

USING INDICATOR PLANTS TO DETECT TOSPOVIRUSES

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Tospoviruses including Impatiens necrotic spot virus (INSV) and tomato spotted virus (TSWV) are transmitted by the western flower thrips (WFT), (*Frankliniella occidentalis*), INSV and TSWV have an extremely wide host range that overlaps with the host range of its primary and most efficient vector, WFT. INSV is more common among greenhouse ornamentals, whereas TSWV is more common among field and vegetable crops including tomatoes, peppers, peanuts and tobacco.

Significant losses have occurred among many greenhouse crops including Impatiens, New Guinea Impatiens, cyclamen, begonia, primula, and gloxinia. Many herbaceous perennials are also susceptible to INSV including penstemon, campanula, phlox, aster and lupine, to name a few. Roses and poinsettias are the only major greenhouse crops not susceptible to INSV. Weeds found in and around greenhouses such as galinsoga and chickweed support thrips egg-laying and are common reservoirs of INSV.

How did INSV enter my greenhouse?

Impatiens necrotic spot virus may have been introduced on incoming cuttings or vegetatively propagated stock plants. (INSV is not seed-borne). INSV may also have been spread as virus-infected thrips hidden in otherwise healthy plants that came into your greenhouse. Virus-infected thrips may already be present in your greenhouse. Common reservoir plants for INSV include Stephanotis, Swedish ivy, cyclamen and especially weeds in and around the greenhouse.

How do thrips acquire and transmit the virus?

Thrips cannot transmit the virus unless they acquire INSV as first instar larvae. First-instar larvae must feed upon virus-infected plants. Infected thrips are produced in a greenhouse only if infected plants (including weeds) that can support thrips development are present. Winged adult thrips are primarily responsible for INSV spread. An infected thrip is able to transmit tospoviruses to at least one plant per day until its death.

What are the symptoms of INSV?

Symptoms are very diverse and vary depending upon the cultivar, crop, time of year and temperature. Generic symptoms of INSV include brown or black spots on the leaves and yellow, black or necrotic ringspots. Stunting, wilting, stem cankers and tip dieback can also occur. Sometimes, a mosaic, line or oak leaf pattern can occur on leaves, stems of flowers.

After an infected thrip feeds on a plant, symptoms may appear in as little as two days up to several months. For example, cyclamen does not show any symptoms until two months after an infected thrip feeds on it. Many weeds are reservoirs of INSV and do not show any symptoms at all. Color photographs of tospovirus symptoms can be seen at the University of Maryland tospovirus web site at: <http://www.agnr.umd.edu/tospo/>

Fungal and bacterial diseases or spray injury are often confused with INSV. For example, spotting on Impatiens can be due to a fungal leaf spot (*Myrothecium*) or a bacterial leaf spot (*Pseudomonas*). Further testing at a diagnostic laboratory is often needed. Some growers are using the Q-Tospo kits that are available from AgDia (800) 62-AGDIA or <http://agdia.com> When using the test kits, be sure to sample from tissue showing symptoms. Samples can also be sent to Agdia for virus screening, especially if a virus other than INSV is suspected. INSV Test Kits are also available from Hydros ((508) 540-2229 or <http://www.hydros.cc/>).

How do I monitor for thrips?

If INSV is detected, the threshold for thrips is extremely low. Just one infected thrip can transmit INSV. Place cards at bench level and check weekly. Many growers find it helpful to place cards at floor level, especially early in the season, to see if any thrips are overwintering in the dirt and debris at floor level. When tracking population trends, you may notice that the adult population peaks every two to three weeks. Supplement card counts with plant inspections. Tap foliage over a sheet of white paper to look for the reddish-brown adult thrips. Thrips move on air currents, so populations tend to be higher at the front and rear of the greenhouse. On ivy geraniums, the small, yellow larvae tend to be on the lower leaf surface, whereas on super petunias, the larvae tend to be on the upper leaf surface.

What plants can be used as Indicator Plants?

Dr. Wayne Allen from Ontario, Canada, evaluated petunia, gloxinia, globe amaranth, tomato, pepper and tobacco for use as indicator plants. He found that certain cultivars of petunia were both highly attractive to the thrips and also developed distinctive viral lesions in as little as two to three days. The petunia cultivars "Red Cloud", "Summer Madness" and "Super Magic Coral" were especially effective. Dwarf cultivars of fava beans may also be used. Use indicator plants before the bedding plant season begins, especially in sensitive propagation areas, or after virus-infected plants have been detected and rogued to determine if infected thrips are still present.

Suggestions on Using Petunia Indicator Plants

- Place petunia indicator plants in areas with higher thrip populations (based upon sticky card counts).
- To enhance feeding by thrips, place a blue non-sticky card, (a blue plastic plate works well) over the plants.
- Remove flowers so the thrips feed on the foliage where you will see symptoms.
- Check petunias every three days. If the thrips is infected with INSV, a brown rim develops around the feeding damage. Small tan or brown spots from 1/8 to 1/4 of an inch across may be seen.

■ Petunias will not be a source of new infections within the greenhouse. The viral lesion remains localized, so leaves can be picked off.

■ Place indicator plants among crops at bench or floor level. For petunias, one plant every twenty to thirty feet seemed to work well.

Suggestions on Using Fava Beans as Indicator Plants

Growers may find fava beans easier to use as indicator plants. Their large seeds are easy to plant and they germinate in a matter of days. Place one seed per pot. (A four-inch pot works well in propagation areas where space is limited.) Any dwarf cultivar works well. Fava beans tend to have less foliage than petunias so more fava beans may need to be used. Suggestions vary from 3 to 12 plants per 1000 square feet.

- To enhance feeding by thrips, place a non-sticky blue card or picnic plate in the pot to attract thrips to the plants.

- Check beans daily for symptoms of thrips feeding and virus infection. Look for dark brown to black spots on the leaves near the white scarring from the thrips. Yellow to light green ringspots may be seen on the leaves or stems.

- Do not confuse viral symptoms with black spots on the stipules that normally occur. Fava beans may also occasionally develop fungal leaf spots with concentric rings.

- If you see infection, remove plants from the greenhouse. (INSV is systemic in fava beans). Any thrips larvae feeding upon an infected fava bean plant can acquire the virus.

References:

Allen, W.R. and J.A. Matteoni. 1991. Petunia as an Indicator Plant for Use by Growers to Monitor for Thrips Carrying the Tomato Spotted Wilt Virus in Greenhouses. *Plant Disease*. 75: 78-82.

Casey, C. (Ed) 2000. Integrated Pest Management for Bedding Plants, New York State IPM Program, Cornell Cooperative Extension Pub. No. 407.

Daughtrey, M.L., R.K. Jones, J.W. Moyer, M.E. Daub, and J. Baker. 1997. Tospoviruses Strike the Greenhouse Industry. *Plant Disease*. 81(11): 1220-1230. (Note: This is an excellent overview of tospoviruses with many color photographs. If you would like a copy, please contact me at (860) 345-4511.)

Pundt, L.J. Sanderson and M. Daughtrey. 1992. Petunias are your tip-off for TSWV. *GrowerTalks*. November 1992. 69-72



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