

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. It is transmitted by thrips and has many weed and crop hosts. This virus has caused economic losses in several crops that include processing and fresh market tomatoes. An IPM program used to manage this disease included sanitation, site selection, thrips control and plant resistance. However, in 2016, a strain of the virus capable of infecting resistant varieties was documented in Fresno County. There have been no other reports of this occurring and none in the Continental United States. In Fresno, this strain has been detected in processing and fresh market tomatoes as well as in lettuce, sowthistle, celery, and peppers. The finds this season in lettuce, and last season in sowthistle are particularly concerning because these are hosts in which the virus can survive during the winter and may suggest that the strain is likely to persist in our environment.

BACKGROUND

Symptoms of *Tomato spotted wilt virus*: The distortions of the fruit and bronzing or yellowing of the foliage with necrotic spots are familiar to most who are involved in tomato production.

Western flower thrips transmits 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 winter weeds and crops and potentially in pupating thrips. In areas with substantial tomato production, the virus amplifies through spring and summer. Risk of losses due to TSWV is generally higher in late season production.



Bronzing on tomato leaf due to TSWV

MANAGEMENT

The most effective TSWV management approach is an integrated management program.

Sanitation: Reduce weed densities and till susceptible crops immediately after harvest. Killing weeds after neighboring tomatoes are planted may increase risk as it will result of movement of any insects living on those plants.

Identify high risk situations: If possible avoid, planting near a known virus source of virus.

Use of insecticides: Foliar applications of Radiant, dimethoate and Lannate have most consistently reduced TSWV levels. Insecticide applications will not keep disease incidence within commercially acceptable levels under very high pressure.



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A single gene resistance (SW5) has been incorporated into many commercial processing and fresh market tomato varieties. It is possible to see 3% TSWV expression even in a resistant variety even due to a non-resistance breaking strain. Also, under very heavy virus pressure, there may be abnormal disease expression of brown concentric rings on the fruit in the absence of symptoms on the leaves.

RESISTANCE BREAKING STRAIN

In spring of 2016, a fresh market field with an SW5 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 what had been reported in a resistance-breaking strain in Europe as determined in Dr. Gilbertson's lab at UC Davis. By fall 2016, the same strain was confirmed in two additional areas within Fresno County.

Distribution of the new strain increased in 2017. In Feb, the strain was detected in sow thistle in Cantua Creek and in the Huron area. 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. Levels within the lettuce were 3 to 5 percent incidence.

Potential persistence of resistance-breaking TSWV: The resistance-breaking strain has been detected in celery, lettuce, peppers and sow thistle, so this strain is capable of causing disease in the absence of SW5. In addition detection in sow thistle and lettuce, as well as increase into



Symptoms of TSWV on lettuce leaf

2017, is documentation of the ability of this strain to survive the winter.

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 OF TSWV WITH SW5-RESISTANCE BREAKING STRAIN Because this is a very new occurrence in this area, many management options are discussed with less than ideal amounts of information. However, we know that both the resistance-breaking and the wild type strains are present. It is reasonable to expect that varieties without resistance will be more severely affected. Plus, the resistance-breaking strain is not reported universally so SW5 varieties should remain component of a management plan.

As suggested above 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 high risk situations.

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