 bc (4)
Entrust 7.0 fl oz						20.5 bc (3)
Cyazypyr 13.5 fl oz + Brigade			2.3 ef (2)			
Hero 11.2 fl oz			3.5 def (3)	3.7 c (6)		
Mustang 4.3 fl oz + Beleaf 2.8 oz	9.5 c (4)	0.3 bc (2)				
Athena 17 fl oz + Beleaf 50SG 2.8 oz					7.0 c (2)	
Beleaf 2.8 oz			4.0 def (4)	4.3 c (8)		
Surround 25 lbs		0.5 bc (4)	4.0 def (4)	5.0 bc (9)		
Agrimex 12.0 fl oz			6.0 bcd (5)			35.8 a (7)
Grandevo 3.0 lbs						38.5 a (9)
Venom 70SG 0.895 lb	14.5 ab (8)	3.3 ab (9)		1.3 c (2)	8.0 c (4)	34.5 a (6)
Cyazypyr 13.5 fl oz				10.0 ab (11)		
Cyazypyr 20.5 fl oz					10.5 bc (5)	31.8 ab (5)
Assail 30SG 4.0	9.5 abc (5)			5.3 abc (10)		
Success 6.0 fl oz + Ecozin Plus	11.5 abc (6)					
Success 6.0 fl oz	13.3 abc (7)					
Requiem 2 qts						
Athena 17 fl oz					12.8 abc (6)	
Leverage 5.1 fl oz		1.3 abc (6)				
Mustang 4.3 fl oz	15.2 abc (10)	1.3 abc				
Movento 5.0 fl oz	16.3 a (11)	2.8 ab (8)				
Microthiol 16.5	16.5 a (12)					
Requiem 3 qts			10.0 ab (8)	4.3 c (7)		
Requiem 2 qts			7.5 a-d (6)		20.3 a (8)	
Untreated	14.9 ab (9)	4.3 a (10)	11.0 a (9)	10.7 a (12)	17.0 ab (7)	37.0 a (9)

# Thrips Efficacy Trials 2007-12

## Efficacious Treatments

Treatment quantity fp/ acre	9 Aug, 2011 Nymphs	Trt 24 Jul Smpled 28 Jul	Trt 17 Jun '09 Smpled 21 Jun	Trt 16 Jul '10 Smpled 20 Jul	Trt 4 Aug '11 Smpled 9 Aug	Trt 26 Jul '12 Smpled 4 Aug
Radiant 6.0 fl oz	8.8 c (1)	0.3 bc (3)	0.8 f (1)	0.3 c (1)	7.3 c (3)	45.7 abc (3)
Radiant 6.0 fl oz + Prev-Am 1qt					6.0 c (1)	
Dimethoate 4 EL 1 pt	9.0 c (2)	0.0 c (1)		2.0 c (3)		
Lannate SP 1 lb	9.2 c (3)	0.5 bc (4)				
Grandevo 3.0 lbs						30.7 c (1)
Torac 15EC (tolfenpyrad) 21 fl oz + Agri-Mek SC 3.0 fl oz						38.7 bc (2)
Entrust 7.0 fl oz						51.7 abc (4)
Cyazypyr 13.5 fl oz + Brigade			2.3 ef (2)			
Hero 11.2 fl oz			3.5 def (3)	3.7 c (6)		
Mustang 4.3 fl oz + Beleaf 2.8 oz	9.5 c (4)	0.3 bc (2)				
Athena 17 fl oz + Beleaf 50SG 2.8 oz					7.0 c (2)	
Beleaf 2.8 oz			4.0 def (4)	4.3 c (8)		

# 2011: Influence of Programs on thrips and TSWV Symptom Incidence

Treatment <sup>z</sup>		Thrips densities (thrips/25 flowers)						TSWV % <sup>y</sup>						
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	Jun	Jul	Aug	Aug			
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										
Cyazapyr	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		NS	NS	4.092	7.105	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			

# 2011: Influence of Programs on thrips and TSWV Symptom Incidence

Treatment <sup>z</sup>		Thrips densities (thrips/25 flowers)						TSWV % <sup>y</sup>						
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	Jun	Jul	Aug	Aug			
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					NS	NS	4.092	7.105	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

# 2011: Influence of Programs on thrips and TSWV Symptom Incidence

Treatment <sup>z</sup>		Thrips densities (thrips/25 flowers)						TSWV % <sup>y</sup>						
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	Jun	Jul	Aug	Aug			
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		NS	NS	4.092	7.105	NS	NS	NS	NS	5.2	8.5	7.6		
AB		NS	NS	0.01	NS	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			

