Krischik V. 2022. Biocontrol and IPM. MNLA SCOOP magazine March

IN FOCUS

REDUCE PESTICIDE USE AND WATER CONTAMINATION WITH

BIOCONTROLS & IPM

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EDUCATION ON BIOCONTROL USE

Biocontrol agents for greenhouses and hoop houses can be successfully used to control pests to decrease pesticide use, decrease contaminated wastewater, and improve worker safety. Live insects and pathogens can be purchased online from many different businesses that rear biocontrol agents for release.

> BIOLOGICAL CONTROL USES INSECTS AND PATHOGENS TO CONTROL PEST INSECTS OR DISEASES.

What is biocontrol?

In 2016, 69% of Canadian greenhouses used biocontrol for insects and 45% for pathogens. Why have growers spent time, money, and educational hours on learning how to mange using biocontrol? Sometime biocontrol works better than conventinal insecticide use, especially for thrips.

Biological control uses insects and pathogens to control pest insects or diseases. Biological control is used as part of a total integrated pest management program (IPM), which includes scouting, using disease resistant plants, sound cultural practices, and compatible pesticides. There are three types of beneficials used in greenhouse production: predators, parasitoids, and pathogens. Predators are insects and mites that feed on pests. Predators feed on a variety of pests. Parasitoids are insects are host-specific and deposit eggs in or on a pest; the parasitoid then develops inside the pest insects, making sure not to kill the important organs and nervous system to keep the insect alive as they develop. Pathogens are fungi, bacteria, or viruses that cause a fatal disease in pests.

Here Are A Few Things That You Can Learn About Biocontrol

Use beneficials when thrips populations are low: A biocontrol program can be developed for managing western flower thrips (WFT), *Franklinella occidentalis*, which is very difficult to manage with insecticides. WFT damage plants directly by feeding and indirectly by acting as vectors for the tospoviruses impatiens necrotic spot virus (INSV) and tomato spotted wilt virus (TSWV). WFT pupae in soil, while greenhouse thrips, *Heliothrips haemorrhoidalis*, pupae on leaves. Foliar applications of beneficials are needed to manage greenhouse thrips and foliar and soil applications for WFT. Thrips feed by piercing plant cells with their mouthparts and sucking out their contents. Damaged plant cells collapse, resulting in deformed plant growth, flower deformation, or silvered patches and flecking on expanded leaves. If thrips feed within developing buds, the damaged cells fail to grow as the leaf or flower expands, resulting in deformed leaves or flowers. Sometimes flower buds abort. Silvery leaf scars and specks of black feces are a good way of diagnosing the presence of WFT on plants. WFT feed on a broad range of plants including impatiens, fuchsia, chrysanthemum, ivy geraniums, marigolds, hibiscus verbena, and petunia.

WFT feeding and virus transmission: During feeding, saliva is injected into the plant cell and the contents withdrawn. When tospoviruses are present in the saliva, these are transmitted to the plant during the feeding process in as little as 15–30 minutes. Only the two larval instars of WFT can acquire the virus. Adult WFT do not acquire the virus from tospovirus -infected plants because tospoviruses pass right through the gut and do not enter the salivary fluid. Overlapping generations of thrips within a greenhouse may result in continuous virus transmission.

On-site test kits can be used to determine whether tospoviruses are present in greenhouse plants. If a plant is showing symptoms and is suspected of being infected with a tospovirus, purchase a test kit such as ImmunoStrips from Agdia Inc., 30380 County Rd. 6, Elkhart, Indiana, 46514, www.agdia.com.

Detecting thrips and virus: Early detection is critical to the control of WFT and to the prevention of tospovirus infections. Indicator plants and sticky cards are the best available means of providing early warning of thrips and TSWV/INSV in greenhouse production areas. Petunia plants (Petunia x hybrida) are excellent early indicators for the presence of WFT feeding and the transmission of tospoviruses because petunias are not systemically infected with either TSWV or INSV. The following petunia cultivars are excellent indicator plants for the detection of tospoviruses: Calypso, Super Blue Magic, Blue Carpet, Cascade Blue, Summer Madness, Burgundy Madness, Red Cloud, and Super Magic Coral.

Use banker plants to keep predatory mites and minute pirate bugs alive when thrips populations are low Ornamental pepper plants have been used in spring crops as banker plants at a rate of one plant per 1,000 sq. ft of growing area. Recent research in Canada reported that the cultivar "Purple Flash" was more effective as a banker plant than the ornamental pepper variety "Black Pearl," which has been used before. About 60–80 pirate bugs can be released per flowering pepper plant. Orius will lay eggs in the same area where thrips lay eggs. Pepper plants attract thrips and serve as indicator plants for early detection. If the pepper plants are in flower and producing pollen, the minute pirate bugs will reproduce on the banker plants. The adults will move across the greenhouse and kill first and second instar thrips larvae and adult thrips.

Use conventional insecticides when thrips populations are high: There are many insecticides registered for WFT, but overuse of pesticides can lead to resistance in the WFT populations you are trying to control. While resistance is of concern, failure of chemical control is most often due to poor timing, poor coverage, or other factors, and these causes should be considered before assuming resistance. Most insecticides and miticides affect insects and mites in specific ways that may be called the pesticides' "mode of action" (MoA). The Insecticide Resistance Action Committee (IRAC) is an organization of chemical companies and researchers that has classified insecticides and miticides into different mode of action groups. Each MoA group is assigned an Insecticide Resistance Action Committee Group number (IRAC code). Mode of action is the way a chemical works, so chemicals in different chemical classes may have the same or similar modes of action and be causes of pesticide resistance. MoA group numbers are found on many pesticide labels. Visit https://ag.umass.edu/greenhouse-floriculture/publications-resources/new-england-greenhouse-floriculture-guide for the New England Greenhouse Floriculture Guide for Insects, Diseases, Weeds, and Growth Regulators. Visit the Krischik lab web site to learn more about pests and biocontrol in greenhouse: https://ncipmhort.cfans.umn.edu/ipm-identifying-pests/greenhouse-integrated-pest-management-ipm

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One of the best recent predators available for release, is the predatory Swirskii mite *Amblyseius swirskii*, that helps manage whiteflies, mites, and thrips. Swirskii mites work better at warmer temperatures than *Amblyseius cucmeris*, which feed only on the first instar nymphs, so they must be released early in the crop cycle before thrips populations are high. In addition, the soil dwelling predatory mite, *Hypoaspis miles* may feed on thrips pupae in the soil as well as fungus gnat larvae. Also, the rove beetle, *Atheta coriaria* is a generalist predator that may feed on thrips pupae, along with fungus gnat and shore fly larvae. The minute pirate bug *Orius* is used as a predator on thrips. Predatory nematodes can be released in the soil to kill thrips pupae and fungus gnats. *Beauveria bassiana* (BotaniGard, Mycotrol O), *Isaria fumosoroseus* (Preferal, NoFly WP) are sprays that kills insects.

Interested in learning more about biocontrol? Register to attend the "IPM and Biocontrol in greenhouses, nurseries, and hoop houses" workshop on Thursday March 17, 2022, at Midland Hills Country Club. The workshop is a collaboration of the Minnesota Department of Agriculture, the Minnesota Nursery & Landscape Association, and the University of Minnesota. You can receive MDA pesticide recertification credit and/or MNLA Certified Professional recertification credit. Register at mnla.biz. For program information, contact Vera Krischik at krisc001@umn.edu.

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