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PURDUE EXTENSION

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Landscape & Ornamentals

Department of Entomology

WESTERN FLOWER THRIPS

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Western flower thrips (WFT), *Frankliniella occidentalis* (Pergande) is one of the most destructive pests in greenhouses throughout the United States. WFT is important because it attacks the leaves and flowers of many ornamental plants and transmits two diseases that can kill plants, impatiens necrotic spot virus (INSV) and tomato spotted wilt virus (TSWV). WFT is the only thrips species that can transmit INSV. This particular species of thrips is difficult to control because they hide deep in the folds of plant buds, or in the soil where foliar insecticide sprays can't reach them. Even when insecticides come in contact with WFT, continued applications can foster the development of resistant WFT populations.

Western flower thrip on sticky card

DESCRIPTION AND LIFE CYCLE

Western flower thrips adults are difficult to find because they are very small and feed in protected areas such as inside flowers, terminal leaf clusters, and unopened buds. WFT males are approximately 1/16 inch long, slender, and pale yellow. Females are longer and more robust, and vary from light yellow to dark brown.

It takes WFT an average of three weeks to develop from egg to adult. However, WFT development varies depending on temperature. At temperatures between 80 and 85˚F, the entire life cycle can be completed in less than 10 days. Female WFT can insert between 150 to 200 eggs into plant tissue during their 30 to 45 day lifespan.

Adult WFT and the first two larval instars are the only life stages that feed on the above ground parts of plants. Both larval instars are commonly found in tight, protected areas, such as where flower petals attach, or beneath developing terminal foliage. Adults and larvae feed on flower petals and pollen. Toward the end of the second instar, the larvae move down the plant into the growing medium to pupate. WFT

Impatiens necrotic spot virus

may also pupate in flowers. While in the growing medium or flowers, WFT undergoes two pupal molts, during which no feeding occurs and general activity is minimal. During this time, foliar-applied insecticides are not effective against this pest.

DAMAGE

WFT damage plants when they insert their needle-like mouthparts into leaves and flowers, and remove plant fluids. This feeding kills plant tissues around the feeding site and makes the leaf or flower petal appear silvery or flecked. Leaves and flowers become deformed when live tissue grows around the dead portions. Damage symptoms become visible within one week after feeding begins. In addition, injured plants are often speckled black with thrips excrement.

WFT feeding can also cause destruction of plants through transmission and infection of two viral diseases INSV and TSWV. Both viruses may be difficult to diagnose because symptom expression varies with environmental conditions (i.e. temperature), season (winter vs. summer), and host species or cultivar. Viral symptoms include ring spots on leaves, blackening of stems, and distorted growth. Suspect plants should be sent to a university diagnostic clinic or private laboratory for verification of virus infection.

In order to transmit the viruses, WFT larvae must feed on infected plants or weeds for 15 to 30 minutes. Weeds that serve to harbor these viruses include chickweed, hairy bittercress, jewelweed, oxalis, and prostrate spurge. The virus must incubate inside the thrips for 4 to 10 days before it can be passed on to the plant. Only the larval stage of WFT can acquire the two viral diseases. When an infected larva becomes an adult, it can transmit the virus to other plants for the remainder of its life. Fortunately, the offspring of these infested WFT are not born with the virus and must feed on a virus-infected plant to pass on the disease. WFT adults can readily migrate from virus infected weeds or crop plants into greenhouses.

MANAGEMENT

Cultural Control

Reduce the potential for WFT problems by starting with a WFT-free crop. Remove any plant stock material that is infested, because this can be a source of future outbreaks. Inspect all incoming plant material and new cuttings for the presence of WFT or its damage. If possible, place incoming plant material in a holding area with one or two sticky cards randomly distributed among the plants. Maintain plants in the holding area for approximately 5 days. Inspect sticky cards at the end of the 5-day period. If thrips are present on the sticky cards, apply an insecticide to control any WFT on the plants.

