The Entomology Research Laboratory

What have we Done for you Lately?

Summary of our Research Activities in 2012-2013

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Refinement of Using Marigolds as Plant-Mediated IPM Systems for Managing Western Flower Thrips

Marigold in flowering calibrachoas.

Over the next 3 years, we will assess the attractiveness of marigolds to western flower thrips in non-flowering and flowering stages of bedding plants. Two annual plant varieties of different colors will be tested in 6-wk greenhouse caged trials. We will infest the plants with thrips, then place a marigold in the middle and assess the number of thrips that are attracted to the marigold. This year tested red and white petunias and yellow and purple calibrachoas. We found that marigolds are highly attractive to thrips in both flowering and non-flowering calibrachoas and petunias, but are most attractive when the crop plants are in non-flowering stages. For example, in calibrachoa, when thrips numbers were averaged over the 6-wk test period, there were 40/marigold vs. 27/yellow flowering calibrachoa, 28/marigold vs. 5/yellow NON-flowering calibrachoa, 5/marigold vs. 1/blue flowering calibrachoa and 13/marigold vs. 2/blue NON-flowering calibrachoa. The yellow calibrachoas and red petunias sustained higher populations of thrips and more damage than the blue calibrachoas and white petunias. By using marigolds in non-flowering calibrachoas and petunias, damage on plants from thrips could be less than if used when the crop plants are flowering. We are also testing the compatibility of insect-killing fungi (*Beauveria bassiana* (GHA), the fungus in BotaniGard and two experimental isolates) with three commercial fungicides (Banrot and Subdue MAXX, *Trichoderma harzianum*, the fungus in RootShield and PlantShield).

Managing Thrips with Fungi, Predatory Mites, and a Pheromone in a Plant-Mediated System

Marigold system in commercial greenhouse.

We are evaluating use of marigolds, a thrips pheromone lure, insect-killing fungi and predatory mites combined together as a plant-mediated system to manage thrips. Marigolds and pheromone lures are highly attractive to thrips, drawing them from the crop to allow for their early detection. Predatory mites are released on the marigold plant leaves to feed on thrips larvae. When three are no thrips, predatory mites feed on marigold pollen sustaining them until prey becomes available. A granular fungal formulation is mixed into the soil to target pupating thrips. The granular formulation enables the fungus to colonize the soil, eliminating a need for repeat applications.

For several years, controlled greenhouse and laboratory trials have been conducted testing the effectiveness of different rates and strains of fungal formulations produced on grain combined with predatory mites (*Neoseiulus cucumeris*). Three fungi were tested, including the *Beauveria bassiana* isolate found in the commercial product Botanigard®. We found there were 80% less thrips on marigolds treated with an experimental isolate of *B. bassiana* in the potting soil compared to a marigold without the fungus. Combining this isolate with predatory mites in the marigold foliage further reduced the thrips population. Now we are currently testing this system in 12 commercial greenhouses at 6 sites, with the addition of a pheromone lure to increase its attractiveness. The following treatments were tested, 1) marigold with an experimental *B. bassiana* isolate, thrips lure and predatory mites, 2) marigold with the *B. bassiana* isolate 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 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 of sticky cards and marigolds to thrips that had the lures than ones without lures. This suggests the lure may have limited value for detecting thrips. Mites were detected in marigold flowers throughout the experiment, suggesting that mites are sustained on thrips and/or pollen in the system for at least 12 wks, eliminating costs associated with their re-application. Two years have been completed. This season will be our final trial. For more information, see the handout ***"Granular Formulations of Insect-Killing Fungi with Plant-mediated IPM Systems for Thrips***".

IPM One-On-One & Grower Training Session: Reducing Pesticides by Increasing IPM Proficiency

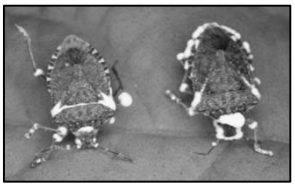
For several years, the VT Greenhouse IPM One-on-One has worked with growers to encourage IPM adoption in greenhouse ornamentals. Individualized goal-oriented educational programs provide hands-on learning tailored to growers' unique interests, skill levels and needs. To date we have reached growers at 11 different operations. Participants have 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 pesticide use. Growers felt pest damage to their crops was reduced because they used more IPM. As a result of their improved scouting skills and implementation of systematic 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 their pests and they transferred this knowledge to co-workers. In addition, three of the locations have transitioned from conventional chemical control to a program that relies primarily on biological control to manage insect pests.

Bubble Greenhouse & Greenhouse Energy Efficiency

Greenhouses can demand large amounts of energy to produce crops during the winter. We are testing 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%. To date results in our 3 test greenhouses (each 30 x 75 ft) show that the bubble system significantly outperforms the thermal curtain in reducing fuel use. Over the period of operation in 2011, 2012, and 2013 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. Testing will continue through 2014 while we refine the operation of the bubble system. We are also coordinating energy audits for growers in ME, NH and VT to demonstrate the value of this service for cutting energy costs. If you are interested in receiving an audit at your operation, contact Margaret Skinner (see below). For more information, see the handout called **"Novel Approaches to Improve Energy Efficiency in Northern New England Greenhouses"**.

Western Bean Cutworm (WBC)

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 Univ. 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. In 2013, we collected 22. These numbers are low, but it is expected that WBC could become a serious pest in the future.



Dead BMSB with fungal outgrowth after treatment.

Brown Marmorated Stink Bug (BMSB)

This exotic pest is expected to impact vegetable and fruit production in our region in the future. The BMSB has spread to 38 states including ME, NH and VT. It feeds on over 300 plants; many are important food crops. It is also a nuisance pest, entering homes in the fall in large numbers. To date, no chemical pesticide or biocontrol agent has been found to be very effective. UVM ERL scientists tested different concentrations of the commercial insect-killing fungus Botanigard® against adults and nymphs in lab trials. The fungal treatment was very effective, suggesting this biological approach could be suitable for managing them under field conditions. If you see a suspect insect, collect it and take it to your Extension office to check its identity. Please visit our website to view this pest and common lookalikes.

Scientists, Technicians and Students Currently Involved with these Activities

Bruce L. Parker	Margaret Skinner	Cheryl E. Frank Sullivan	Don Tobi
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Funding Sources and Grower Collaborators

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