Special Research Report #205: Insect Management

Thrips/Tospovirus Management Systems

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BACKGROUND

Thrips and the viruses they may transmit have become a major pest control problem for many floricultural producers. The small size of thrips and their cryptic habit combined with the broad array of virus symptoms in affected plants have made diagnosis difficult. The development of a comprehensive integrated pest management (IPM) program for thrips and their associated viruses requires the combined talents of many individuals and each must address an aspect of thrips/virus management in their area of expertise. We assembled the following team of researchers: Michael Parrella (team leader, identification, sampling, chemical/biological control), Diane Ullman and Karen Robb (tospoviruses/induced resistance), Kevin Heinz (biological control), Michael Brownbridge (chemical control/biopesticides/application technology), and Elizabeth Mitcham and Arnold Hara (postharvest control strategies).

MATERIALS NEEDED

Each of the researchers has developed the materials and methods for their respective part of the project. Each can be contacted separately for more information on their part of this project. This report is a brief summary of the accomplishments. It focuses on thrips identification; biology; tospovirus monitoring; and control; biological control; chemical control; pesticide application technology; and post-harvest control techniques.

RESULTS

Thrips Identification. There are 21 species of thrips that are potential pests of floricultural crops. Differentiating these species from other non-pests thrips is important. Many non-pest thrips may inadvertently fly/drift into greenhouses and these are not vectors of tospoviruses and will not injure the crop. The most troublesome species are in the genus *Frankliniella*, which is illustrated in Figure 1.

Figure 1

A user-friendly key has been developed to assist growers in making identifications. Portions of this key can be found at the Department of Entomology web site for Dr. Parrella at http://entomology.ucdavis.edu/faculty/parrella/index.cfm.

Sampling for Thrips/ Tospovirus. Sampling plans have been formulated for thrips attacking cut flower crops, e.g. roses and chrysanthemums. Although developed in California, these sampling plans have been successfully evaluated on New Guinea Impatiens in Vermont. Either blue or yellow sticky cards can be used. They these need to be hung just above the crop at a density of approximately 5-10 per pest management unit (usually 5000 – 10,000 ft^2). In addition, our studies have shown that a density of 25 thrips per card per week translates into 1-2 thrips per flower in a rose crop (Figure 2).

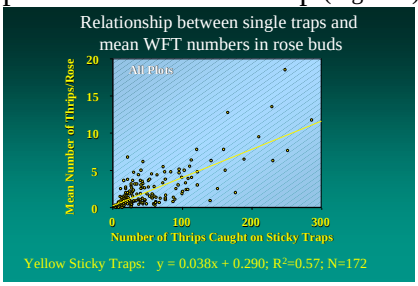

Figure 2

Depending on the cultivar and color, this low number of thrips can be tolerated with little or no damage.

It has been demonstrated that petunia indicator plants can be used with directional traps to locate sources of infective thrips. Also that removal of these sources could dramatically reduce virus incidence in field cut flower and bulb crops (to less than 1%). Thus, by using information obtained from directional sticky cards and petunia indicator plants, applications of highly effective pesticides, e.g. Conserve, were minimized and tospovirus incidence was maintained at very low levels.

Chemical Control/ Application Methodology. A wide range of new reduced risk materials has been evaluated while conducting this research. The inconsistent results obtained with the fungus *Beauveria bassiana* across the country could be a function of differences in application methodology. Flat fan nozzles and solid full cone nozzles (FF 8004, SFC-1 @ 40 psi) consistently provided excellent canopy penetration and coverage on the undersides of leaves. Overall, the flat fan nozzle appeared to be the most effective in delivering spores into the interior section plants. Laboratory and field trials of traditional pesticides suggest that Conserve, Marathon II, and Avid were among the most effective insecticides evaluated for thrips control.

Initial research with products that "induce" a plant's natural defensive system, e.g. Jasmonic Acid, polyphenol oxidase, and Coronalan has demonstrated that these materials effectively reduce feeding by western flower thrips on crops such as *Lisianthus.*

Biological Control. Research was initiated on two natural enemies of thrips, the nematode *Thripinema nicklewoodi*, and the commercially available predatory mite, *Amblysieus cucumeris*. The nematode is a "new" natural enemy of thrips. Efforts have concentrated on understanding its biology, potential for thrips suppression, and mass-rearing possibilities. Studies with the predatory mite have revealed that the use of cherry pollen to supplement releases of *N. cucumeris* (instead of the commonly used apple pollen) may increase the effectiveness of this natural enemy.

Post Harvest Control Technology. Various treatments were evaluated for the control of western flower thrips on *Dendrobium* orchids. Exposure to 1.5% O_2 at 35°C for 36 h resulted in 99.8 % mortality for western flower thrips and exposure to 1.5% acetaldehyde (1 h exposure at 24°C) resulted in 94.2 % mortality for western flower thrips. Complete control of western flower thrips required a combined treatment of 1.0% or 1.5% Aa followed by exposure to 1.5% O_2 at 35°C for between 18 and 36 h.

CONCLUSIONS

Progress has been made in each area that is critical to developing an effective IPM program for thrips and tospovirus. One or more of the areas addressed by this research should have applicability regardless of what crop is grown or where it is produced.

IMPACT TO THE INDUSTRY

1. Simple user-friendly keys are available to separate the different thrips species.
2. Utilize 5-10 sticky traps per pest management unit (5,000-10,000 ft^2).
3. 25 thrips/card translates into 1-2 thrips/flower, which can be tolerated with little or no injury.
4. The biopesticide, *Beauveria bassiana*, is more effective when applied through solid full cone or flat fan nozzles.
5. Conserve, Marathon II, and Avid were among the most effective insecticides evaluated. New products, which "induce" a plants natural defense, have potential to reduce thrips feeding.
6. Thrips control achieved using the predatory mite, *Amblysieus cucumeris*, can be enhanced through the addition of cherry pollen.
7. Exposure to 1.5% O_2 at 35°C for 36 h resulted in almost 100% control of thrips on *Dendrobium* orchids.
8. As the public continues to demand less pesticides in agriculture, retailers and wholesalers can assure them that IPM programs are being developed and implemented for control of one of the major pests of floricultural crops – thrips.