

Tomato Spotted Wilt Virus

Prospects for 1989

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What are the prospects for Tomato Spotted Wilt Virus on floral crops in 1989? It appears things may get worse before they get better and tomato spotted wilt virus will continue to be a problem for greenhouse flower growers. At the Sixth Ornamentals Workshop on Diseases and Insects in Crossnore, NC, October, 1988, tomato spotted wilt virus was reported to have been diagnosed in one or more floral crops from most states in the U.S. and several areas in Canada. In North Carolina we have seen the disease in calceolaria, cyclamen and cineraria during the winter months. We have also seen the disease on New Guinea impatiens stock plants, rooted cuttings and hanging baskets, which is a potential threat to most of the bedding plants which are just being seeded at the time this is being written.

Tomato spotted wilt virus, transmitted primarily by pesticide resistant western flower thrips, has been a severe problem for many greenhouse flower growers across the United States and Canada. This thrips is evidently an efficient vector of tomato spotted wilt virus and transmission occurs at very low numbers of thrips. The western flower thrips is very active and flies readily in the greenhouse on bright, warm days. Many growers have experienced serious losses due to tomato spotted wilt virus disease. The insecticide program to suppress the western flower thrips is expensive in terms of costs of pesticides plus labor and the reduced quality of finished plants due to phytotoxicity.

Carzol SP Received 24 (c) Registration

North Carolina growers received a powerful new weapon for combatting the western flower thrips, when NorAm Chemical labeled Carzol SP for thrips control on ornamental plants in the greenhouse. Carzol SP is a restricted use pesticide because of its extreme oral toxicity to humans. However, if handled with proper precautions and proper protective clothing, the risk of using Carzol SP can be reduced. Considering that Carzol SP is a 76% soluble powder and it is used at 8 ounces per 100 gallons of water, there have been relatively few reports of phytotoxicity associated with Carzol SP. Carzol SP is known to be phytotoxic to certain cultivars of chrysanthemum. "Royal Trophy" first develops a marginal chlorosis and then necrotic spots form on the leaf margins. This variety has purple flowers. Carzol SP does not seem to have much effect on the blossoms. The yellow daisy, "Rejoice", is also reported to be sensitive to Carzol as are the varieties "Champ" and "Golden Champ".

Sticky Traps for Monitoring Western Flower Thrips

A recent experiment at N.C. State University demonstrated that for monitoring the western flower thrips in the greenhouse, light blue sticky traps are more attractive than white or yellow traps. Four colors of sticky traps were compared for attracting western flower thrips in a commercial greenhouse growing African violets. Seabright Enterprises whitefly traps were used as the standard industry yellow trap. Traps of the same size were constructed and painted with Fixall Rust Resistant Spray Enamel - Flat White, Liquitex Acrylic Titanium White, and Fixall Rust Resistant Spray Enamel - Light Blue. Then the traps were coated with a thin

layer of Seabright Limited Stikem polybutene adhesive. All of the traps were stapled to 12 inch stakes and placed in sand filled pots to keep them upright. Five traps of each color were randomly distributed among the African violets growing on benches in a polyethylene covered greenhouse. The traps were distributed on 3 October and collected 18 October. All of the thrips on each color were compared by a one way analysis of variance.

The Efficacy of Different Colors of Sticky Traps for Monitoring Western Flower Thrips on African Violets, North Carolina, 1988.

<i>Sticky Trap Color</i>	<i>Avg Number of Thrips per Trap 18 OCT*</i>
<i>Yellow</i>	<i>8.600c</i>
<i>Rust Resistant Flat White</i>	<i>13.400bc</i>
<i>Titanium Oxide White Acrylic1</i>	<i>8.600b</i>
<i>Rust Resistant Light Blue</i>	<i>28.400a</i>

** Means followed by different letters are significantly different at the 1% level (DMRT, P=0.01)*

Hosts of Tomato Spotted Wilt Virus

The host range for tomato spotted wilt virus is very large, including 40-50 families and 200-300 species. In North Carolina, grower losses have been the worst in gloxinia, New Guinea impatiens, exacum, garden impatiens and Reiger begonia. Cyclamen, cineraria and calceolaria have also been damaged. As the virus is exposed to new host species, the list of susceptible crops will continue to increase. Recently, schefflera and aglaonema have been reported as possible new hosts. Stephanotis was recently reported to be infected in a commercial greenhouse in

Oregon. This is a significant report, since Stephanotis, a woody perennial vine, is found in many greenhouses and can serve as a long term reservoir of the virus. Symptoms similar to those reported in Oregon have been observed on Stephanotis in North Carolina.

