

29. Biological Control of Western Flower Thrips (HortReport, January 2002)

There are many species of thrips that can attack greenhouse and nursery crops, however Western Flower Thrips (*Frankliniella occidentalis*) is the most serious due to their ability to transmit the major viruses, Impatiens Necrotic Spot Virus (INSV) and several strains of Tomato Spotted Wilt Virus (TSWV). Western flower thrips have a broad host range and may feed upon impatiens, fuchsia, chrysanthemum, ivy geraniums, verbena, petunia, cyclamen, primula and many other ornamental hosts.

Early detection and treatment of this pest is critical to minimize virus transmission. Damage symptoms or virus infection may not be visible until many days after plants have been fed upon. Greenhouse vegetable seedlings and transplants should be isolated from ornamental plants.

Damage

Western flower thrips feed on leaves, flowers and buds of many plants. As damaged leaves and flowers grow they appear deformed, streaked, or have a silvery appearance. Black specks of excrement may also be evident where thrips have fed.

Western flower thrips spread Impatiens Necrotic Spot Virus and Tomato Spotted Wilt Virus. The virus is acquired by thrips larvae (first instar) when they feed on infected plants and adult thrips transmit the virus to healthy plants. There is no treatment for this virus once the plant is infected. Virus symptoms may include ringspots, vein necrosis, mottling, or mosaic patterns. Vegetable plant yields are reduced and fruit may be unmarketable. If you suspect that a plant has a virus, have it tested through a laboratory or use an on-site diagnostic kit. If INSV/TSWV is detected, rogue infected plant material and destroy to prevent further spread of the virus.

Life cycle

Adult thrips are narrow, about 1.3mm long, yellowish with a brownish black abdomen. The wing margins have fringes, and the abdomen is pointed at the end. These characters can be seen on a sticky card using at least a 10x hand lens.

Females insert eggs into leaves and buds. Eggs hatch into larvae that are yellow. After two larval stages, a prepupa develops followed by the pupal stage and finally the adult. Prepupa and pupal stages are usually found in growing media or other debris, however, they can be found on the plant in protected areas on foliage and flowers. Only adults and larvae feed on plants. The entire life cycle from egg to adult takes approximately 12 days at 86° F.

Monitoring and Sanitation

Early detection is critical for thrips control. Examine plants once a week for feeding damage and use blue or yellow sticky cards to detect winged adults. Blue sticky traps are more attractive to western flower thrips. Place one trap/1,000 square feet of growing space and hang traps near doors and vents. Check traps once a week and record. Before starting vegetable seedlings, monitor growing area with sticky cards to detect lingering thrips from previous season.

Eliminate sources of thrips by having good sanitation before and during the crop cycle. Remove weeds and all plant debris inside the production area and have at least a 20-foot weed free barrier around the greenhouse. Weeds can harbor both the thrips (and other pests) and the virus. Ongoing problems with INSV are often the result of poor sanitation.

An effective method for detecting thrips on plants is by tapping or shaking flowers and leaves over a white sheet of paper. This method may dislodge the dark colored adults and the yellow larvae.

Biological Controls

There are many natural enemies of western flower thrips, however controlling thrips biologically often requires integration with compatible pesticides for effective control. Virus indicator plants should be deployed in vegetable production if there is a history of the disease in the greenhouse range. Indicator plants (susceptible varieties of plants) provide an early warning for locating thrips. Certain petunia varieties are very effective

(Carpet Blue, Blue Madness) in detecting thrips and INSV. Petunias attract thrips and may show symptoms of virus infection, however the petunias do not become a reservoir for the virus. Virus symptoms appear as small brown to black spots. Infected petunia leaves can be removed and the plant can be used for further detection throughout the season.

These biocontrols are commercially available from most biocontrol suppliers.

Neoseiulus (Amblyseius) cucumeris

Neoseiulus cucumeris is a predaceous mite that attacks thrips larvae and eggs on foliage and flowers. High numbers are needed for effective control. Mites are distributed loosely or in sachets (small envelopes). These sachets may provide several generations of predatory mites over a six weeks period.

Hypoaspis miles

Hypoaspis miles is a predatory soil mite that feeds on thrips pupae in growing media. Researchers report thrips reductions by 30 to 60%. This mite should be used in conjunction with a natural enemy that feeds on thrips stages found on plants.

This natural enemy is also effective in reducing fungus gnat larvae.

