INTEGRATED PEST MANAGEMENT

insights

Spring 2013
Northeastern IPM Center

Chapter 1

Collaborators in Region Join Chorus against Spotted Wing Drosophila

Researchers and educators, working together online and in the field, are confronting an invasive species that has changed the tune for Northeastern fruit growers: the spotted wing drosophila (SWD).

Cacophony: SWD damages raspberry. Source: Hannah Burrack, North Carolina State University, Bugwood.org

Chapter 1

Spotted Wing Drosophila

HOW TO CATCH THIS FRUIT FLY

Traps can be made inexpensively from plastic cups, or from pint- or quart-sized deli or yogurt containers with lids. Drill or poke about ten 1/8" diameter holes just under the upper lip of each container. Pour in one to two inches of apple cider vinegar, or bait as recommended by your extension service, plus one drop of unscented dish detergent. Place traps near crop plants before fruit begin to color. Strain collected small flies from the bait solution at least once a week. Check online factsheets for pictures of male and female SWD. Magnification helps to identify male SWD, and is required to distinguish female SWD from other species. Check fruit for larvae (maggots), as they may infest fruit even before adults are caught. Dispose of unwanted or fallen fruit to prevent SWD from using it as a breeding site. For more management details, see:

http://www.northeastipm.org/swd/

SWD is a small "fruit fly" that has upset crop production across North America as it has moved eastward since its discovery in California in 2008. The three-millimeter adult female SWD saws through soft-fleshed fruit as it approaches its peak of ripeness, laying eggs in raspberries, blueberries, blackberries, strawberries, grapes, and late-season peaches, all valuable crops in the Northeast.

In 2011–12, the Northeastern IPM Center awarded about $210,000 in funds for SWD research, including a Regional IPM Competitive Grant of just over $160,000 to Richard Cowles, a scientist at the Connecticut Agricultural Experiment Station, for research on sustainable management of SWD. The Center also funded three Urgent IPM projects in the fall of 2011 totaling just under $30,000.

Glen Koehler, an associate scientist at the University of Maine, received one of those grants. He recalled that in August 2011, "Fall raspberry growers in Connecticut and New Hampshire got clobbered. More than one grower told me that this pest was driving them out of business."

Orchestrating a Response

Going into 2012, Koehler knew that New England fruit growers faced an imminent threat and needed information on whether the problem would reoccur. If it did, growers would need to know where and when SWD was spreading. "My plan was to get everyone working on the same page. I knew we could be more efficient and

get a better handle on the situation if we collaborated on methods and combined our observations."

As part of that collaboration, Koehler worked with Cowles to organize a meeting in March 2012 of 40 extension and research staff from New England and New York to learn about SWD biology, monitoring, and management. Cowles devised the bait and provided biological insight that Koehler used to design a simple, inexpensive, and effective New England-wide SWD survey protocol.

Showtime

The grant funds made it possible to build and distribute over 1,000 traps and enough bait formula for season-long trapping at 244 different sites, with multiple traps per site. Survey leaders in each of the cooperating states—Jim Dill, David Handley, and Frank Drummond in Maine; Heather Faubert in Rhode Island; Alan Eaton in New Hampshire; Sonia Schloemann in Massachusetts; Mary Conklin in Connecticut; and Ann Hazelrigg in Vermont—provided labor and vehicles for weekly visits to collect trap contents, count SWD, and record observations. Joseph LaForest, University of Georgia, and Hannah Burrack, North Carolina State University, provided access to a computer mapping system tailored to display the New England information.

"It is important for us to work together," Koehler said. "We are providing a bird's eye view of the SWD threat that is much more powerful for understanding and managing SWD. We received just under $10,000 from the Northeastern IPM Center, and we leveraged that with extension and research programs across six states to prevent roughly $6 million of crop losses in 2012, as estimated by crop specialists surveyed in each state. Our early warning network is paying off."

"Growers are looking at a crisis where nature, markets, and risk all meet," Koehler said. "They were hanging out there, and needed an integrated pest management system to confront this problem and help them out. This is exactly why we need the Northeastern IPM Center. It can address the issue on a regional scale, quickly providing resources to let us work together to solve this problem."

