

Special Research Report # 130: Disease Management

Improved Tospovirus Management Systems for Greenhouse Production

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BACKGROUND

The tospoviruses are a group of plant-infecting viruses that are transmitted by several species of thrips. However, the western flower thrips, *Frankliniella occidentalis*, is considered to be the most important vector in greenhouse crops.

Tospovirus management in flower crops is complicated by several factors. For example, disease incidence does not correspond to thrips density. Thus, merely monitoring insect populations is not sufficient to predict epidemics. Also, virus symptoms vary between plant species, mimic other diseases or nutritional disorders, and symptoms may not appear on infected plants for 10 to 14 days after thrips feeding. Finally, weeds in and around the production area can be asymptomatic virus sources.

A priority for improved tospovirus management is an early warning system that would alert growers to the presence of viruliferous (virus-carrying) thrips before crop symptoms are seen.

Indicator plants, which develop characteristic symptoms within a few days after feeding by viruliferous thrips and serve as an alert to their presence, have been used for this purpose.

However, this system will only be effective if the indicator plants are more attractive to viruliferous thrips than the crops they are intended to protect. This is an important question that has not been investigated.

It is also important to consider the role of the crop plants in virus epidemics. Certain infected crops serve may serve as better sources for the spread of tospovirus epidemics, if they are more attractive to thrips relative to other infected crops. We know that some vegetable crops can be more attractive to thrips when infected. For example, in 2004 Maris and his colleagues determined that pepper plants infected with TSWV were more attractive to western flower thrips than were noninfected

pepper plants. There have been no studies of crop attractiveness and INSV infection. If this information were available for key greenhouse flower crops, these plants could be a priority for culling.

Common greenhouse production practices might affect virus epidemics. It is possible that pesticides stimulate thrips movement, which could enhance virus spread. We know that thrips feed in two ways: (1) short tasting probes to gauge host suitability and (2) longer feeding probes. Since the latter may disrupt plant cells, virus transmission is more likely via the former. If a pesticide is distasteful, i.e., repellent, a short tasting probe may stimulate vector movement without providing a lethal dose. Thus, a pesticide that effectively kills thrips might still contribute to virus spread if it is repellent to thrips.

MATERIALS AND METHODS

Supplies for raising thrips colonies, ELISA testing, and pesticides.

RESULTS

Objective 1: Attractiveness of key crops and indicator plants to viruliferous thrips. Begonia and petunia were found to be significantly more attractive to thrips (as measured by feeding scars per square cm of leaf area) than the other plants tested (Fig. 1). This suggests that petunia will be a useful indicator plant in crops of impatiens, tomatoes, or chrysanthemums. Fava bean does not seem to be a useful indicator plant.

Mean no. Thrips Feeding scars per cm² leaf area \pm 1SE

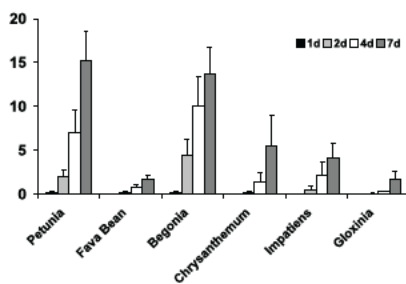


Figure 1. Relative attractiveness of western flower thrips for crop and indicator plants.

Julie: Is it possible to expand this figure across 2 or 3 columns? We have space and it would read better.

Objective 2. Attractiveness of key crops infected with tospovirus to healthy thrips. This objective could not be completed due to difficulties establishing INSV-infected plants.

Objective 3. Pesticides and repellency of viruliferous

pesticides exhibited repellency that was significantly different from water when tested using impatiens leaf tissue.

CONCLUSIONS

It was determined that petunia can effectively serve as an indicator plant for the presence of viruliferous thrips in several key flower crops. Fava bean did not work effectively as an indicator plant. Pesticides commonly used in floriculture production that showed repellent effects on thrips in the laboratory did not show those same effects when tested on plant material in the greenhouse.

IMPACT TO THE INDUSTRY

Growers can confidently use indicator plants to detect viruliferous thrips in begonia, chrysanthemum, impatiens, and gloxinia crops. This early detection tool can alert growers to the presence of viruliferous thrips before crop symptoms are seen. It can alert growers of the need for management of the thrips vector and virus sources.

Pesticides that showed thrips repellency in the laboratory did not under field conditions, removing concerns that thrips control could spread disease. Repellent pesticides can stimulate thrips movement

and potentially enhance virus spread.

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