

## Tomato resistance-breaking *Tomato spotted wilt virus* detected in 2018

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*Tomato spotted wilt virus (TSWV)* is a persistent challenge faced by tomato producers. This virus is transmitted by thrips and has many weed and crop hosts. It causes economic losses in several crops that include processing and fresh market tomatoes. An IPM program to limit damage caused by TSWV includes sanitation, site selection, thrips control and plant resistance. However, in 2016, a strain of the virus caused disease in tomato varieties with the TSWV resistance gene (SW5) in Fresno County. Similar SW5 resistance-breaking strains were documented in Europe and other parts of the world, but this is the first report in the Continental United States. This strain increased in distribution over the past two years and was detected in processing and fresh market tomatoes as well as in celery, lettuce, pepper and sow thistle. In Mar 2018, the SW5 resistance-breaking strain was detected in Fresno County lettuce, which provides evidence that it is likely to remain a challenge to producers. Control strategies should make use of multiple tactics without total reliance on any one management approach.

### BACKGROUND

Symptoms of *Tomato spotted wilt virus (TSWV)* are characterized by fruit distortions and bronzed, spotted or yellow leaves in tomatoes.

Western flower thrips transmit TSWV in Central California. Only thrips that feed on TSWV-infected plants as nymphs can transmit the virus as an adult. Thrips retain the virus for life, and viral transmission is optimum several minutes of feeding.

The host range includes lettuce, common bean, celery, pepper and potato are hosts as well as weeds such as sow thistle, prickly lettuce, mallow, mustards, wild radish, London rocket, shepherd's purse, pineapple weed and many others. Seasonal variations of TSWV levels: In the winter, the virus is detected in a relatively low number of weeds and crops, and may be present in pupating thrips. Levels of TSWV in areas with concentrations of tomatoes increase in spring and summer. Risk of losses due to TSWV is generally higher in late season tomato production.



Bronzing on tomato leaf due to TSWV

### MANAGEMENT

The most effective TSWV control strategy is an integrated management program.

Sanitation: Reduce weed densities and till susceptible crops immediately after harvest. If sanitation is not possible prior to tomato planting, consider treating the weeds with insecticide before tilling or applying herbicide.

Identify high risk situations: If possible avoid, planting near a known virus source that cannot be addressed oth-

erwise.

Insecticides: Foliar applications of Radiant, dimethoate and Lannate can reduce TSWV levels. However, insecticide applications may not keep disease below commercially acceptable levels under high pressure.



Fruit symptoms of TSWV include spotting and distortions

A single gene resistance (SW5) is present in many commercial processing and fresh market tomato varieties. Up to 3% of resistant plants may show TSWV symptoms as a result of a wild type strain (strain that is not SW5 resistance-breaking). Also, under very heavy virus pressure, the wild type strain will cause brown concentric rings on the fruit on SW5 varieties in the absence of symptoms on the leaves.

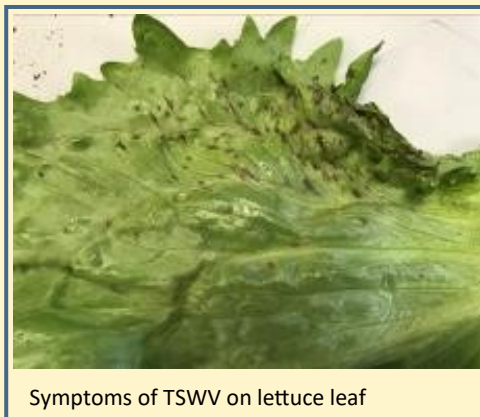
### **RESISTANCE BREAKING STRAIN**

In spring of 2016, a fresh market tomato field with a resistant variety had as much as 50% TSWV incidence in the Cantua Creek area within Fresno County. The virus present in the affected plants was similar to a resistance-breaking strain reported in Europe as determined in Dr. Gilbertson's lab at UC Davis. By fall 2016, the same strain was confirmed in two other areas within Fresno County.

Distribution of the new strain increased in 2017. In Feb 2017, the strain was detected in sow thistle in Cantua Creek and in the Huron areas. The area affected by this strain increased within Fresno County in both processing and fresh market tomatoes. It also affected tomatoes in Merced and Contra Costa Counties by the end of the 2017 season.

In Mar 2018, the resistance-breaking strain was detected in three lettuce fields in the Cantua Creek area. The wild type strain was present also. Symptom incidence of TSWV within the lettuce were 3 to 5%.

Potential persistence of resistance-breaking TSWV: The resistance-breaking strain has been detected in celery, lettuce, peppers and sow thistle. Detection in sow thistle and lettuce in winter, as well as the increased distribution of the virus during 2016-2017 suggests that the SW5-resistance breaking strain will remain a production challenge into the future.



Symptoms of TSWV on lettuce leaf

Currently, there is no alternative to SW5 in commercial varieties. There are other approaches to resistance being tested under greenhouse conditions with plans to evaluate these lines under field conditions in 2018. In addition, relative severity of TSWV in commercial varieties are being compared in collaboration with commercial seed companies in 2018.

### **MANAGEMENT AFTER THE SW5-RESISTANCE**

**BREAKING STRAIN** Research is currently underway to better understand this strain and our management options. Based on current information, SW5 resistance remains an important component of a management strategy. Because the wild type strain is also present with the SW5 resistance breaking strain, higher disease incidence would be expected in varieties lacking SW5. Plus, in many production areas, there is no evidence of the resistance-breaking strain. However, avoidance of total reliance on SW5 for management of TSWV is prudent.

An integrated approach is the most reasonable means of reducing risk. In particular, manage potential sources of the virus, avoid extremely high thrips population densities and recognize and avoid high risk situations.

Report SW5-resistance breaking strains: Please contact the UC Vegetable Crops Advisor in your county if high TSWV incidence is present in your SW5 tomato varieties.

### **ACKNOWLEDGEMENTS:**

The research on which this note is based is supported by **California Tomato Research Institute**.

Those who have made major contributions on this research project included **Robert Gilbertson, Ozgur Batuman, Monica Macedo, Diane Ullman,**

**Michelle LeStrange, Brenna Aegerter and Scott Stoddard.**

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