Singing the Same Tune

Koehler and his group distributed fact sheets that Kathy Demchak, an extension associate at Penn State University, produced with Northeastern IPM Center funds. Demchak networks with growers, making sure they are aware SWD is out there. "Unfortunately, sometimes growers haven't noticed the pest, and haven't realized how infestations could quickly get so bad," Demchak said. "They were facing 50 percent crop loss, or had to shut down entirely at the peak of harvest." And, she adds, crop damage is preventable if caught early. The key is getting people to monitor for SWD.

“What’s really impressed me is how interested extension educators are in helping growers,” Demchak said. “Even in these days of cutbacks and heavy workloads, these people are making an extra effort to improve a situation. When we pull in the same direction, we reach a common goal.”

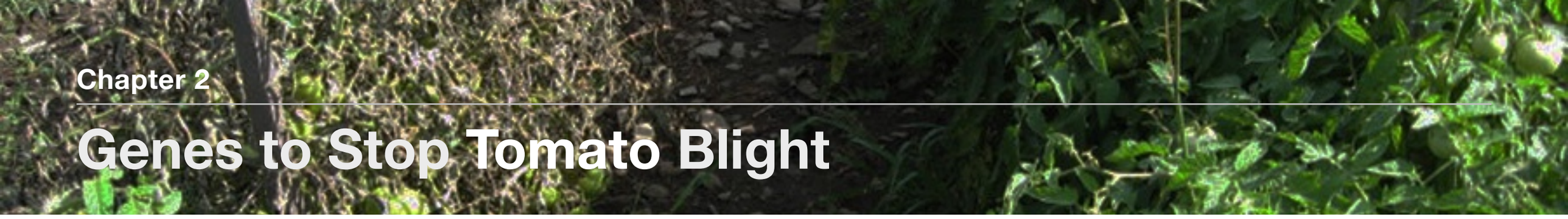
Chapter 2

Setting the Gold Standard for Tomatoes

When food lovers choose items for a grocery list or plan a garden plot, tomatoes take the prize. Tomatoes rank first among the top ten most popular vegetables grown in home gardens and fifth among the most profitable vegetables to grow.

In 2009, airborne fungus late blight, which can spread through a garden or field in just a few days, decimated tomato crops in the Northeast.

Tomatoes susceptible to late blight, on the left, contrast with tomato hybrids resistant to late blight, early blight, and septoria leaf spot. Source: Mike Gloss, Kingbird Farm; Martha Mutschler, Cornell University.



Chapter 2

Genes to Stop Tomato Blight

NATURAL ADVANTAGE

"Tomato breeds that contain genetic control of all three diseases have little to no need for fungicide applications."

Some growers in the region reported total tomato crop loss. Scientists stepped up creation of blight-resistant tomato varieties, working with new urgency on research they had begun years before.

In addition to late blight, early blight and septoria leaf spot also threaten Northeastern tomato crops. Martha Mutschler of Cornell University stepped into the ring with a goal of knocking out this fungal triple threat. With a USDA Regional IPM Competitive Grant from the Northeastern IPM Center in her corner, Mutschler prepared to go the distance to combine the winning genetic characteristics for fungal resistance in tomato crops.

Finding Genes that Protect

Mutschler and her team of collaborators—including Tom Zitter of Cornell, Kelly Ivors and Randy Gardner of North Carolina State University's Mountain Research Station, and many extension partners in New York, West Virginia, Pennsylvania, and North Carolina—learned that plants carrying the late-blight-resistance genes Ph2 and Ph3 formed the gold standard of late-blight resistance.

Tomato breeds that contain genetic control of all three diseases have little to no need for fungicide applications. They naturally resist the effects of late blight and septoria. Mutschler's varieties underwent testing in both organic and conventional settings to meet the needs of diverse growing methods.