Maintain a weed-free environment because weeds are often not treated with insecticides and can provide refuge for WFT and both INSV and TSWV diseases. Eliminate weeds from inside and outside the greenhouse, including areas underneath benches, behind vents, and in pots. Weeds removed from outside the greenhouse will reduce thrips movement into the greenhouse. Maintain a 20-30-foot weed-free barrier around the greenhouse perimeter to prevent weed seed germination and entry of new weed seeds through unscreened vents and doors.

Remove all unsellable blooms from plants. These provide food and refuge for WFT. Remove all debris from the greenhouse as quickly as possible to prevent WFT from migrating back onto the main crop from infested plant parts when pruning plants and flowers. Make greenhouse workers aware of this, so they will understand the importance of removing and discarding unsellable flower parts.

Physical Control

Western flower thrips can migrate into greenhouses through side vents, ridge vents, sidewalls, and entryways. Place screening material (192 microns or 132 mesh) across open vents to reduce WFT entry. Compensate for the reduced airflow from screening by installing additional exhaust fans and/or increasing the square footage of screened surfaces. Total exclusion may not be physically or economically feasible. An excellent compromise is to selectively screen windward sections of greenhouses. Clean screens regularly to remove debris which may reduce airflow. Be sure to turn off fans before cleaning screens.

Scouting and Record-Keeping

For early WFT detection, scout in and around the crop by using colored sticky cards or visually inspecting plants. Although blue sticky cards are more effective for catching thrips, use yellow sticky cards because you can use them to scout populations of other important pests such as winged aphids, adult whiteflies, leafminers, fungus gnats, and shoreflies. In addition, thrips are generally easier to see on yellow sticky cards than blue ones.

Hang sticky cards vertically, approximately 1 to 2 inches above the plant canopy and spaced at intervals of around 1 card per 1,000 square feet. More cards per unit area may be advisable, especially if you are using cards to monitor other pests, if you detect a high population of WFT, or if a crop is highly susceptible to INSV or TSWV. It is also advisable to place sticky cards near entryways and vents to determine how these insects enter and move within your greenhouse.

Determine the effectiveness of management strategies by using efficient record-keeping techniques. Accurate and detailed records of WFT activity in the greenhouse are important in implementing pest management programs. Maintain records of: plant species or cultivar attacked, temperature, time of year, region of greenhouse where plants and cards are infested, and WFT numbers caught per sticky card. Examine sticky cards at least once per week and replace every 1 to 2 weeks. Count just one side of a sticky card per week to save time and labor. By using a simple threshold of 20 thrips per card per week in one of our experimental greenhouses, we were able to identify five months where thrips sprays were not needed.

Biological Control

Several natural enemies are commercially available for use against WFT in the greenhouse including predatory mites, minute pirate bugs, and entomopathogenic fungi.

Both predatory mites and minute pirate bugs are commercially available for managing WFT. Amblyseius (=Neoseiulus) cucumeris and Amblyseius degenerans are aboveground predatory mites commonly used for WFT. These are available from most commercial biological control suppliers. They can be released by hanging sachets containing the mites on plants, or by sprinkling loose bran containing the mites onto plants. Both mite species only feed on the young (immature) stages of WFT. They do not attack adults. In addition, A. cucumeris may not reproduce during the winter months. In contrast, A. degenerans can reproduce throughout the year in greenhouses and tolerates drier conditions than A. cucumeris.

Hypoaspis miles is a soil-predatory mite that feeds on thrips pupae. The mite reproduces rapidly, and few are needed to establish a population. They are shipped in one-liter bottles containing 10,000 mites.

Minute pirate bugs, Orius spp., feed on young and adult WFT. Both nymphs and adults are predaceous.

Beauveria bassiana (Botanigard/Naturalis) is an insect-killing fungus that is formulated as a foliar spray. The fungus attacks the active stages of WFT, young and adults. It works best on small, developing thrips populations rather than those that have already become established.