In some susceptible crops, such as chrysanthemum, North Carolina growers are experiencing little or no losses due to tomato spotted wilt virus because, with the exception of "Polaris" and a few others, most pot mum cultivars appear to be resistant to the virus. Tomato spotted wilt virus is an extremely variable virus, however, and a new strain of the virus could appear at any time to infect cultivars which now appear to be resistant.

Symptoms of Tomato Spotted Wilt Virus

The symptoms of tomato spotted wilt virus on gloxinia include chlorotic to necrotic line patterns and rings spots on leaves, terminal bud necrosis, stunted plants, malformed leaves, white ring or line patterns on red or blue flowers (color breaking), flower distortion, and delayed flowering. Symptom expression is most severe within 5-10 days after infection and particularly on young plants. If the plants survive this severe shock phase of the disease, new growth can emerge symptomless but stunted and still carry the virus. Symptoms vary widely from plant to plant.

Symptoms on Reiger begonias include necrotic areas on leaves, finely etched chlorotic mottling and blotching on leaves. White to brown rings (color break) may show up on petals of red cultivars. Frequently, only 1 or 2 leaves show these symptoms on individual plants. Plants may not be severely damaged. In North Carolina tomato spotted wilt virus has been occasionally found in Non-

Stop begonias but not in fibrous rooted begonias.

On cyclamen, finely chlorotic and necrotic ring spots have been observed on leaves. These ring spots rapidly become brown necrotic spots that could be confused with a fungal leaf spot. Damage to cyclamen is often minimal. Tomato spotted-wilt virus is very difficult to confirm by laboratory assay in cyclamen.

On New Guinea impatiens symptoms include black ring spots and line patterns in leaves, black lesions on stems, slightly to extremely stunted plants, twisted and malformed leaves and terminal dieback. Symptoms vary widely from plant to plant and between cultivars. Cuttings from infected plants may fail to root or root and grow very slowly. Symptoms can be mild to severe. New Guinea impatiens in baskets hanging high in the greenhouse are very difficult to survey for symptoms.

On garden impatiens symptoms include black ring spots and line patterns on leaves, black lesions on stems, leaf drop and stunted plants.

On exacum symptoms include tan leaf spots, tan necrotic terminals, wilted branches or sections of plants and brown cankers on the stems. The disease is more common in flowering size plants than young plants. Infected plants are usually unsalable.

On cineraria symptoms include chlorotic spots on leaves, stunted plants and delayed flowering. Dark brown to black lesions develop on the petioles and leaf veins. Plants usually do not die but their quality is greatly reduced.

On calceolaria symptoms appear as water soaked, blighted, wedge-shaped parts of leaves.

On chrysanthemum symptoms include chlorotic to necrotic leaves, dark brown to black stem lesions and stunted plants. Symptoms can vary from very mild to severe depending on the cultivar reaction. Tomato spotted wilt virus has been a serious problem in chrysanthemum in Hawaii and California. We have not confirmed tomato spotted wilt virus on chrysanthemum in North Carolina, probably because we do not grow the most susceptible cultivar Polaris. Research workers in Canada have reported tomato spotted wilt virus losses in chrysanthemum that vary by both the susceptibility of the cultivar to the virus and cultivar attractiveness to the thrips.

