TOMATO SPOTTED WILT VIRUS

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Tomato Spotted Wilt Virus will again be found this coming summer but no one is able to forecast the level of infection. It is not unusual for a new disease moving into an area to be erratic and unpredictable until it becomes well established. We are at the early stages of this development.

What did we learn from last year's situation? What can we learn from others having had to deal with this disease? Can we develop a strategy - can we protect our industry?

Northern/Southern 1989 Situation

Growers in Georgia first noted problems in their peppers and onions during the last week of March 1989. Thrips populations combined with further field symptoms and the verification of the disease triggered a massive insecticide spray program in Georgia. Monitor was first used in early May followed by combinations of Orthene, Cygon and Thiodan. Most fields had less than 1% infection prompting a premature sigh of relief. Fields with higher incidences were rogued while some disced completely.

In Ontario the early plantings went into cool wet soils, providing an initial excuse for poor initial growth. Some plants never recovered even after the soils warmed. On June 15 Tomato Spotted Wilt Virus was confirmed for the first time in Ontario in outbreak proportions in field tomatoes sourced from Georgia. On June 22 a meeting at Ridgetown was held to alert all processors and grower groups of the problem, subsequently a single spray application of Thiodan plus Cymbush was recommended. Over 70% of the processing tomato acreage grown from southern transplants were infected. In most cases the extent of the disease was <5%, however, some fields contained over 50% virus infection. Later it was observed that the virus had spread into adjacent tomato fields, local virus-free plants, and even into potatoes to a limited extent. In most cases the secondary spread was minimal. Yield losses in most fields with low incidence of the disease were negligible due in part to the tomato's natural ability to compensate. However, there were separate incidences where losses were substantial.

A "Super Virus" some call it. A virus that can infect the widest host range of any known virus. TSWV can infect over 200 broadleaf and 8 grass species with new host plants found each year. Major crops such as tomatoes, peanuts, tobacco, pineapples, lettuce, peppers and ornamentals are on its "hit" list. The disease is spread by tiny insects known as thrips. Of the many known thrips species 6 are known as carriers of the virus - Ontario has at least 2 and possibly 3 of the 6 already resident throughout the tomato growing areas. The virus has been present to a limited extent in perennial weed hosts in Ontario since 1935. SO WHY SUCH A BIG PROBLEM NOW? There are no clear cut answers but consider the following.

1. the establishment of a more efficient insect vector east of the Rockies - the Western Flower Thrips
2. a possible change in the virus itself allowing the existing Thrips such as the Tobacco Thrips to become more efficient carriers of the virus
3. establishment of the virus in greater numbers of hosts - weeds, ornamentals, etc.
4. build up of thrips populations due to insecticide resistance
5. greater movement of infected plant material both throughout urban and rural locations

Can we learn from others - No other area in the world has had to deal with this insect-virus complex to the extent than Hawaii. Hawaii has had to develop control strategies to maintain their tomato and lettuce industries. They have found the following ways to manage this disease which we will consider as it relates to both the Ontario and southern situation.

1. Protect Seedlings

Hawaii growers start their tomatoes in white seedling plug trays next to their production fields. Thrips emerge from the soil within the production fields and since they are attracted to the colour white, fly directly into the seedling bed area infecting the early tomato transplants. Early infection causes the greatest level of damage. Growers are now advised to grow their seedlings away from the production sites or cover the seedling trays with a fine mesh netting which thrips cannot penetrate. In Georgia, however, protecting vegetable seedlings from thrips invasions appears to be impossible. There are no immediate cultural practices being considered nor have insecticides been shown to effectively reduce TSWV infections in Georgia. In Ontario, it seems possible that locally grown transplants can be grown virus free with the appropriate control measures.

2. Avoid Sequential Planting

In Hawaii the climate is such that continuous year round tomato production is feasible. Virus carrying thrips move from older harvested fields to new plantings continuously perpetuating the disease cycle. The cold winters of Ontario help break this cycle and is considered a significant factor in Tomato Spotted Wilt control. A similar comment can be made for Georgia but to a lesser extent.

