



AGRONOMIC SPOTLIGHT



TOMATO SPOTTED WILT AND TOMATO YELLOW LEAF CURL IN FRESH MARKET TOMATOES

- » Tomato spotted wilt and Tomato yellow leaf curl are viral diseases that can cause devastating yield losses in tomato.
- » These two diseases occur most frequently in Hawaii, California, and the southern tomato growing regions of the U.S.
- » Management of these diseases involves the integrated use of strategies to prevent infection and reduce disease spread.

TOMATO SPOTTED WILT

In the past, Tomato spotted wilt (TSW) has been found mostly in tropical and sub-tropical regions, but recently the disease is occurring in more temperate locations. In the U.S., the disease now occurs in Alabama, Arkansas, California, Florida, Georgia, Hawaii, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee.^{1,2}

Plants infected with TSW show a bronzing of young leaves, and many small, dark to chlorotic spots develop on the leaves (Figure 1a). The spots can coalesce, become necrotic and spread to terminal shoots, resulting in tip dieback and wilting.^{1,2} If infected when young, plants are stunted and may not produce any fruit. Chlorotic to necrotic rings may appear on the fruit (Figure 1b). The pathogen is not seed transmitted, but seed in infected fruit can be discolored.^{2,3} Yield losses of 75 to 100% have been reported in Hawaii.¹

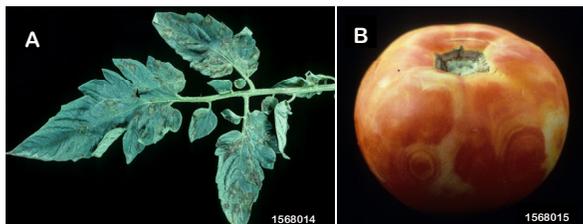


Figure 1. Foliar (a) and fruit (b) symptoms of Tomato Spotted Wilt. Edward Sikora, Auburn University, Bugwood.org.

TSW is caused by the *Tomato spotted wilt virus* (TSWV). This virus has a very wide host range, infecting over 1000 plant species in more than 80 different families, including both monocots and dicots.^{2,3} Many vegetable crops, including potato, eggplant, celery, and lettuce, are hosts of TSWV. Landscape plants and native plant species, including amaranth, burdock, shepherd's purse, jimson weed, blue morning-glory, purslane, chickweed, cocklebur, sowthistle, and nasturtium, are also hosts of TSWV. Some hosts do not show obvious symptoms but can serve as virus reservoirs.

TSWV is transmitted by several species of thrips, with the western flower thrips being the most important vector in

many areas. Thrips acquire the virus when they are in the larval stage, while feeding on infected plants. The larvae take the virus into their bodies, where the virus replicates. After reaching the adult stage, infected thrips can transmit the virus to other plants, and they can do so for life.^{1,2,3}

The disease is dispersed over long distances in windblown thrips and on infected plant material, such as transplants. The virus is not seedborne, and it generally cannot be transmitted mechanically on contaminated tools or clothing. The pathogen overwinters on alternate hosts.

TSW MANAGEMENT

TSW is difficult to manage. Several cultural practices can be used to avoid infection and minimize the spread. Tomato transplants should not be grown in the same greenhouse with ornamental planting stock. Weeds in and around greenhouses and production fields should be managed to eliminate potential reservoirs of the virus. If possible, select planting times that do not coincide with major thrips migration periods. Reflective mulches can also help reduce thrips populations in field plantings early in the season. Rogue-out and destroy symptomatic tomato plants.

TSW resistant tomato varieties are available, with the SW-5 resistance gene used in many commercial cultivars. However, some strains of TSWV can overcome this form of resistance.¹

There have been mixed results for using insecticides to control the thrips vector. The use of contact insecticides alone is usually not effective because they do not reach the areas where thrips are feeding. The addition of a surfactant has been shown to increase the effectiveness and slow the spread of the disease.^{2,3}

TOMATO YELLOW LEAF CURL

Tomato yellow leaf curl (TYLC) is caused by the *Tomato yellow leaf curl virus* (TYLCV). It is one of the most devastating virus diseases of tomato in areas with mild winters and no designated tomato free periods. Yield losses of 100% have

(Continued on page 2)





TOMATO SPOTTED WILT AND TOMATO YELLOW LEAF CURL IN FRESH MARKET TOMATOES

(Continued from page 1)

been reported in some areas.^{2,4} TYLC started to be a significant problem in the southern US in the 1990s, and it was found in California for the first time in 2007. The virus may be spreading around the US on tomato transplants for both the commercial production and retail markets, and on cluster-fruit types of tomatoes.²

Symptoms of TYLC appear 10- to 21-days after infection, depending on the rate of plant growth. Infected plants show severe stunting, and shortened internodes result in a bushy appearance to the plants. New leaves are significantly reduced in size, wrinkled, and develop interveinal chlorosis. Leaves curl upwards at the margins, giving them a cup-like appearance (Figure 3).^{2,4} Flower abscission before fruit set results in a significant reduction in fruit number, but the fruit that do develop can be of normal size. With high inoculum pressure, fruit of resistant varieties may show no symptoms in the mature green stage but then have uneven ripening.



