

Crops and Weeds as Sources of Inoculum for Tomato Spotted Wilt Virus

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Tomato Spotted Wilt



TSWV : Where is the source of the Virus?

Field incidence in CA

2003	Merced
2004 & 05	Coalinga area ...
2006	Kettleman, Huron, 5 Points, Firebaugh
2007	Even more widespread, but less severe
2008	More widespread in CA

TSWV Plant Host Range

Infects over 900 plants, mostly dicots

Ornamentals

- Begonia
- Geranium
- Impatiens
- Lily
- Marigold
- Mums
- Snapdragons
- Verbena
- Zinnias

Weeds

- Cheeseweed
- Chickweed
- Datura
- Lambsquarters
- Morningglory
- Nightshade
- Pigweed
- Purslane
- Sowthistle

Crops

- Tomatoes
- Peppers
- Lettuce
- Peanuts
- Radicchio

and many more ...

TSWV : Where is the source of the Virus?

**100s of PLANTS SAMPLED in 2005 – 2006
on westside Fresno and in Merced county**

CROPS

Tomato
Potato
Lettuce
Pepper
Radicchio
Eggplant
Cauliflower
Celery
Spinach
Pea

WEEDS

Russian thistle
Ground cherry
Black nightshade
Prickly lettuce
Tree tobacco
Bindweed
Mallow
Nettle
Sowthistle

ORNAMENTALS

Canna Lily
Calla Lily
Daisy
Dahlia
Sweet pea
Zinnia
Nasturtium
Poppy
Petunia
Chrysanthemum

+ 100 more that tested negative

Red = tested positive

Where is the Source of TSWV Inoculum in the SJV?

Growers and PCAs noted INCREASED:



Tomato transplants
Weeds in fallow lands
Almond Acreage
Radicchio plantings

and speculated these areas as potential TSWV inoculum reservoirs and habitat for thrips.



