



What have we been up to in 2014?

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How can You reduce Insect Pest Problems in Vegetables in their High Tunnels?



Habitat pot in high tunnel tomatoes.

Aphids are the #1 pest of vegetables in Northeastern high tunnels. They stunt plant growth, secrete sticky honey dew and transmit virus diseases. The bottom line is they cost growers money. To combat aphids, some growers spray chemical insecticides, which pose a threat to human health and the environment. Organic growers either do nothing, or spend a lot on frequent releases of natural enemies. Plant-mediated IPM systems (e.g., trap, banker, and habitat plants) offer an innovative way to manage aphids and other pests in high tunnels at low cost. For the next 3 years, we will work on developing and evaluating IPM tactics for high tunnel vegetables, specifically leafy greens and tomatoes. We will test the aphid banker plant system and habitat pots (made up of alyssum, beans, marigolds and lantana) placed in high tunnel production in ME, VT and PA. We will determine how well these systems support commercially available natural enemies such as *Orius insidiosus*, *Aphidius colemani*,

Aphidoletes aphidymiza. We will also investigate whether these IPM plant systems

attract and sustain naturally-occurring beneficials. Results will help grower determine if these plant system are worth using in their operation. Keep your eyes out for workshops on high tunnel IPM in the future.

How attractive are Marigolds for luring Western Flower Thrips out of your Crop?

Through our past research we have found that flowering marigolds, especially Hero Yellow varieties, are very attractive to western flower thrips and will pull the pest out of bedding plants early in the season before they flower. Growers have often asked if marigolds work as well at getting the thrips out when the crop is flowering. To answer that question, for the past two years we have been assessing marigold attractiveness in flowering and non-flowering stages of bedding plants in greenhouse caged trials. Each year two plant varieties of different colors are tested over a 6-wk period. We infest the plants with lab-reared thrips, and then put a marigold in the middle. We count the number of thrips that are attracted to the marigold and the number that stay on the bedding plants. So far, we have tested red and white petunias; yellow and purple calibrachoas; orange and yellow osteospermums; and pink and red verbenas. In all of the trials marigolds had more thrips and damage than the bedding plants, but are the most attractive when the crop plants are not flowering. This demonstrates the need to get the marigolds in the crop early to reduce pest numbers early, before the bedding plants begin to flower. We are also testing the compatibility of insect-killing fungi (*Beauveria bassiana* (GHA), the fungus in BotaniGard) with commercial fungicides (Banrot and Subdue MAXX, *Trichoderma harzianum*, the fungus in RootShield and PlantShield). This will help growers decide when and where to apply fungicides to reduce their impact on beneficial fungi.



Marigold in flowering calibrachoas.

How can You decrease your pest Problems while increasing adoption of IPM?

For several years, the VT Greenhouse IPM One-on-One has worked with growers to encourage their use of IPM for greenhouse ornamentals. Individualized goal-oriented educational programs provide hands-on learning tailored to growers' unique interests, skill levels and needs. Participants adopted new practices, such as use of sticky cards and indicator plants for early pest detection, sanitation and rouging infested plants, spot treatments rather than greenhouse-wide sprays to reduce pesticide use, and refinement of biocontrol and more informed pesticide use. Growers felt pest damage to their crops was reduced because they used more IPM. With improved scouting programs, growers took action earlier to reduce or prevent outbreaks and damage. Growers in general said participating in the program gave them greater confidence in their ability to identify and manage pests and they transferred this knowledge to co-workers. Several operations have transitioned from conventional chemical control to a program that relies primarily on biological control to manage insect pests. **If your operation is in VT and would like to be a part of this program, please contact us or fill out the "Part of the Action" form located on the handout table.**

Putting it all together with a Marigold Plant-Mediated System to Manage Thrips

We evaluated combining a pheromone lure, insect-killing fungi and predatory mites on a flowering marigold to create a plant-mediated system to manage thrips. Marigolds and pheromone lures are highly attractive to thrips, and drew them from the crop for early detection. Predatory mites, *Neoseiulus cucumeris*, were released on the marigolds to feed on thrips larvae. When thrips are absent, predatory mites feed on marigold pollen sustaining them until prey are available. Granular fungal formulations were mixed into the soil to infect pupating thrips. The granular formulation enabled the fungus to colonize the soil, eliminating a need for repeat applications.

During the 2012-2014 growing seasons we tested this system in 12 commercial greenhouses at 6 sites. The following treatments were tested, 1) marigold with an experimental *Beauveria bassiana* fungus, thrips lure and predatory mites, 2) marigold with the *B. bassiana* fungus used in Botanigard®, thrips lure and predatory mites, 3) marigold with a thrips lure only, 4) marigold without a thrips lure, fungi, or mites, 5) yellow sticky card with thrips lure, and 6) yellow sticky card without a lure. At all sites, more thrips and damage were detected on the marigold system than surrounding crop plants. Though marigolds were highly attractive to thrips, because populations were generally low, differences in thrips numbers between the treatments were not significant. There was also little difference in the attractiveness to thrips of sticky cards compared to marigolds with lures or without lures. This suggests the lure may have limited value for attracting and detecting thrips. Mites were found in marigold flowers throughout the experiment, suggesting that mites are sustained on thrips and/or pollen for at least 12 wks, eliminating costs associated with their re-application. **For more information, see the handout “Granular Formulations of Insect-Killing Fungi with Plant-mediated IPM Systems for Thrips” in your folder.**

Bubble Greenhouse & Greenhouse Energy Efficiency

Greenhouses demand large amounts of energy to produce crops during the winter. We tested the suitability of two environmentally-friendly methods for reducing heat costs in hoop greenhouses—a standard thermal curtain and an experimental bubble insulation system. This is a unique device that generates soap bubbles to fill the space between the two layers of plastic covering the house. A standard 2-layer inflated plastic hoop house has an R-value of 1-2, while one filled with bubbles is reported to have an R-value of 30-40, which could reduce fuel use by 80%. Results in our test greenhouses (each 30 x 75 ft) show that the bubble system outperforms the thermal curtain in reducing fuel use. Over the 2011-2014 periods of operation, gas use was less in the houses with the curtain and bubble system than in the unimproved house. However, improvements are needed for the bubble system to fully realize its energy conservation potential. **For more information, see the handouts called “Retrofitting a Greenhouse for Energy Conservation” & “Novel Approaches to Improve Energy Efficiency in Northern New England Greenhouses” found in your folder.**

Western Bean Cutworm (WBC)..Yet Another New Pest to look out for!

This is an emerging pest in the eastern US. It attacks crops late in the growing season, feeding on field, sweet and popcorn and dry and snap beans. Larvae feed on developing kernels in husks or beans in pods. Prior to 2000, losses were limited to the western Corn Belt states, but now they are moving East. From 2011-13, we collaborated with Penn State and Cornell University on a survey, resulting in the first detection of WBC in VT (Chittenden Co.). In 2012-13, the survey was expanded to three more VT counties (Franklin, Rutland and Addison). In 2012, we collected 82 WBC adults. We collected 22 in 2013 and 100 in 2014. In all years, the peak flight period, based on trap catches, was from mid-June to mid-August and most of the WBC were collected in Addison County. These numbers are low, but WBC could become a serious pest in the future. Populations are increasing in parts of New York, and damage has been observed.

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