

WESTERN FLOWER THRIPS MANAGEMENT

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INTRODUCTION

Western flower thrips, *Frankliniella occidentalis* (Pergande) is one of the most destructive insect pests in greenhouses throughout the United States. It has a broad host range which includes many vegetables, fruits, and floricultural crops grown in greenhouses. Western flower thrips feed on both foliage and flowers, which can reduce crop marketability. It also transmits two deadly viruses: tomato spotted wilt virus (TSWV) and impatiens necrotic spot virus (INSV).

BIOLOGY

Western flower thrips (WFT) are small (less than 2 mm) insects that possess rasping-piercing-sucking mouthparts. The lifecycle consists of an egg stage, 2 immature (young) stages, 2 pupal stages, and an adult. Development from egg to adult is temperature dependent with optimum temperatures between 80 and 85°F. Females can live from 27 to 45 days and lay 150 to 300 eggs during their lifetime. Eggs are laid in leaves which hatch in 2 to 4 days. The young feed for 1 to 2 days before molting. The young feed on leaves and flowers. Western flower thrips pupate in the soil, leaf litter, or other protected place. The pupal stages last approximately 6 days before adults emerge.

SCOUTING/MONITORING

Recommendations for scouting/monitoring for WFT include:

- Map your greenhouses to help you record when and where WFT populations are changing. Divide the greenhouse into sections indicating the location of sticky cards and crop type.

- Be sure to scout/monitor using both sticky cards and visual inspections because in some cases there may be low numbers on the sticky traps, but the flowers may have a high number of young WFT.

- Use yellow or blue sticky cards. Blue sticky cards detect populations at lower levels than yellow sticky cards, but yellow sticky cards detect other greenhouse pests (eg. fungus gnats, whiteflies, and winged aphids) in addition to WFT.

- Place sticky traps 1 to 2 inches above the crop canopy. Use sticky traps at the rate of 1 or 2 per 1000 ft². Use more sticky traps when growing crops (eg. impatiens) highly susceptible to TSWV and INSV.

- Visually inspect the crop by blowing into flowers or tapping flowers over a white sheet of paper and counting the number of WFT present.

CULTURAL MANAGEMENT

1. Sanitation

Plant residues and soil debris must be removed from the greenhouse. After a crop has been harvested, all plant material must be disposed of far away from the greenhouse. This prevents WFT from migrating back into the greenhouse. Plant and soil debris should be placed into plastic bags. Plant debris should not be placed in containers located in the greenhouse or left on the floor. As the plant material dries, WFT will migrate from the drying plant material onto the main crop. In addition, soil debris can potentially harbor WFT pupae.

2. Weed Management

Weeds must be eliminated from outside and inside the greenhouse. Weeds are reservoirs for TSWV and INSV, and provide hiding places for WFT. A weed-free area should be maintained at least 30 feet around the perimeter of the greenhouse. If weeds or lawn are near the greenhouse, keep the weeds and lawn from flowering by mowing or weed-eating. Weeds inside the greenhouse can be managed by physical methods or using herbicides. Physical methods include concrete, geotextile fabrics, or black plastic. Herbicides currently registered for use in greenhouses include: Roundup[®], Scythe[®], Finale[®], and Reward[®]. Roundup[®], is a non-selective, systemic, post-emergent herbicide that controls weeds after they emerge; Scythe[®], Finale[®], and Reward[®] are all non-selective, post-emergent, contact herbicides. Caution must be exercised when applying herbicides in the greenhouse, because of the potential harm to the main crop. Apply herbicides early in the morning or late afternoon.

3. Quarantine/Inspect Incoming Plant Material

Quarantine plant material before it is brought into the greenhouse by placing plants into a holding area. A holding area can be a small greenhouse or isolated location not normally used during crop production. Place blue or yellow sticky cards in various locations among the crop. Check sticky cards daily for the presence of WFT over a 2 to 3 day period. In addition to sticky cards, visual inspections should be performed at the end of the quarantine period. If "high" numbers of WFT are present, either rogue heavily-infested

plants, remove flowers containing WFT, or spot-spray the target crop where the highest populations are present. These practices will minimize WFT movement into the greenhouse. If quarantine is not a feasible option, inspect incoming plant material carefully.

4. Removal of "grandmother" plants and older stock plants

Plants not part of the crop production system should be removed from the greenhouse. These plants serve as a hiding place for WFT and serve as a reservoir for tomato spotted wilt virus and impatiens necrotic spot virus.