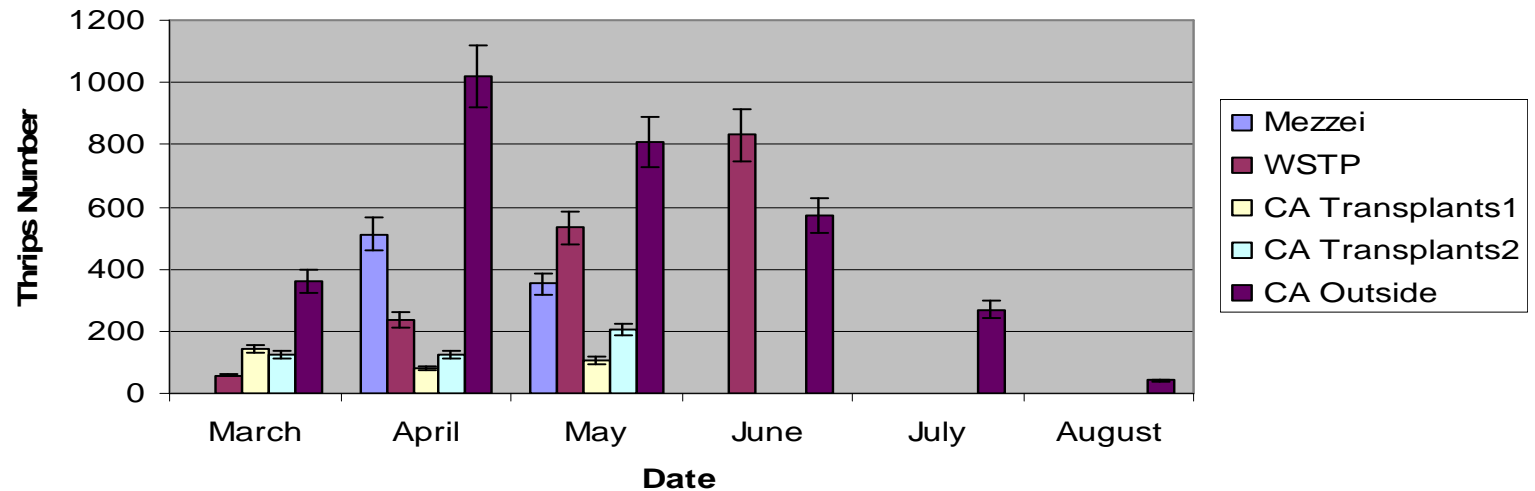
TSWV Research – 2007 & 2008

Monitor Thrips (sticky cards) & % Disease
Major CA Greenhouses

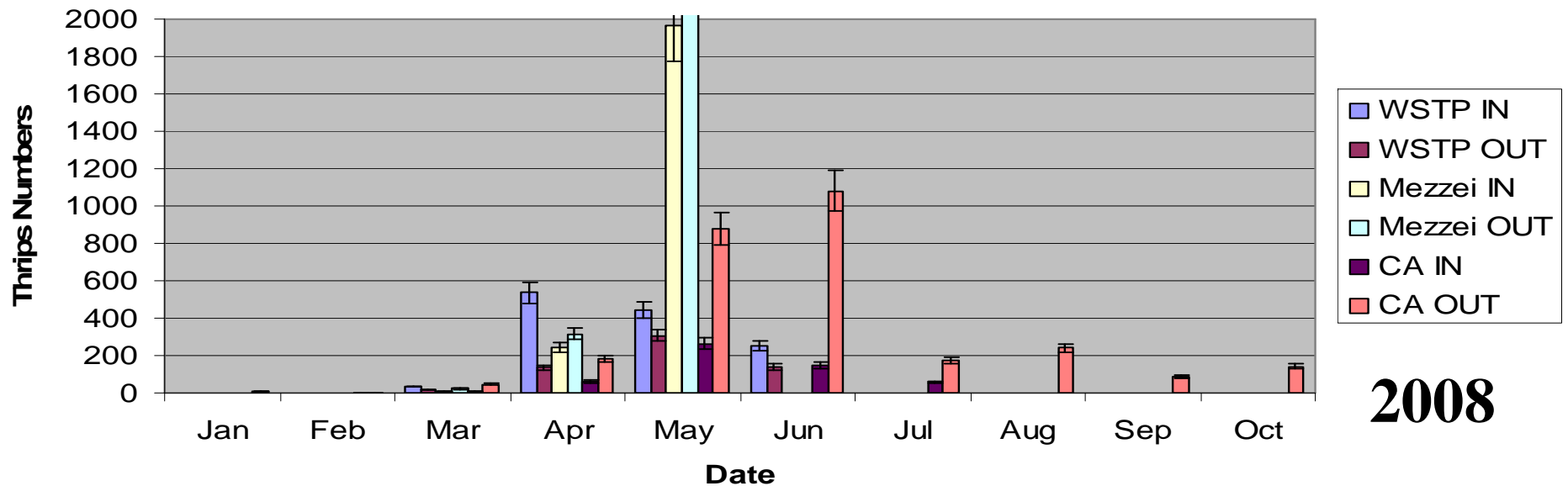
4 corner periphery of greenhouse operation
Specific Grower plants

Greenhouses

Transplant Houses 2007



Thrips populations were higher in 2008 compared with 2007.



2008

**Fava beans and petunia plants
develop diagnostic symptoms of TSWV
infection more rapidly than tomatoes**



**TSWV was not detected in indicator plants or
in tomato transplants in any of the monitored
greenhouses**

Monitoring of Greenhouses & Processing Tomato Transplants

Summary

1. Relatively low thrips populations on transplants (*especially in closed greenhouses*).
2. No evidence of TSWV infection on transplants.
3. Transplants are **NOT** a major source of thrips or TSWV for **processing** tomatoes.



TSWV incidence was slightly greater in direct-seeded versus transplanted fields

Results-TSWV incidence

2007 - TSWV first detected 20 April

2008 - TSWV first detected mid-May

2007 - spotted wilt appeared in most fields, but late and at low incidences (>1%-3%).

2008 - overall TSWV pressure was greater, especially in later planted fields (0%-15%).

In 2007 & 2008 overall economic losses due to TSWV in monitored fields was considered minimal, although some fields were bad.

Where is the source of TSWV Inoculum in the SJV?

Known host CROPS:

**Tomatoes and peppers are summer crops:
MARCH – OCT 10**

**Lettuce has two crops per year:
Fall harvest **AUG - NOV**
Spring harvest **NOV - APR****

Potential for TSWV to bridge from crop to crop.

TSWV in peppers

Found in many
westside Fresno fields
- Summer 2006 & 2007





TSWV in lettuce



**Detected in Huron Lettuce
Fields in
FALL of 2005 – 2008,
SPRING 2008**

**But was sporadic and not
economic**

Radicchio - a reservoir crop for TSWV ?



