Greenhouse Integrated Pest Management (IPM)
University of Vermont Entomology Research Laboratory
Summary of Current & On-going Research 2011-2012

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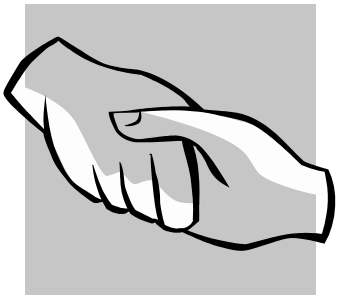


IPM One-On-One Program: Reducing Pesticides by Increasing IPM Proficiency

This is year 3 of the VT Greenhouse IPM One-on-One program. Our goal is to increase grower adoption of IPM in greenhouse ornamentals by providing individualized goal-oriented educational programs that provide hands-on learning experiences tailored to growers' unique interests, skill levels and needs. To date we have enlisted the participation of 8 growers, and in 2012, more will be added. Through meetings, surveys, site visits and evaluations we assisted growers in their effort to increase implementation of IPM. All participants who took part in the program have adopted new practices, such as use of sticky cards and indicator plants to detect pests early, sanitation and rouging of infested plants, spot treatments rather than greenhouse-wide applications to reduce overall pesticide use, and refinement of biocontrol and pesticide use. All of the participating growers felt pest damage to their crop plants was reduced because they used more IPM tactics. 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. Growers at two of the locations have transitioned from conventional chemical control to a program that relies primarily on biological control to manage insect pests. An additional location hopes to start a similar transition in 2012. Most locations sprayed fewer times and many used more biorational pesticides. Growers indicated that the greatest challenges hindering their expanded adoption of IPM were a lack of time to scout, hard to control insect/mite pests, lack of workers skilled in IPM, consumer intolerance for infested plants, ineffective pesticides and lack of knowledge of pest biology.

Thrips Biological Control with Fungi, Predatory Mites within a Plant-Mediated System

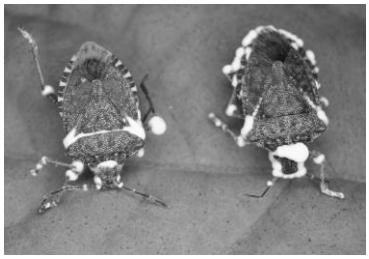
Thrips remain the most difficult pest in greenhouse ornamentals and resistance to pesticides has been reported. Effective and affordable non-chemical approaches must be developed so growers can use biological control more efficiently. This research builds on our previous work by evaluating use of insect-killing fungi and predatory mites together within a plant-mediated system to attract thrips out of the crop and manage them on that plant. Marigolds are highly attractive to thrips and can be used for early detection, and perhaps to draw the pest away from the crop. Because marigolds produce pollen, they also can serve as a habitat for predatory mites, providing a food source in the absence of prey. We are testing ways to enhance the effectiveness of this plant-mediated system by incorporating a granular fungal formulation in the soil to target pupating thrips. Predatory mites released on the foliage targets thrips in the plant canopy. The granular formulation enables the fungus to colonize the soil, eliminating a need for repeat applications. Greenhouse and laboratory cage trials have been conducted over the past 4 years to test the effectiveness of different granular fungal formulations produced on grain applied at different rates combined with predatory mites (*Neoseiulus cucumeris*). Three fungi were tested, including the *Beauveria bassiana* isolate found in the commercial product Botanigard®. Preliminary results suggest that thrips were maintained at relatively low levels for 10 wk on marigolds in which the fungus and predatory mites were combined. This research could revolutionize IPM for thrips. It demonstrates the great potential of insect-killing fungi for use against thrips when a highly virulent strain is combined with predatory mites as part of a total system. In 2012, additional large scale commercial greenhouse trials will be conducted to further assess the effectiveness of these biological control systems. Check out the handout "***"Marigolds, Fungi & Predatory Mites, Oh Boy! Plant-Mediated IPM Systems for Managing Western Flower Thrips Research Summary 2008-2011"*** detailing the results from these projects.

Marigold plant-mediated IPM system in commercial greenhouse.

Bubble Greenhouse & Greenhouse Energy Efficiency

Unfavorable weather is a bane to farmers leading to financial instability. Growers are turning to greenhouse production to reduce loss due to poor weather and increase the length of the growing season. Though plastic hoop houses are inexpensive to erect, they demand large amounts of energy in this region. We are currently 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 up to 80%. To date results in our 3 test greenhouses (each 30x75 ft) show that the bubble system significantly outperforms the thermal curtain in terms of reducing fuel use. Over the period of operation in 2011, gas use was 25% less in the bubble house and 7% less in the curtain house than in the unimproved house. Gas use was 20% less in the bubble house than in the one with the curtain. In general, 3-7 ccf/day more natural gas was used in the control house than in the bubble house, which represents a savings of over $8/day. Savings would be even greater for larger greenhouses and those heated with propane or oil, which are the fuels more commonly used by greenhouse growers in northern New England. Testing of the systems will continue in 2012 while we make improvements to the bubble system. Through this project, we are coordinating energy audits for growers in the 3 states to demonstrate the value of this service for cutting energy costs. Check out the **Small Farm Quarterly** article "***Soap Bubbles to Insulate Greenhouses: A New Approach to Energy Conservation***" (on the flip side of Greenhouse Energy Efficiency Resources handout) detailing this exciting project!

Brown Marmorated Stink Bug (BMSB)



Dead BMSB with fungal outgrowth after treatment.

This is one of the latest exotic invasive pests to reach northern New England, and it is expected to have a major impact on vegetable and fruit production in the future. There have been several sightings in New Hampshire and Vermont this year. It is known to feed on over 300 plants, many of which are important food crops. Damage to crops in New Jersey and Pennsylvania this year was estimated to be in the millions. It also is a serious nuisance pest, when it enters homes in the fall in large numbers. To date, no chemical pesticide or biological control agent has been found to be particularly effective. UVM ERL scientists tested the effectiveness of the commercial insect-killing fungus Botanigard® against the adult stage in laboratory trials. Three concentrations of the fungus were tested, and the highest rate killed 67-100% of the adults within 12 days. More research is needed to determine how best to use this microbial product under field conditions. Several other naturally-occurring insects are often mistaken for the BMSB. Collect suspect specimens and take them to your Extension specialist to confirm their identity.

Key features of BMSB: Greyish or brown shield-shape body, two white bands on antennae; hard shield on its back.

Scientists, Technicians and Students Currently Involved with these Activities

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Funding Sources and Grower Collaborators (Alphabetical Order)

- American Floral Endowment
- Claussen's Florist & Greenhouses
- Dutton Berry Farm
- Edgewater Farm
- Gardener's Supply
- ME Extension Service
- NH Extension Service
- NH Horticulture Foundation
- Northeast Sustainable Agric. Research & Education Program
- Organic Farming Res. Foundation
- Sam Mazza's Farmstand
- Univ. of Vermont Extension
- USDA Emerging & Critical Pests Prog.
- USDA Extension IPM Program
- USDA Agric. Research Service
- USDA HATCH Program
- USDA NE IPM Comp. Grants Program
- USDA NRCS CIG Program
- VT Greenhouse IPM Program
- Walker Farm

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