Figure 3. Foliar symptoms of Tomato Yellow Leaf Curl. Florida Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Bugwood.org.

The TYLCV has a fairly wide host range, affecting 30 plant species in 12 different plant families. Most of the important hosts are in the Solanaceae (tomato family). However, common bean and many weed species are also hosts of this virus. Virus reservoir hosts vary from region to region, but established tomato fields are often the most important sources of both TYLCV and the whitefly vector for introducing the disease to new tomato plantings. TYLC resistant varieties of tomato may not show symptoms of the disease, but they can be sources of the virus for nearby susceptible plants.

TYLC is transmitted by adult whiteflies, mostly the sweetpotato whitefly, but not by the greenhouse whitefly. Once they acquire the virus, infested whiteflies can retain and spread the virus for several weeks, but the virus does not replicate in the whitefly. The TYLCV is neither seedborne nor mechanically transmitted (transmitted on tools, etc.) The disease can spread long distances in infected plants and in wind dispersed whiteflies.^{2,4}

TYLC MANAGEMENT

The management of TYLC can require significant changes in production practices and expectations for yields. The

integrated use of several cultural practices will help prevent the introduction and spread of the diseases. Virus and whitefly free transplants should be used, and transplants produced in areas where the virus is known to be present should be avoided.⁴ Manage weeds in and around tomato fields to eliminate virus reservoirs. Avoid planting near older plantings of solanaceous crops or other known hosts (common bean), and monitor fields for whitefly infestations.

Use reflective mulches or floating row covers to protect young plants from whitefly feeding. Rogue-out infected plants to slow the spread within a field. Destroy plant debris shortly after harvest, and eliminate volunteer plants. The establishment and enforcement of region-wide host free periods can help break the cycle in locations that do not have a true winter that eliminates the whitefly vector.^{2,4,5}

The use of whitefly-proof screen material and UV absorbing screens and covers for protected culture production (hoop-houses, high-tunnels, etc.) can reduce or prevent the insect transmission of the virus.² This has been used as a successful management tool in Hawaii and Mexico.

Insecticides can be used to keep whitefly populations low, but the use of neonicotinoid insecticides can significantly lower populations of natural predators and other beneficial insects, resulting in additional problems.

TYLC resistance is available in many commercial tomato cultivars. However, resistance is not available in cultivars for all conditions and market preferences. TYLC resistance can be overcome by high inoculum levels and high whitefly pressure. Resistance should be used in with other management strategies.^{2,5}

Sources:

- ¹ Melzer, M., Tripathi, S., Matumoto, T., Keith, L., Sugano, J., Borth, W., Wieczorek, A., Gonsalves, D., and Hu, J. 2012. Tomato spotted wilt. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. PD-81.
- ² Jones, J., Zitter, T., Momol, T., and Miller, S. 2014. Compendium of tomato diseases and pests: Second edition. American Phytopathological Society, St. Paul, MN.
- ³ Sherwood, J., German, T., Moyer, J., and Ullman, D. 2009. Tomato spotted wilt. The Plant Health Instructor. DOI:10.1094/PHI-I-2003-0613-02.
- ⁴ Gilbertson, R. 2013. Tomato yellow leaf curl. UC IPM, UC Pest Management Guidelines. UC ANR Publication 3470.
- ⁵ Melzer, M., Ogata, D., Fukuda, S., Shimabuku, R., Borth, W., Sether, D. and Hu, J. 2009. Tomato yellow leaf curl. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. PD-70.

For additional agronomic information, please contact your local seed representative. Developed in partnership with Technology, Development & Agronomy by Monsanto.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. The recommendations in this article are based upon information obtained from the cited sources and should be used as a quick reference for information about viral diseases of tomato. The content of this article should not be substituted for the professional opinion of a producer, grower, agronomist, pathologist and similar professional dealing with this specific crop

SEMINIS DOES NOT WARRANT THE ACCURACY OF ANY INFORMATION OR TECHNICAL ADVICE PROVIDED HEREIN AND DISCLAIMS ALL LIABILITY FOR ANY CLAIM INVOLVING SUCH INFORMATION OR ADVICE. 170306082122 032217DMC