April 2005



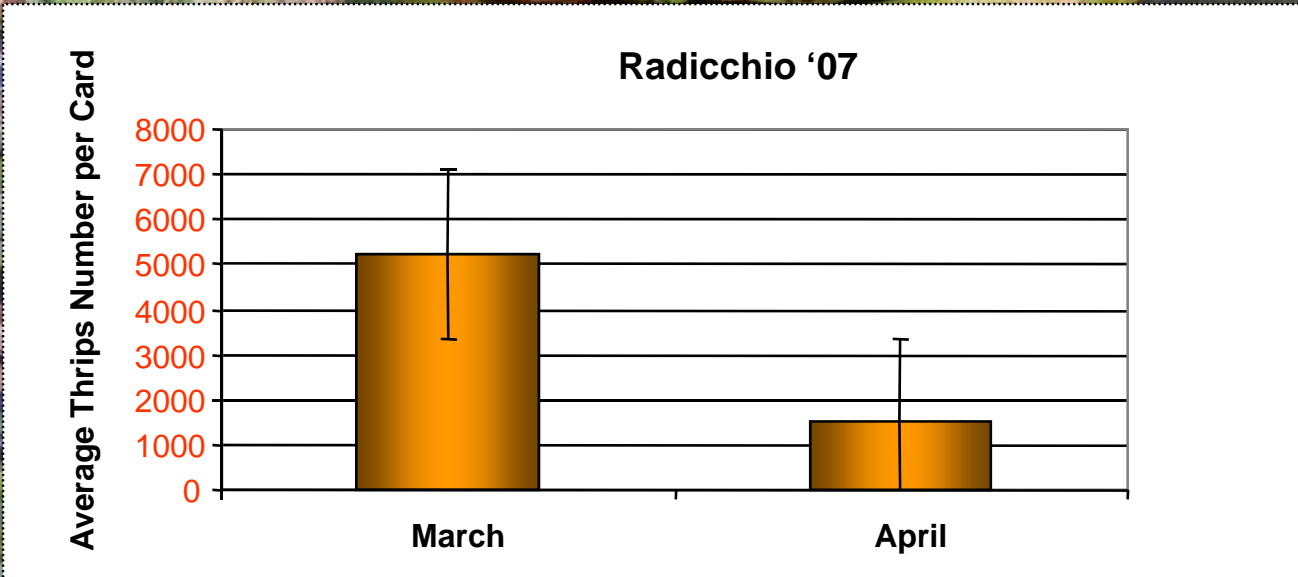
November 2006

Radicchio Field - March 2007





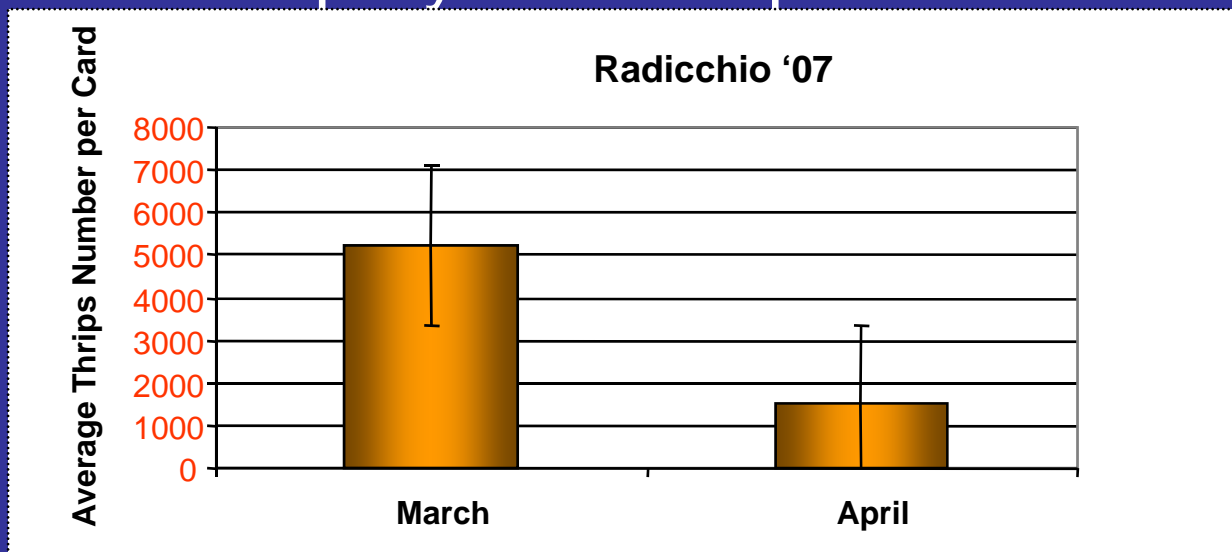
Radicchio – March 2007
High TSW Infestation &
High populations of thrips



2007 - TSWV first detected in April in tomatoes near the radicchio field.

Radicchio

- Is a crop that can be a source of TSWV inoculum.
- Thrips thrive in radicchio.
- TSWV thrives in the thrips and in the radicchio.
- Growers came to recognize this and now they manage the crop much better with more timely insecticide sprays and crop sanitation.



Radicchio Crop – May 2008

VERY CLEAN - NO TSWV



Growers took a more proactive approach to TSWV management.