5. Screening

Screening prevents WFT entrance from outside to inside the greenhouse, especially during the winter months when WFT are looking for a warmer environment. This can reduce the need for insecticide applications. If possible, screen side vents, ridge vents, and door ways. It is important to choose screening material with the appropriate screen hole diameter. The proper screen size for WFT is <0.0075 inches or <192 microns. Be sure screens are installed properly and check for air flow restrictions. It is important to periodically clean screening material to increase its longevity, by washing it off to remove dust and debris. Don't clean screening during ventilation. For more information, consult a supplier.

6. Clothing

Growers and workers should avoid wearing yellow or blue colored clothing, as these colors are highly attractive to WFT. This minimizes movement of WFT from outside to inside the

greenhouse. Colors that should be worn are gray, brown, green, or white.

CHEMICAL MANAGEMENT

Chemical management of WFT is difficult, because most stages of WFT are found in flowers. They enter flower buds before they open, which makes it difficult to get insecticides into the flowers to make contact with WFT. Below is a list of chemicals that have been used to manage WFT.

Organophosphates

- Chlorpyrifos (Dursban/Duraguard)
- Acephate (Orthene)
- Diazinon (Knox-Out)

Carbamates

- Bendiocarb (Dycarb)
- Formetenate (Carzol)

Pyrethroids

- Fluvalinate (Mavrik)
- Permethrin (Pounce)
- Pyrethrum/PBO (Pyrenone)
- Bifenthrin (Talstar)
- Cyfluthrin (Tempo/Decathlon)
- Fenpropathrin (Tame)

Chlorinated Hydrocarbon

- Endosulfan (Thiodan)

Macrocyclic Lactone

- Abamectin (Avid)

Botanical

- Azadirachtin (Azatin/Neemazad)

Others

- Horticultural Oil
- Insecticidal Soap

Recommendations for using chemicals to manage WFT include:

- Spray program: 2 to 3 sprays at 3 to 5 day intervals to break the lifecycle. Eggs and pupae

are not controlled with chemicals. This spray program takes care of young after eggs hatch and adults emerging from pupae. Spray at 7 to 10 day intervals as needed. Be sure to monitor/scout to evaluate effectiveness of chemical management.

- Don't use combinations (mixing two chemical classes) anymore than twice in a row to minimize the potential for resistance.

- Complete coverage of target crop is essential.

- Spot spray target crop. In some cases it may not be necessary to expose the entire WFT population to a chemical. Just spray the plants with "high" numbers of WFT.

- Don't use pesticides in the same chemical class for more than 2 to 3 applications in sequence. Use a different chemical class.

BIOLOGICAL MANAGEMENT

Biological control of WFT may involve a combination of natural enemies. Natural enemies available for growers interested in implementing biological control for WFT are *Amblyseius cucumeris*, *Amblyseius degenerans*, *Orius spp.*, and *Hypoaspis miles*.

- *Amblyseius cucumeris* is a predatory mite which feeds on young stages of WFT. It does not feed on adults. The mite needs to be introduced early, before populations reach damaging levels. It feeds on 1 thrips per day during its 30 day lifespan. It goes into a resting stage in late fall/winter. The mite is readily available from most biocontrol suppliers.

- *Amblyseius degenerans* is a predatory mite which also feeds on young stages of WFT. It does not feed on adults. Introduce early, before populations reach damaging levels. It feeds on 4

to 5 thrips per day. This mite does not go into a resting stage.

- *Orius spp.* are minute pirate bugs that feed on all stages of WFT. They can consume 5 to 20 thrips per day. They feed in the flowers where the adult WFT are present. They do go into a resting stage in late fall/winter.

- *Hypoaspis miles* is a soil predatory mite that has been shown to feed on the WFT pupae stage. In addition, they are highly effective in controlling fungus gnat larvae. They are applied over the soil surface. More research needs to be conducted to evaluate effectiveness of this mite.

Currently, biological control is still in its infancy and research is being conducted to evaluate feasibility in various crop production systems. For more information on biological control of WFT consult a biocontrol supplier or call the Purdue University Extension Entomology Department.

A problem in using any WFT management is that some crops (eg. impatiens) have a low tolerance to WFT, because of the potential for viral infection. As a result, successful management of WFT cannot be obtained by using one practice, but it involves a combination of cultural, chemical, and biological management practices.

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