

Diagnosis at a Glance

Caused by

Tospovirus, a single-stranded RNA virus

Common hosts

Tomatoes, peppers, potatoes, celery, eggplant, peanuts, lettuce, pineapple, cucurbits (melons, squash, cucumbers, etc.), many legumes, many ornamentals, and weeds such as field bindweed and curly dock

Symptoms

- Young leaves turn bronze in color
- Leaves develop numerous small, dark spots
- Plants appear wilted
- Tips die back
- Dark streaking of the terminal stems
- Stunting
- Chlorotic ring spots and raised bumps on fruit
- Fruits are deformed and ripen unevenly
- Reduced fruit quality and yield

Transmitted by

Thrips, in a persistent propagative manner

Disease conditions

Warm temperatures and high thrips population

Disease management

Cultural practices:

- Remove all infected plants
- Weed and insect control
- Crop rotation
- Use reflective mulches
- Check seed sources for “new” tolerant cultivars

Introduction

Tomato spotted wilt virus (TSWV) is an important disease of many different crops grown in temperate and subtropical regions of the world. TSWV is a unique virus in a virus class by itself. The host range for TSWV is one of the widest known for plant viruses. It infects over 1,000 species in 85 families, including both monocots and dicots. In New Mexico, the virus has been confirmed in begonia, cowpea, impatiens, peanut, pepper, potato, squash, and tomato. Other common hosts include celery, cucumber, eggplant, lettuce, onion, peppermint, spinach, watermelon, many legumes, many ornamentals, and many weeds such as curly dock, field bindweed, and pigweed (Table 1). This disease is especially damaging in the ornamental and vegetable greenhouse industries.

In New Mexico, TSWV causes only sporadic problems in a small number of agronomic and ornamental plants. In other parts of the U.S., catastrophic losses—nearly 100% of some commercial fields—have been reported. Research on the virus population in New Mexico compared 285 viral isolates from multiple hosts to those from across the U.S. and around the world. Results of this study suggest NM is affected by a unique TSWV population only present in the southwestern U.S. This population likely arose due to geographic isolation and is related to other TSWV populations from the U.S., Spain, and Italy. Although the NM population of TSWV is distinct from other U.S. populations, it is still closely related to those that cause severe disease problems. Further research into vector populations and environmental conditions may provide clues to the factors that limit the disease pressure in NM.

Disease Symptoms

Symptoms of TSWV are numerous and varied. However, there are two fairly common symptoms for which this disease was named. First, the young leaves turn bronze and subsequently develop numerous small, dark spots. Second, the leaves often droop on the plant,

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Table 1. Partial Host Range of Tomato Spotted Wilt Virus¹			
Ornamentals			
African violet	Columbine	Geranium	Poppy
Amaryllis	Cosmos	Gladiolus	Primrose
Anemone	Cyclamen	Gloxinia	Ranunculus
Aster	Dahlia	Impatiens	Salvia
Begonia	Delphinium	Larkspur	Snapdragon
Calendula	Dusty miller	Marigold	Statice
Calla	Exacum	Nasturtium	Stock
Chrysanthemum	Fuchsia	Peony	Verbena
Cineraria	Gaillardia	Petunia	Zinnia
Vegetables			
Bean	Celery	Kale	Pepper
Broccoli	Cowpea	Lettuce	Potato
Cabbage	Cucumber	Pea	Spinach
Cauliflower	Eggplant	Peanut	Tomato
Weeds			
Burdock	Curly dock	Lambsquarter	Pigweed
Buttercup	Field bindweed	Morning glory	Shepherdspurse
Chickweed	Jimsonweed	Nightshade	Wild tobacco
Clover			
Miscellaneous			
Pineapple			
¹ Table modified from Putnam and Dutky, <i>Tomato Spotted Wilt Virus</i> , Maryland Department of Agriculture.			

creating a wilt-like appearance. Other symptoms include dieback of the growing tips, stunting, mottling, and dark streaking of the terminal stems. Affected plants may develop a one-sided growth habit or may be stunted completely. Plants that are affected early in the growing season often do not produce any fruit, while those infected after fruit set produce fruit with striking symptoms, including chlorotic concentric ring spots, raised bumps, uneven ripening, and deformation (Figure 1). Infected plants produce poor-quality fruit and have reduced yield.

Disease Transmission

TSWV is transmitted from infected plants to healthy plants by at least ten species of thrips. Thrips are tiny (approximately 1/16 of an inch) winged insects that feed on plants through sucking mouthparts. Thrips transmit the virus in a persistent propagative manner, which means that once the insect has picked up the virus, the virus replicates within the insect and the insect is able to

transmit the virus for the remainder of its life. The virus is not passed on from adult to egg; however, progeny that develop on infected plants will quickly pick up the virus and be effective spreaders of the disease.

Disease Management

Controlling this disease is difficult. The wide host range, which includes many perennial ornamentals and weeds, enables the virus to successfully overseason from one crop to the next. Additionally, efforts to control the insect vectors in agricultural fields have had little effect on TSWV. This is likely due to the fact that large populations of thrips may fly or be blown into treated fields from non-treated areas nearby.