Radicchio Crop – May 2008

VERY CLEAN - NO TSWV



Growers took a more proactive approach to TSWV management.

Almond Flower Collection for Thrips



5 Orchards, 4 corners/orchard, 25 flowers/corner

Almond Flower Collection for Thrips



**Almond Leaf Collection
for TSWV - Summer 2006**

**1 Orchard near TSWV
Tomato Field**

75 trees sampled – 0 TSWV

RESULTS:

6 Thrips – FEB 2008

5 Orchards, 4 corners/orchard, 25 flowers/corner

Weed Collection for TSWV

March 2008 – Fresno & Kings Counties



11 species, 5 samples each (4 Locations)

Bindweed, Bur clover, Fiddleneck, Groundsel, Lambsquarters, London rocket, Malva, Nettle, Prickly lettuce, Sowthistle, Wild radish

Weed RESULTS:
NEGATIVE for TSWV



11 species, 5 samples each (4 Locations)

Bindweed, Bur clover, Fiddleneck, Groundsel, Lambsquarters, London rocket, Malva, Nettle, Prickly lettuce, Sowthistle, Wild radish



Weed Collection for TSWV
July 2008 – Fresno & Kings Counties

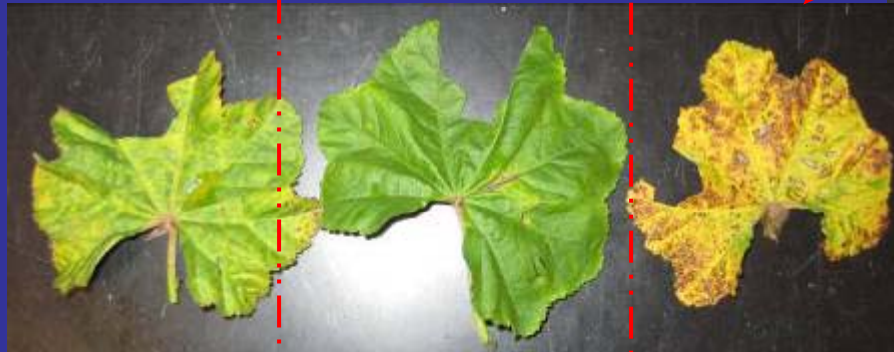
9 species, 5 samples each

**Barnyardgrass, Black nightshade, Dodder, Lambsquarters,
Pigweed (tumble), Purslane, Sowthistle,
Thornapple (Datura – jimsonweed), Tree Tobacco**

NEGATIVE for TSWV

Weed Collection for TSWV

March 2008 – Merced County



**Malva is PCR and
ImmunoStrip Positive**

Weed Collection for TSWV March 2008 – Merced County



**PRICKLY LETTUCE and Fennel -
samples are POSITIVE for TSWV
(PCR and ImmunoStrip)**



Weed survey results for TSWV incidence (Fresno and Merced counties)

Weed	Tested (+)	Weed	Tested (+)
Barnyard grass	25 (0)	Lambs quarters	63 (0)
Black nightshade	25 (0)	Malva	110 (1)
Bindweed	25 (0)	Mustard	60 (0)
Bur clover	25 (0)	Nettle	25 (0)
Common sunflower	25 (0)	Pigweed	25 (0)
Dodder	25 (0)	Prickly lettuce	90 (2)
Fiddle neck	25 (0)	Purslane	25 (0)
Ground cherry	25 (0)	Russian thistle	25 (0)
Groundsel	40 (1)	Sowthistle	60 (1)
Jimsonweed	25 (0)	Tree tobacco	25 (0)

(+) number of plants tested positive for TSWV by immunostrips and/or PCR

Weeds Summary

- A variety of common weeds were collected throughout the growing season and in areas known to have TSWV outbreaks.
- Most samples were negative for TSWV, with an incidence of <0.1%.
- Weeds that were positive included groundsel, Malva, prickly lettuce, sowthistle.
- Weeds do not seem to be the important inoculum reservoir for TSWV.

Inoculum Reservoir Conclusion

1. **Pepper & tomato crops** can amplify the virus and serve as an inoculum reservoir.
2. **Lettuce** is not such a big threat as an inoculum reservoir or bridge crop, because most lettuce is on an aggressive insecticide program.
3. **Radicchio** is a crop that poses a big threat as a potential TSWV inoculum reservoir and bridge crop, however it appears that the threat can be managed with thrips management and crop sanitation.
4. **Almonds & flowers** don't appear to be a threat.
5. **Weeds** do not seem to be an important inoculum reservoir at this time.

2009 research plans

1. Triple check the greenhouses
2. Double check the almond flowers
3. Double check the weeds
4. Keep watch on tomato, pepper and radicchio crops



Thank You
Are there any questions?

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