University of California Cooperative Extension, Yolo County
70 Cottonwood Street, Woodland, CA 95695 530-666-8143
http://ceyolo.ucdavis.edu

31 Jan 2013 (Volume 53-1)

TOMATO INFO

Tomato spotted wilt virus

TOMATO SPOTTED WILT VIRUS

Tomato spotted wilt virus (TSWV) has persisted in our area over the last several years and has now become more widespread. The extent of damage (symptoms) in parts of some fields may exceed 20%, however, overall infection in most fields appears to be in the 1 to 2% category. The California Tomato Research Institute has continued to fund a TSWV research project over multiple years to develop an integrated pest management (IPM) strategy for thrips and TSWV.

The management of spotted wilt for some is simple: plant a resistant variety. A number of varieties with TSWV resistance are available. With high demand, the 2013 supply is anticipated to be limited.

Among the susceptible varieties, the range of symptom severity (susceptibility) is broad. UC Fresno Advisor Tom Turini working with UC Tulare Advisor Michelle Le Strange evaluated susceptible varieties to assess the percentage of plants infected with spotted wilt. Varieties were compared over a 6-year period from 2007 to 2012. Trials were all planted near Five Points at or around the UC Westside Research and Extension Center. Not all varieties were compared each year, but the compilation provides a rough guide to categorize those varieties repeatedly showing a tendency toward high, medium or low incidence.

Table 1. *Tomato spotted wilt virus*: a visual assessment of susceptibility

Low	Medium to variable	High
BQ 163	H 2005	H 8004
H 2206	Sun 6366	BOS 602
UG 19406	H 1015	H 8504
Sun 6368	NDM 5578	HM 6898
H 4407	CXD 282	H 2601
H 2769	AB 2	AB 3
H 3004	H 9780	Nun 672
H 6397	K 2770	APT 410
UG 15308	CXD 255	
BQ 205	HMX 7885	
UG 4305	PX 1723	

The value of the variety susceptibility guide (Table 1) is to provide a relative idea of the susceptibility of processing tomato varieties. Growers can then make choices based upon the potential risk for thrips and TSWV in a given field.

A risk index for TSWV has been developed by the TSWV research team that is based on factors that have been identified as playing a role in disease development, e.g., planting date, surrounding crops as hosts or bridges for the virus, proximity to weedy fallow fields and site history. At this point, fields at risk are those planted 1) near bridge crops (lettuce, radicchio and fava beans) or weedy fallow fields, 2) late in the season (and thus near old tomato fields), and 3) in locations that historically have high levels of disease (hot-spot areas). If seed supply of resistant varieties is limited, growers should consider planting resistant varieties in these high-risk fields.

For our Sacramento Valley area, it is less clear exactly what factors (e.g., surrounding vegetation) make a high-risk site. Especially in an early-planted field, if the virus didn't come

into the field with infected transplants (which appears to be uncommon for commercially produced processing tomato transplants), the surrounding vegetation is likely the host source. But from all the survey and scouting work that UCD Plant Pathologist Bob Gilbertson and team did on evaluating weed hosts and crops, there were few 'smoking guns' identified. Radicchio, especially, and the winter cover crop fava bean were 2 crops that were identified as good bridges to extend the virus into the next season. And while there were many cases of high TSWV infection in tomato fields along a border (that pointed to the TSWV coming from adjacent fields and the surrounding area), there hardly was a common thread tying the high incidence into a neat package.

Recent research suggests that thrips emerging from soil are another potential source of TSWV inoculum early in the growing season, and this could explain how lone TSWV-infected plants can be found in the center of fields, far removed from potential plant hosts. For sure, the levels of thrips and TSWV are low early in the season and efforts to eliminate known bridge crops and weedy fallow fields (a place that both thrips and TSWV can be amplified) will benefit both early and late planted crops in terms of reduced thrips and virus pressure.

Table 1 would be enhanced if coupled with yield outcome. To provide a glimpse at yield from these tests (Table 2), yield is shown for year 2011, when TSWV infection level ranged from 0 to 53% of plants showing symptoms when rated 0 to 4 weeks before harvest. For instance, the spotted wilt resistant variety H 5508 had a near zero level of infection coupled with a high yield output of 66.5 tons/acre. However, yield from susceptible variety H 7709 with a 33% TSWV infection level also had high yield with 62.9 tons/acre. From this data set, AB 3 would not be particularly attractive knowing it is high risk (gleaned from Table 1) and relative yields were in the lower ranking group (at 48.6 tons). And based solely on Table 2 results, AB 0311, while possessing spotted wilt resistance and with 'zero' detectable virus symptoms, yield level was in the lowest performing group.

<u>Note</u>: For local growers, the Fresno yield comparison table might not directly apply to your variety selection decisions- rather it is used in this example to illustrate that variety fitness in a particular field depends upon multiple factors beyond just disease resistance.