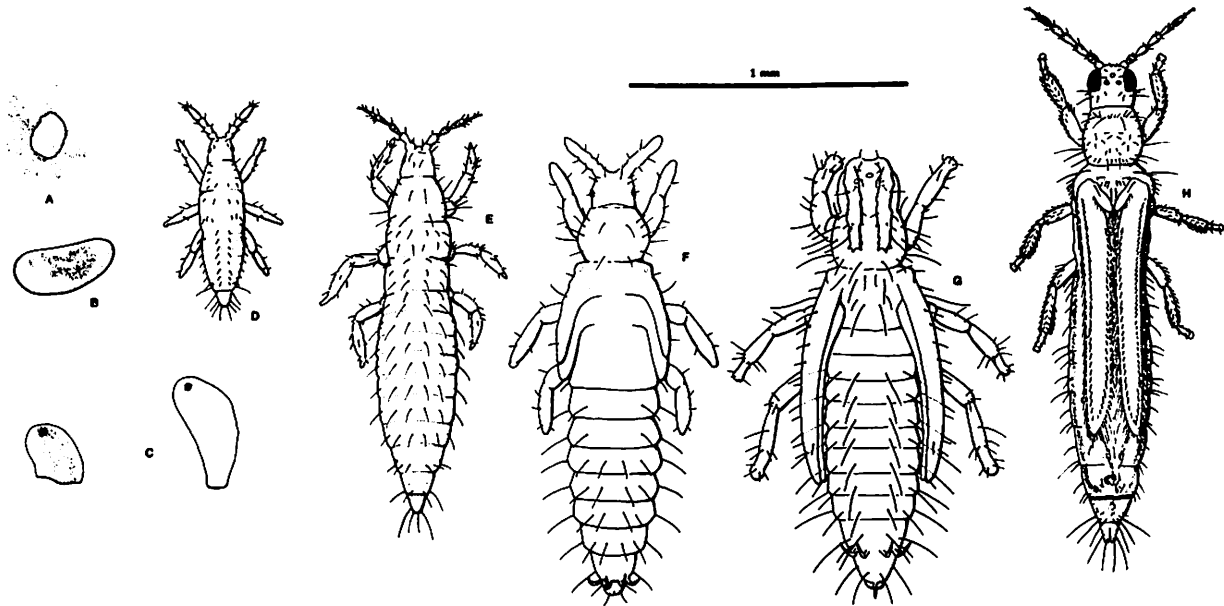
Symptoms on Stephanotis include chlorotic ring spots in leaves and terminal dieback.

Diagnosis of Tomato Spotted Wilt Virus

Because symptoms of tomato spotted wilt vary with host plant species and even cultivar and because the distribution of the virus particles in an infected plant is not necessarily uniform diagnosis of tomato spotted wild virus is not easy. Some parts of the plant may have many particles and other parts may have few virus particles. Choosing the best tissue for assaying stock plants is a problem which is now being researched by Dr. Jim Moyer, research plant pathologist at N.C. State University. Drs. Moyer, Jones and Creswell continue to refine the detection techniques and indicator plants.

Prospects for the next few years

During the past six months, there have



Western Flower Thrips: A, Top view of egg in plant tissue. B, Egg. C, Larvae oozing out of plant tissue just as they hatch. D, First larva. E, Second larva. F, Prepupa. G, Pupa. H, Adult female.

been some encouraging and some discouraging developments. Several major propagators have become aware of tomato spotted wilt virus and are attempting to have their stock assayed for tomato spotted wilt virus in order to avoid shipping infected plants. Based on industry comments, other growers continue to ship tomato spotted wilt virus infected plants. Some growers who have had problems with tomato spotted wilt virus appear to have eliminated the problem or greatly suppressed the disease through a combination of careful and heavy roguing of infected plants, concentrated western flower thrips control program and avoiding highly susceptible plants. In other greenhouses, a low percentage of infected plants just seems to continue in one crop or another.

The potential exists for a grower to successfully struggle to eliminate tomato spotted wilt virus by discarding infected plants and spraying for thrips management, only to have all that work, time and money spent and

plant losses wasted by one shipment of infected plants from a propagator.

In 1988, at least three states (including North Carolina) have reported field infections of tomato spotted wilt virus in tomatoes and peppers which originated from infected greenhouses. This was the first time field infections of tomato spotted wilt virus had been reported from any of the three. The tomato spotted wilt virus represents a real threat to field grown vegetables, tobacco, peanuts, and outdoor ornamentals in addition to the greenhouse floral industry.

International Conference

Tomato spotted wilt virus and its thrips vectors are becoming an increasingly important international problem in floral crops, vegetable crops, peanuts, tobacco, etc. There will be an international conference on the tomato spotted wilt virus in Honolulu from March 27 to 29, 1989 plus a one or two day field production tour.