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WESTERN FLOWER THRIPS

Arm yourself with knowledge before battling this pest

When speaking with growers these days about pest issues, western flower thrips (*Frankliniella occidentalis*) is a pest that comes up again and again. This little insect that is native to the western United States, has become one of the hardest pests for commercial growing operations to control. But why is this? First, a portion of western flower thrips' (WFT) life cycle is spent in the soil. Most growers using spray treatments only target the crops' foliage. While this may be effective for adults and first and second instar larvae, foliar applications leave the pupa and pre-pupae thrips in the soil untreated.

Secondly, the very nature of WFTs behavior makes them a tricky target. These tiny insects hide in the flower buds and other crevices that are hard to reach with contact insecticides. Even more frustrating, their eggs are inserted into plant tissue, and no insec-

Monitoring greenhouses for WFT infestations is important, because early detection is essential to maximize control of the pest.

Photos by Suzanne Wainwright-Evans

PRODUCT TRIALS

The products listed below were tested in at least four experiments at IR-4 with the same rate and application method. They all provided excellent control (>95 percent) in at least one of the experiments.

Aria (flonicamid)

Avid (abamectin)

Botanigard (*Beauveria bassiana*)

Kontos (spirotetramat)

Conserve* (spinosad)

Acelepryn

Flagship (thiamethoxam)

Overture (pyridalyl)

Pylon (chlorfenapyr)

Hachi-Hachi (tolfenpyrad)

TriCon (no longer available)

* In 11 trials, Conserve did not provide acceptable levels of control. Some thrips populations were known to be tolerant while others were known to be sensitive to Conserve.

Amblyseius cucumeris in release sachets are used to control thrips in this gerbera crop.

ticide can kill this life stage. To add one more hurdle to effective control, there are not that many different modes of action (MOA) available today for thrips, thus limiting what growers have available. Few MOA plus poor management practices have lead to resistance issues not only in the United States, but also in other parts of the world.

Know your thrips

Adult WFT are tiny, slender insects with fringed wings ranging in color from yellowish to dark brown. Females are slightly larger than males and can lay 100-200 eggs directly into plant tissues such as leaves, bracts and petals.

Females do not require the presence of a male to produce viable eggs. Eggs that hatch usually are biased towards females and will go through two actively feeding larval instars that are followed by nonfeeding prepupal and pupal instars.

Depending on the plant species/variety, growth stage, flowering vs. vegetative and flower color, larvae may choose to pupate on foliage or in the soil or growing media. Under ideal conditions, WFT may take as little as one to two weeks to go from an egg to adult and will have multiple generations per year, as long as conditions are favorable for reproduction (at temperatures higher than 50°F).

WFT feed on a range of plants, including impatiens, fuchsia, chrysanthemum, geraniums, marigolds, daisies, petunia and many others. Thrips feed by piercing plant cells with their mouthparts and sucking out contents. Damaged plant cells collapse, resulting in deformed plant growth, flower deformations, silvered patches and feces flecking. Thrips that feed in flower buds can cause the flowers to abort.

In addition to direct feeding injury, WFT can vector two tospoviruses: impatiens necrotic spot virus and tomato spotted wilt virus. During feeding, larvae inject saliva into plant cells before the contents are withdrawn. Transmission of tospoviruses to unaffected plants occurs as the larvae and adults feed. Only larvae can acquire the virus, but the virus can be passed onto the adult that continues to spread the virus. Adult thrips do not pass the virus to eggs.

Monitoring greenhouses for WFT infestations is important, because early detection is essential to maximize control of the pest. Indicator plants (petunia, fava bean) and blue and yellow sticky cards (one card/1,000 square feet) are the best methods to monitor pest populations. Indicator plants also can be used to determine if WFT are infected with tospoviruses. Tolerance levels will depend on the crop, stage of growth, the plants tolerance to WFT damage and presence of tospoviruses.

Biological control of thrips

Predatory mites such as *Amblyseius cucumeris* and *A. swirskii* live on the foliage, feeding on thrips and other pests. They target the first and second instars of thrips because the stronger thrips adults can defend themselves against these very small predatory mites. Yet the minute pirate bug, *Orius* sp., is a predator not afraid to attack adult WFT. This biocontrol agent will happily go after thrips of many life stages on the foliage, stabbing them with their straw-like mouth parts, sucking their prey dry. Orius requires pollen in their diet, and will not subsist on WFT alone. Orius are sensitive to day length, which is a limiting factor in their effectiveness during winter months in northern climates, unless supplemental lighting is used.