3. Crop Placement

In Hawaii, if at harvest, a crop has a high incidence of disease, growers are advised to plant a non-susceptible crop such as cabbage or cucumbers or let the field lay fallow for 3 weeks, which will cause the thrips to leave the area. It is interesting to note that a barrier crop such as cabbage has reduced the incidence of TSWV in Hawaii. The strategy of crop placement is not as significant in either Georgia nor Ontario as, once the crop is harvested, fields are left fallow, in a sense, during the summer in Georgia and over the winter in Ontario.

4. Plow Harvested or Abandoned Crops Immediately

Leaving abandoned susceptible crops, a common practice in Hawaii, acts as a continuous virus reserve for thrips. Thrips can be killed through burial. Ploughing lessens the amount of disease tissue exposed to Thrips feeding. In Georgia growers may want to consider this recommendation by discing their transplant beds soon after being "pulled." It is not applicable in Ontario.

5. Weed Management

There are many weeds in Hawaii which are hosts to TSWV acting as virus reservoirs. This is probably also true in Ontario and Georgia, however, at least many of the annual weeds are eliminated as host plants during the winter.

6. Minimize Cultivation

After planting a crop, try to minimize cultivation since this will aggravate thrips causing them to move around and infect more plants. The clipping program in Georgia has the potential of spreading virus diseases directly by mechanical means or by the movement of infected thrips. Delaying early season cultivation in Ontario if thrips are present may reduce secondary disease spread.

There are a number of control methods being developed and considered in the management of Tomato Spotted Wilt Virus with some aspects more pertinent in one geographical region than another. It appears that disease control may be easier with less industry wide losses in Ontario than in Georgia or Hawaii.

Strategies of Control in Ontario

1. Assess insect-disease complex in Ontario

    - determine thrips biotypes and population dynamics
        relative importance of WFT, Tobacco and Onion Thrips
        overwintering capacity and stage - larvae, pupae or adults
        peaks and sources of native thrips populations
        compare Georgian vs Ontario thrips
        follow Georgian thrips - determine their significance in Ontario
    - determine the significance of weeds as virus hosts
        whether thrips can complete their life cycle or casual feeders
    - assess the relationship between the ornamental greenhouse industry and incidence of the disease in the field
    - assess the relationship of flower beds in urban and rural areas to incidence of the disease in the field

2. Use virus free transplants

- local Ontario plug plants may be the saving grace for managing this disease
- encourage control practices in Georgia
    - identify which thrips are the major insect vectors
    - weed control; identify major weed hosts of TSWV
    - reduce clipping; may cause spread of insects and virus
    - use foliar insecticides; Lannate/Nudrin, Cymbush/Ammo, Vydate L, Carzol, Monitor, Orthene, combinations of Malathion, Guthion, Thiodan with Cymbush or Ambush
    - consider using granular insecticides; Di-Syston, Nemacur, with Temik used on border rows
    - spray an insecticide just prior to shipping north
    - soil fumigation

3. Determine the extent of TSWV in Georgia transplants

- encourage communication between southern inspectors and the north
- if TSWV is found in Georgia at a 1-2% level, Ontario growers should spray southern transplants as soon after transplanting as possible with 1 or 2 applications of either Lannate or the combination Thiodan plus Cymbush. Do not continue to use a preventative spray program to control thrips throughout the year.

4. Determine if transplant water treatments of Orthene or Vydate will reduce early season thrips brought in with southern transplants.

5. Monitor thrips populations with indicator plants such as petunias and/or white sticky traps.

6. Control weeds within fields.

7. Control specific weeds bordering fields that have been identified as excellent virus reservoir hosts.

8. Reduce cultivation, lessening disturbance and insect movement within a field.

9. Roguing plants in large infected fields has not been shown to be effective. If, however, roguing is practised remove plant material from field.

10. Rotate crops with non-susceptible hosts, eg., corn, wheat, cabbage, cucumbers.

11. Bury thrips pupae after harvest through cultivation.

12. Develop resistant cultivars.

13. Pray for rain.