Controlling thrips is somewhat more effective in greenhouse situations. In greenhouses, however, growers should take care to avoid repeated sprays of similar insecticides because thrips are able to build up resistance to commonly used insecticides in a relatively short time. Rotating the insecticide class is the best approach to insect control. Control of thrips may be obtained with pyrethroids, carba-

mates, chlorinated hydrocarbons, organophosphates, and soaps. Insecticides are most effective when applied in the morning, when the thrips are most active and the chance for plant damage is reduced. Pesticide regulations change frequently, so check with your local county Extension office (<http://aces.nmsu.edu/county/>) for information on available insecticides.

While eliminating this disease may not be possible, the incidence and severity of TSWV may be reduced by using cultural practices such as starting with virus-free plant material, removing all infected plants (since there is no cure once a plant has the disease), controlling weeds, and rotating crops. Some studies have also shown that using reflective mulches under plants may help to reduce infection. In greenhouses, it may be possible to greatly reduce the number of thrips entering the greenhouse by covering doors and air intakes with a fine mesh (400 mesh) cloth. Efforts are underway to breed cultivars with good horticultural characteristics that also exhibit tolerance to the virus.

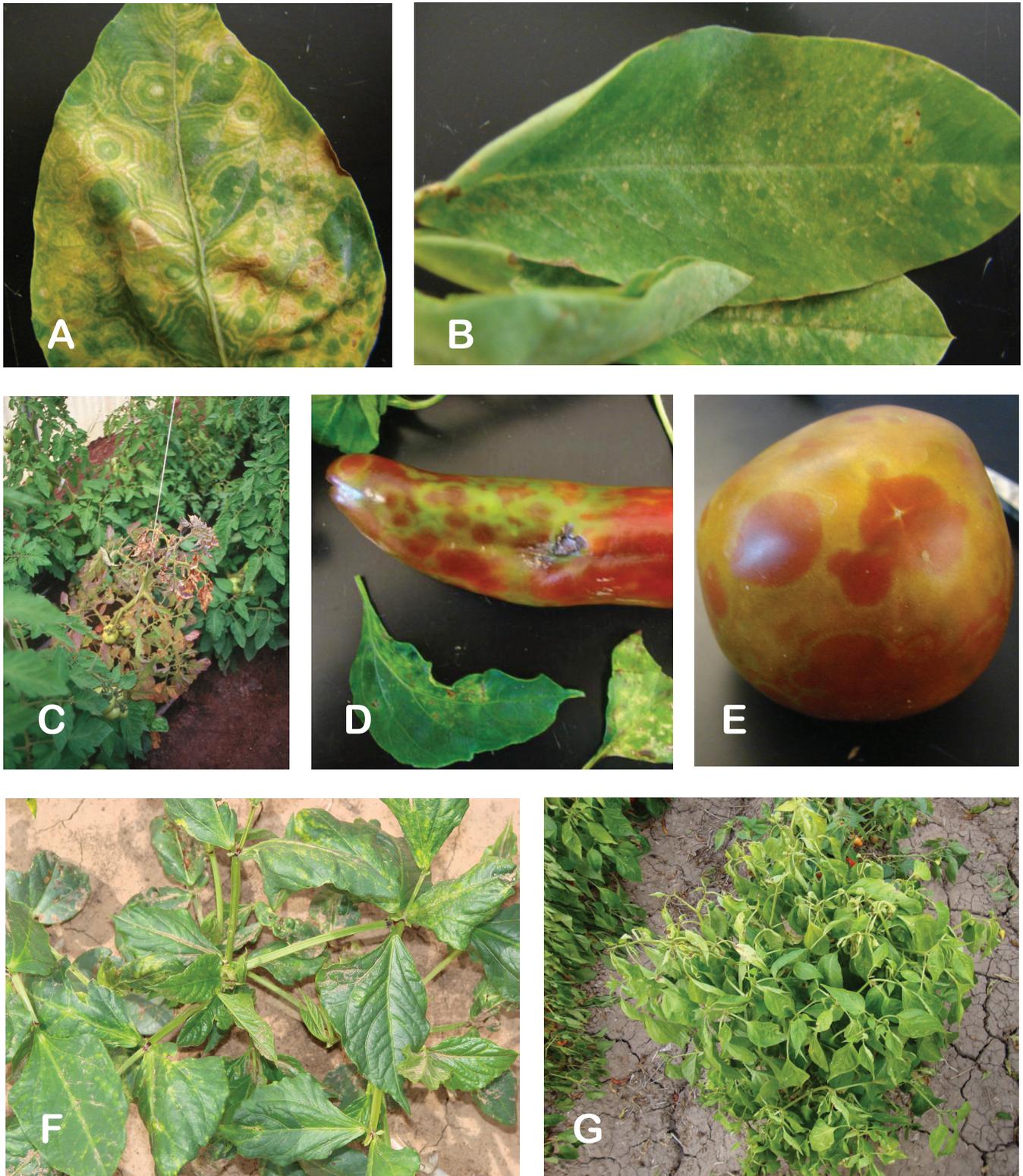


Figure 1. Symptoms of TSWV in New Mexico. (A) Leaf tissue from a pepper plant exhibiting concentric ring spots, necrotic spotting, and leaf deformation. (B) Peanut leaf tissue exhibiting chlorotic flecking and ring spots. (C) Infected tomato plant exhibiting wilting and bronzing. (D and E) Fruit from pepper and tomato exhibiting uneven ripening in a ring spot pattern. (F) Cowpea leaves exhibiting necrotic flecking, veinal chlorosis, and leaf deformation. (G) Mature pepper plant exhibiting terminal necrosis. Photo Credit: New Mexico State University.

Selected References

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