Hypoaspis miles (*Stratiolaelaps scimitus*) is a predatory mite that can be used against WFT, but targets the life stages in the soil. This tiny mite, also called the soil-dwelling mite, will go after the very difficult-to-control life stage of the pupa as well as the pre-pupae. These predatory mites can be used right in the media of plants, or apply them to dirt floors.

The Rove beetle, *Atheta coriaria*, fights thrips and other pests. Like *H. miles*, this small beetle also lives in the media, constantly hunting down insects. The beetle is not a stand-alone option to control thrips, but rather part of a larger biological control program.

Parasitic nematodes

One of the up-and coming-stars against WFT are insect parasitic nematodes (IPN). They are microscopic, non-segmented roundworms that are produced in a laboratory and released in their infective juvenile stage to search out and enter insect pests. Once an infective juvenile finds a suitable host, it enters through natural body openings. Once inside, nematodes release symbiotic bacteria that quickly kill hosts within 24-48 hours.

IPN *Steinernema feltiae* is effective against WFT when applied regularly in a program. Successful programs include a drench application to the soil followed by a weekly spray or sprench application to target foliar-dwelling life stages. IPN are applied to the soil and plant foliage just like the biological control agents (BCAs) listed above, so you may be wondering if BCAs are compatible. Interactions between nematodes and BCAs will be minimal. In fact, combinations of several BCAs will work together to control WFT populations.

IPN can be applied using most conventional liquid application systems such as irrigation injection, spray tanks, drip irrigation, back packs and dips tanks. Some things to consider prior to nematode application is an agitation system to prevent nematodes settling, maintaining pump pressure below 300 psi, using nozzle apertures larger than 0.5 mm and removal of filters of 50 mesh or finer. Optimal nematode soil or growing media temperatures are between 50-86°F.

Nematode applications should be made in the early morning or late evening to avoid nematode desiccation and to target thrips when their mobility is generally low. Use blackout curtains, close vents, and switch off artificial lighting during and for at least two hours after application to minimize both UV light and heat exposure to nematodes. Spray adjuvants will promote improved application uniformity and allow nematodes to reach WFT more effectively.

One of the great benefits of using IPN against thrips is that growers can often start by incorporating them into their current spray program. Because nematodes are not insects, most insecticides currently on the market will have minimal impact on them. Check www.beckerunderwood.com for a nematode/pesticide compatibility chart. This is an excellent way to ease into trying BCAs. Besides controlling WFT, *Steinernema feltiae* also kills fungus gnats.

Pesticide program

Many growers are looking for that silver bullet product that will control thrips the way that Conserve (spinosad) did when it first hit the market. Unfortunately, such a product does not exist. Overuse and lack of rotation will create new problems for growers.

To prevent losing more product efficacy the way users have with Conserve (spinosad), growers must rotate the mode of action when managing thrips. MOAs can be found on the OHP website. The company has compiled an excellent document with most commercially available pesticides listed, including those from other manufactures. Products are lumped into groups by their MOA, so when you need to rotate, select a product from a different group. Another way to get this information is to contact your pesticide supplier or product manufacturer.

Managing thrips requires

Sticky cards

The use of sticky cards is one of the easiest ways to help monitor thrips populations. These cards trap the flying adults. But more importantly, if changed and used regularly, will help give you an ongoing thrips population count. For effective use, change sticky cards weekly.

MOA rotation and effective use of biological control agents in a thrips (pictured) control program, is critical to the preservation of effective insecticides.

planning and understating of today's products. Lucky for the industry, the IR-4 Ornamental Horticulture Program has recently compiled data from 55 experiments on thrips from 2006 through 2010. This report is available free on the IR-4 website.

The program tested 57 products (48 different active ingredients) on five thrips species (chili, gladiolus, privet, weeping fig and western flower). Additional information collected included crops used, application method, rate and phytotoxicity. Data from the trial revealed that not one product performed consistently across the board on all types of thrips or in all situations. Read the full report, Thrips Efficacy Summary – 2011, at ir4.rutgers.edu/Ornamental/ornamentalSummaryReports.cfm.

Plan ahead

Regardless of how you choose to manage thrips, whether strictly chemical, biological or a combination of both, always plan ahead. Know the products' strengths and weaknesses when it comes to the specific life stages they target. Keep up with sticky card counts and records to know if your current control strategies truly are working. Also, if you find a pesticide that works well for you, do not depend on it too often or you could end up with resistance issues. MOA rotation, as well as effective use of BCAs in a control program, is critical to the preservation of effective insecticides.

Finally, if looking to exclusively use BCAs to manage thrips, be sure to use and adapt the expertise of other growers, consultants, manufacturers, distributors, university extension agents, books and the internet to assist in starting an effective control program that is right for your operation. **GM**

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