Orius insidiosus

Orius insidiosus is a minute pirate bug that feeds on all thrips life stages. It will also attack aphids, mites and caterpillars. They reproduce best at high humidity and during long days.

***Beauveria bassiana* – (Mycoinsecticide)**

A fungal strain that is pathogenic to insects. Spores must have direct contact with insect to be effective. As spores attach to the insect cuticle, they germinate and the fungus infects body cavity. Two products commercially available are Naturalis T& O™ and Botanigard ES™.

This fungus should be used as a preventive and not as a “rescue treatment.” Successive treatments may be required for control. It will not control heavy populations of insects and it takes 7-10 days before there is evidence of control.

30. Biological Control of Western Flower Thrips with the Predatory Mite, *Neoseilus (Amblyseius) cucumeris* (HortReport, February 2002)

Western flower thrips have a broad host range and may feed upon tomatoes, peppers, cucumbers, impatiens, fuchsia, chrysanthemum, ivy geraniums, and many other ornamental hosts. This pest is difficult to control since it has widespread resistance to many different classes of insecticides. In addition to damaging plant tissue, this insect transmits Impatiens Necrotic Spot Virus (INSV) and Tomato Spotted Wilt Virus (TSWV) to both vegetable and ornamental plants. Early first instar nymphs acquire the virus as they feed on infected plants. The virus is retained in the thrips until they reach the adult stage that transmits the virus to susceptible hosts.

Growers in Pennsylvania have utilized the predatory mite, *Neoseilus cucumeris* to control larval stages of thrips. This predatory mite has been used for many years in European countries to control thrips on greenhouse vegetables such as tomatoes, peppers and eggplants. *Neoseilus* should be used when thrips populations are at low levels or as preventative treatment. Biological control is not a rescue treatment and should not be used when thrips populations are high. Virus indicator plants should be used in vegetable production if there is a history of INSV in the greenhouse range. Indicator plants (susceptible varieties of plants) provide an early warning for locating thrips. Certain petunia varieties are very effective (Carpet Blue, Blue Madness) in detecting thrips and INSV. Petunias attract thrips and may show symptoms of virus infection, however the petunias do not become a reservoir for the virus. Virus symptoms appear as small brown to black spots. Infected petunia leaves can be removed and the plant can be used for further detection throughout the season. For more information on indicator plants, consult this web site for the University of Connecticut. <http://www.hort.uconn.edu/ipm/greenhs/htms/tos pov.htm>

Life Cycle of *Neoseilus cucumeris*

Neoseilus cucumeris is a beige predatory mite with eight legs and is less than 1 mm long. After the female mite mates she deposits eggs daily on leaf hairs close to the veins on the underside of the leaf. The egg stage is followed by the larval stage,

two nymphal stages and finally the adult stage. Both the nymphal and adult stages will feed on thrips larvae. Total development time for the mite is about six to nine days at 77° F.

Predatory mites kill their prey by piercing the thrips larvae and sucking out the body contents. They are most effective against the small first instar stage. The second instar thrips and thrips adults will attack the predatory mite by striking out with its abdomen. Timing predatory mite introductions with the presence of first instar larva increases their effectiveness. *Neoseilus* may also prey on spider mites or eggs.

Products

Neoseilus cucumeris is commercially available in the US. The predatory mites are sent to the grower as adults mixed with a carrier such as bran, and flour mites are added as food during shipment. The mites can be distributed loosely by sprinkling on leaves. Most growers prefer to use small sachets (envelopes) that contain different stages of predatory mites and flour mites. These sachets serve as breeding system over a period of six weeks. They are hung on the plants and the predatory mites exit through the top of the sachet onto the plants.

Introduction Method

- Consult supplier for rates.
- Reduce high thrips populations with a compatible insecticide. (Consult biocontrol supplier or this web site: www.koppert.nl/e0110.shtml).
- Introduce the predatory mites as soon as possible after delivery. The material may be stored for a short period in a cool dark place with at least 85% relative humidity.
- Allow the mites to adjust to greenhouse temperature before distributing. Turn and shake the tube slightly in order to distribute the predatory mites equally in the bran.
- The predatory mites should be sprinkled equally throughout the plants. Sprinkle the material (predatory mites + bran) on the

leaves or in small piles on the rockwool cubes.

- If using the controlled release sachets, hang them near thrips infestations.