Table 2. TSWV incidence and tomato yield outcome, UC Westside Research and Extension Center, Five Points (Turini and Le Strange, 2011)

			Yield		Tomato spotted wilt virus (% infected plants)			
	Variety		tons/a		18-Jul	11-Aug	23-Aug	
1	AB 0311	SW	39.6	e	0	0	0	a
2	H 5508	SW	66.5	a	0	0	1	a
3	N 6394	SW	49.1	bc	0	1	3	a
4	UG 19406		-		7	16	19	bc
5	H 3402		53.8	b	10	21	21	bc
6	BQ 205		46.5	cd	19	26	27	bcd
7	Sun 6368		-		14	24	29	bcd
8	HMX 9905		53.9	b	19	28	31	cd
9	H 7709		62.9	a	30	30	33	d
10	H 8004		-		17	32	35	d
11	H 9780		46.1	cd	12	34	38	d
12	AB 3		48.6	c	25	50	53	e
13	Sun 6366		42.0	de	-	-	-	
	LSD		4.9		9.1	13.5	12.3	
	% CV		7		49	43	35	

<u>Bottom Line</u>: While it is likely that TSWV reduces yields and resistance is an effective management tool, the field performance of a variety, even under high disease pressure, depends on other factors that may not be related to TSWV resistance.

Chemical control:

Fresno Advisor Tom Turini has also looked at a number of insecticide programs targeting the thrips vector of tomato spotted wilt. After several years of trials, he concludes that the following materials are most effective as foliar applications:

Dimethoate 4EL (at 1 pint)
Lannate SP (at 1 lb.)
Radiant SC (at 6 fluid oz.)
Beleaf 50 SG (at 2.8 oz.) combined with Mustang (at 4.3 fluid oz.)

In general, a good IPM program has a target threshold level of the insect vector as a 'trigger' to initiate a treatment. While this is relatively easier for insect pests, such thresholds are far more difficult to establish for insect-transmitted viruses where there is not a direct correlation between insect numbers and virus incidence. The threshold would ideally be developed by quantifying a collection of infectious thrips that results in economic crop damage, but such a program of detection is difficult to develop and execute.

Thus, the best insecticide strategy is to make the initial application when thrips population build-up is initially detected (with yellow sticky card traps or the predictive model indicates the first adults have hatched) and when TSWV is just detected within the field or in fields in the general vicinity. Growers who are not certain whether the symptoms in their fields are TSWV should have the sample tested, as other viruses can cause symptoms that mimic TSWV and these viruses are not spread by thrips. Field test kits exist for rapid confirmation of TSWV. Delaying the initiation of spraying until confirmed presence of thrips/TSWV will reduce unnecessary sprays. Once thrips and TSWV appear in the field, multiple repeat applications are likely needed depending on thrips pressure and TSWV incidence.

Treat early. The seedling-stage through the flower setting stage of tomatoes is more sensitive to TSWV damage than the fruit sizing and ripening stage. Reduce the thrips population within the field to reduce disease spread especially during the sensitive vegetative growth stage of tomatoes.

In a given year, it is likely thrips population will be high and any insecticide program will provide only partial control at best. Migration of thrips from outside of the field will likely continue so there will be a constant wave of 'new thrips' coming into the field. There is bit of good news: the adult thrips can't acquire the virus. Thus they have to come to the field 'dirty' or have offspring within the tomato field for their young to feed on infected plants—thus leaving the young to spread the virus. The most effective strategy for the grower is to spray early when the thrips and virus first appears and then follow with repeated sprays during the most sensitive stages of plant growth. Spraying should cease well before early ripening begins since mature plants are less susceptible to yield loss.

To reduce development of insect resistance, rotate insecticide chemistries rather than repeatedly using a singular material within the season.

In over 4 years of trials, Advisor Turini has consistently found the neonicotinoid insecticide Platinum was ineffective when applied through a drip irrigation system for thrips and TSWV management in tomatoes. Platinum and other neonicotinoids have activity against other insect pests, but should not be used for thrips control.

Web sites seasonal thrips & TSWV reports:

UCD Pathologist Neil McRoberts (working with Bob Gilbertson) developed a model to predict thrips population development for several production areas including Yolo-Colusa.
https://sites.google.com/site/cubelabsite/current-research/tomato-spotted-wilt-virus/thrips-population-projections

Chuck Rivara of the CTRI created a program to send email alerts about TSWV thrips activity. Sign up for this free service at http://www.tomatonet.org

TSWV test kits:

Field test kit from Ag Dia
https://orders.agdia.com/InventoryD.asp?loc=IN&collection=ISK%2039300&attribute_Size=25

Kit from Envirologix: http://www.envirologix.com/artman/publish/article_249.shtml

The field kit from AgDia is individualized and easy to use in the field. The kit from Envirologix is like a simple chemistry 1a lab set that is more suitable for use on a bench in the office. Either is valuable to detect TSWV from plant tissue. Cost is about $5 for each sample tested. Minimum purchase is a package of 25.

Submitted by,

Gene Miyao
Farm Advisor, Yolo, Solano & Sacramento counties