# 2011 Influence of Programs on Yield/Quality

Treatment					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Injections into drip irrigation system buried to 10 in						red	grn	rot	Sun burn	TSWV	color	solids	pH
Platinum75SG 3.7 oz (22 Jun), Venom 6.0 oz (12 Jul)					29.535	55.6	6.3	12.6	5.4	19.6	23.417	5.833	4.560
Platinum75SG 3.67 oz (22 Jun), Venom 6.0 oz (22 Jul)					29.246	61.4	8.1	9.3	3.3	17.9	24.167	5.508	4.453
Untreated					33.878	62.7	7.0	9.1	3.1	18.2	24.167	5.667	4.540
Drip injection, probability					NS	NS	NS	NS	NS	NS	NS	NS	NS
Foliar applications					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Trans- plant drench 17 May	24 Jun	6 Jul	14 Jul	21 Jul		red	grn	rot	Sun burn	TSWV	color	solids	pH
HG	Radiant	Dimeth	Radiant	Dimeth	37.958	64.3	7.6	9.5	2.8	15.9	24.111	5.522	4.532
W	10.0 fl oz	4EL 1pt. oz	10.0 fl oz	4EL 1pt. oz	30.368	59.6	9.0	11.0	4.7	15.7	23.444	5.622	4.548
	Radiant	Dimeth	Radiant	Dimeth	30.248	61.1	7.4	9.5	3.1	18.9	24.444	5.667	4.529
	10.0 fl oz	4EL 1pt. oz	10.0 fl oz	4EL 1pt. oz	24.968	54.6	5.2	11.3	5.1	23.8	23.667	5.862	4.582
Untreated					24.968	54.6	5.2	11.3	5.1	23.8	23.667	5.862	4.582
LSD p=0.05					4.716	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

# 2011 Influence of Programs on Yield/Quality

Treatment					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Injections into drip irrigation system buried to 10 in						red	grn	rot	Sun burn	TSWV	color	solids	pH
Platinum75SG 3.7 oz (22 Jun), Venom 6.0 oz (12 Jul)					29.535	55.6	6.3	12.6	5.4	19.6	23.417	5.833	4.560
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Untreated					33.878	62.7	7.0	9.1	3.1	18.2	24.167	5.667	4.540
Drip injection, probability					NS	NS	NS	NS	NS	NS	NS	NS	NS
Foliar applications					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Trans- plant drench 17 May	24 Jun	6 Jul	14 Jul	21 Jul		red	grn	rot	Sun burn	TSWV	color	solids	pH
HG	Radiant	Dimeth	Radiant	Dimeth	37.958	64.3	7.6	9.5	2.8	15.9	24.111	5.522	4.532
W	10.0 fl oz	4EL 1pt. oz	10.0 fl oz	4EL 1pt. oz	30.368	59.6	9.0	11.0	4.7	15.7	23.444	5.622	4.548
	Radiant	Dimeth	Radiant	Dimeth	30.248	61.1	7.4	9.5	3.1	18.9	24.444	5.667	4.529
	10.0 fl oz	4EL 1pt. oz	10.0 fl oz	4EL 1pt. oz	24.968	54.6	5.2	11.3	5.1	23.8	23.667	5.862	4.582
Untreated					24.968	54.6	5.2	11.3	5.1	23.8	23.667	5.862	4.582
LSD p=0.05					4.716	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

# 2011 Influence of Programs on Yield/Quality

Treatment					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Injections into drip irrigation system buried to 10 in						red	grn	rot	Sun burn	TSWV	color	solids	pH
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Untreated					33.878	62.7	7.0	9.1	3.1	18.2	24.167	5.667	4.540
Drip injection, probability					NS	NS	NS	NS	NS	NS	NS	NS	NS
Foliar applications					Yield (tons/ acre)	Fruit quality (% by weight)					PTAB		
Trans- plant drench 17 May	24 Jun	6 Jul	14 Jul	21 Jul		red	grn	rot	Sun burn	TSWV	color	solids	pH
HG	Radiant	Dimeth	Radiant	Dimeth	37.958	64.3	7.6	9.5	2.8	15.9	24.111	5.522	4.532
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Untreated					24.968	54.6	5.2	11.3	5.1	23.8	23.667	5.862	4.582
LSD p=0.05					4.716	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