Product names by major suppliers:

Biobest: **Neoseilus-system, Neoseilus-Breeding System**, Phone: 303-661-9546, <http://www.biobest.be> or <http://www.bugsandbees.com>

Kopperts: **Thripex, Thripex Plus**, Phone: 734-641-3763, <http://www.koppert.nl>

Syngenta: **Ambly-line cu, Ambly-line cu CRS** (controlled release sachet), Phone: 805-986-8265, Fax: 805-986-8267, email: info@syngentabioline.com

These products are available through biocontrol distributors located throughout the US.

A list of distributors in the US can be found at the Association of Natural Bio-control Producers web site: www.anbp.org

Points to consider

- Use when thrips populations are at low levels.
- Never use predatory mites as a curative treatment for thrips.

The predatory mites develop well when relative humidity is at least 65%.

31. Biological Control of Western Flower Thrips with the Pirate Bug, *Orius insidiosus* (HortReport, March 2002)

Western flower thrips have a broad host range and may feed upon tomatoes, peppers, cucumbers, impatiens, fuchsia, chrysanthemum, ivy geraniums, and many other ornamental hosts. This pest is difficult to control since it has widespread resistance to many different classes of insecticides. In addition to damaging plant tissue, this insect transmits Impatiens Necrotic Spot Virus (INSV) and Tomato Spotted Wilt Virus (TSWV) to both vegetable and ornamental plants. Early first instar nymphs acquire the virus as they feed on infected plants. The virus is retained in the thrips until they reach the adult stage that transmits the virus to susceptible hosts.

Early detection and treatment of this pest is critical to minimize virus transmission. Damage symptoms or virus infection may not be visible until many days after plants have been fed upon. Greenhouse vegetable seedlings and transplants should be isolated from ornamental plant material from outside sources that could be harboring the virus or virulent thrips.

The minute pirate bug or *Orius insidiosus* is effective in attacking both the adult and immature thrips stages and will also feed on other prey such as aphids and spider mites. Remember to use *Orius* or any other natural enemy as a preventive control. Biological control is not a rescue treatment and should not be used when thrips populations are high.

Life Cycle of *Orius insidiosus*

Orius is a small bug with a long feeding tube called a rostrum that folds under its body. The adult female is about 3 mm, while the males are slightly smaller.

When introduced into the crop, the adult female will lay 1-3 eggs per day embedded in the plant tissue of petioles, or in veins on the underside of the leaf. From these eggs emerge yellow nymphs with conspicuous red eyes. The total development time from egg to adult is approximately 3 weeks at 77° F. The adult bug lives for 3-4 weeks and feeds on all thrips stages, while the younger nymphs eat only thrips larvae. Upon finding prey, they insert

their rostrum and drain the prey of its body fluids. *Orius* will also eat pollen when there are no thrips.

Points to consider

- Eliminate the use of toxic insecticides 2 months before introducing *Orius*.
- *Orius* can be used in combination with the predatory mite *Neoseiulus cucumeris*.
- Introduce *Orius* as soon as thrips are detected.
- Consult biocontrol supplier for rate information.
- Apply in the cool morning or early evening, avoid application in bright sunlight.
- *Orius* lays eggs largely in side shoots. Avoid loss of eggs by introducing after removing side shoots.

Product Information

Orius is commercially available in the United States through biocontrol suppliers. The adult bug is sent to grower in a buckwheat husk carrier, packed in a plastic bottle. Turn the bottle and shake lightly before and during introduction to have equal distribution. Sprinkle the material on leaves in groups to encourage mating and do not disturb for several days so that the bugs have sufficient time to spread throughout the crop. Introduce *Orius* near thrips hot spots to increase their effectiveness. Do not introduce near sticky cards.

Product names by major suppliers:

Biobest: **Orius-System**, Phone: 303-661-9546,
<http://www.biobest.be> or <http://www.bugsandbees.com>

www.bugsandbees.com

Kopperts: **Thripor**, Phone: 734-641-3763, <http://www.koppert.nl>

Syngenta: **Oriline**, Phone: 805-986-8265, Fax: 805-986-8267, email: info@syngentabioline.com

A list of distributors in the US can be found at the Association of Natural Bio-control Producers web site: www.anbp.org. Most distributors require

orders to be placed by Thursday for delivery the following week.

Benefits

- Can be used in a both vegetable and ornamental crops.
- Can be introduced preventatively in pollen bearing crops.
- Can be combined with other thrips predators.
- Attacks other insect pests.