Using Biological Control Effectively

- Consult Extension and biological control specialists, supplier catalogs, trade journals, and publications in order to obtain as much information prior to starting a biological control program.
- Find a reliable biological control supplier, and be sure to order natural enemies at least 3 weeks before application. Release natural enemies upon delivery; delaying release reduces effectiveness.
- Start on a small scale. Don't convert an entire operation to biological control until you have tested it and feel comfortable with using it.
- Release natural enemies before thrips populations reach damaging levels. Biological control is a preventative measure, not a reactive measure.
- Scout and record the number of natural enemies and thrips present before and after release in the greenhouse.

Chemical Control

Chemical approaches when used alone may not always produce successful results when managing thrips and other greenhouse pests. There are several reasons for this:

- Adult and young thrips are not likely to come into contact or may be missed with a single application because they hide in areas that are difficult to reach with sprays.
- Pupae in the growing medium and eggs in leaves are not affected by most insecticides. Adults and larvae that emerge after an insecticide application are less likely to come into contact with a spray residual.
- In the spring and summer, adults can continuously infest unscreened greenhouses migrating from outdoors.
- Resistance to several organophosphate, carbamate, and pyrethroid chemical class insecticides has been reported.

Successful control with insecticides is only possible when you use them as part of an overall pest management program that also includes cultural and biological control options. The box below offers suggestions to help you increase the effectiveness of insecticide applications.

Using Chemical Control Effectively

- Use spray equipment that produces very small spray particles (<100 microns). Spray particles of this size are ideal because they penetrate deep into the protected areas of the plant (tight flower buds and terminal foliage) where WFT are located. This also provides the most efficient use of an insecticide, if coverage is thorough. Smoke or aerosol formulations of insecticides may also improve control.
- Make at least 2 applications at 5-day intervals to reduce high populations or over-lapping generations of WFT. The second application is timed to contact the larvae (which were in the protected egg stage during the first application) before they migrate into the growing medium to pupate. The second application also targets newly emerged adults that escaped insecticide exposure while in the pupa stage in the growing medium.
- Rotate insecticide classes to delay the onset of resistance. It is best to use one insecticide class for one generation cycle (approximately 3 weeks) then rotate to an alternative class. See Table 1 on the following page for International Resistance Action Committee (IRAC) designation.

Table 1. Insecticides Recommended for Western Flower Thrips Management

Active Ingredient	Trade Name	REI*	Class** (IRAC)
Abamectin	Avid	12	MC (6)
Acephate	Orthene	24	OP (1B)
Azadrachtin	Azatin/Ornazin/Molt-Z	4	OP (1B)
Bifenthrin	Talstar Attain	12 12	P (3)
Chlorfenapyr	Pylon	12	OP (1B)
Chlorpyrifos	Duraguard	24	OP (1B)
Cyfluthrin	Decathlon	12	P (3)
Fenoxycarb	Preclude	12	1GR (7B)
Flonicamid	Aria	12	FB (9C)
Fluvalinate	Mavrik	12	P (3)
Methiocarb	Mesurol	24	C (1A)
Novaluron	Pedestal	12	IGR (15)
Pyridalyl	Overture	12	UNK
Spinosad	Conserve	4	M (5)
Sulfotepp	Dithio, Sulfotepp	4	OP (1B)

*REI = Restricted Entry Interval (Hours)
**MC = Macrocyclic Lactone, OP = Organophosphate, P = Pyrethroid, IGR = Insect Growth Regulator, C = Carbamate, M = Microbial, N = Neonicotinoid, UNK = Unknown, FB = Feeding Blocker

Western Flower Thrips: *Frankliniella occidentalis* (Pergande)

READ AND FOLLOW ALL LABEL INSTRUCTIONS. THIS INCLUDES DIRECTIONS FOR USE, PRECAUTIONARY STATEMENTS (HAZARDS TO HUMANS, DOMESTIC ANIMALS, AND ENDANGERED SPECIES), ENVIRONMENTAL HAZARDS, RATES OF APPLICATION, NUMBER OF APPLICATIONS, REENTRY INTERVALS, HARVEST RESTRICTIONS, STORAGE AND DISPOSAL, AND ANY SPECIFIC WARNINGS AND/OR PRECAUTIONS FOR SAFE HANDLING OF THE PESTICIDE.

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