Shared Bounty

Mutschler and her collaborators release their tomato lines nonexclusively. All seed companies have access to the triple-resistant tomato lines and the molecular markers for the Ph2 and Ph3 resistance genes. Thus they can add the triple fungal resistant trait to their new varieties. To make selection easier for growers, Mutschler and Zitter developed a list of tomato variety characteristics with their resistance and tolerance capabilities. See the Vegetable MD Online website: http://vegetablemdonline.ppath.cornell.edu/.

Among the varieties already on the market for the 2013 growing season is the new triple-fungal resistant tomato hybrid “Iron Lady” (High Mowing Organic Seeds). More new hybrids with the trait are expected to be released by several seed companies in the next few years. “The process is moving fast,” says Mutschler. “At this rate, new varieties might come out yearly,” she predicts.

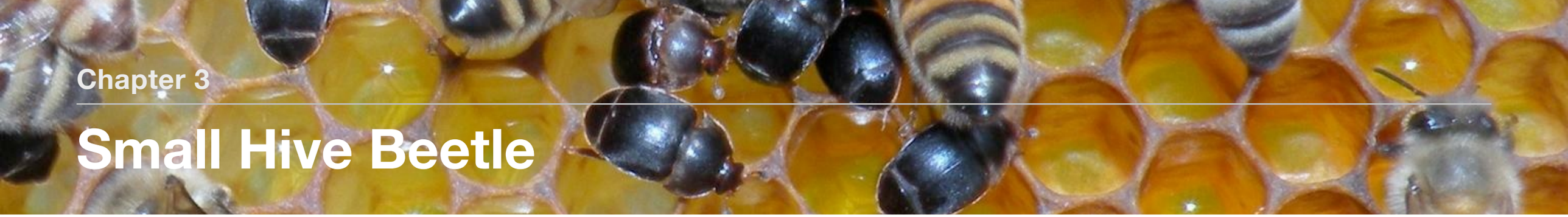
This means there is much work to be done. Mutschler hopes to breed tomato lines with even stronger resistance to early blight. What’s more, Mutschler is combining genes for different traits to solve other problems. She says she is confident that her team will continue to develop tomato plants that can withstand a wide range of pest insects and diseases spread by them.

Chapter 3

Small Steps to Help Honeybees

Scientists are trying to stop the small hive beetle (SHB, *Aethina tumida*) that carries pathogens into honeybee colonies.

Small hive beetle among honeybees. Source: Jessica Lawrence, Eurofins Agroscience Services, Bugwood.org



Chapter 3

Small Hive Beetle

TRAPPING STRATEGIES

Gruner reached 22 local and regional associations of beekeepers over the 24-month project.

A team led by Daniel Gruner of the University of Maryland received funds from the Northeastern IPM Center to develop strategies to manage the beetle. Gruner tested biopesticides, natural enemies, and trapping methods. Although a natural enemy, a nematode, would attack SHB in the lab, neither the biopesticides nor the nematode proved to be a significant defense in operational honeybee colonies. However, in-hive trapping strategies for SHB showed promise. Gruner reached 22 local and regional associations of beekeepers over the 24-month project. As a result, hundreds of beekeepers gained an increased awareness of this emerging pest of honeybees and trapping methods that could help stop it.

Chapter 4

Designing Stink Bugs Out of Landscapes

The brown marmorated stink bug (BMSB) has a non-discriminating palate and a healthy appetite. The pest thrives on numerous plant species as both food sources and suitable places for laying its egg masses. Ornamental plants face the same risks of BMSB infestation as fruit and vegetable crops.

The brown marmorated stink bug prefers plants that it "knows" evolutionarily, such as cornus *(dogwood). Source: Rob Routledge, Sault College, Bugwood.org*

Chapter 5

Brown Marmorated Stink Bug

VULNERABLE ORNAMENTALS

Researchers recently conducted a study of BMSB in woody ornamentals commonly found in home and public landscapes of the Northeast, with the goal of determining whether BMSB can be designed out of landscapes. Principal investigator Erik Bergmann led the team from the Northeastern IPM Center's BMSB Working Group and the University of Maryland.

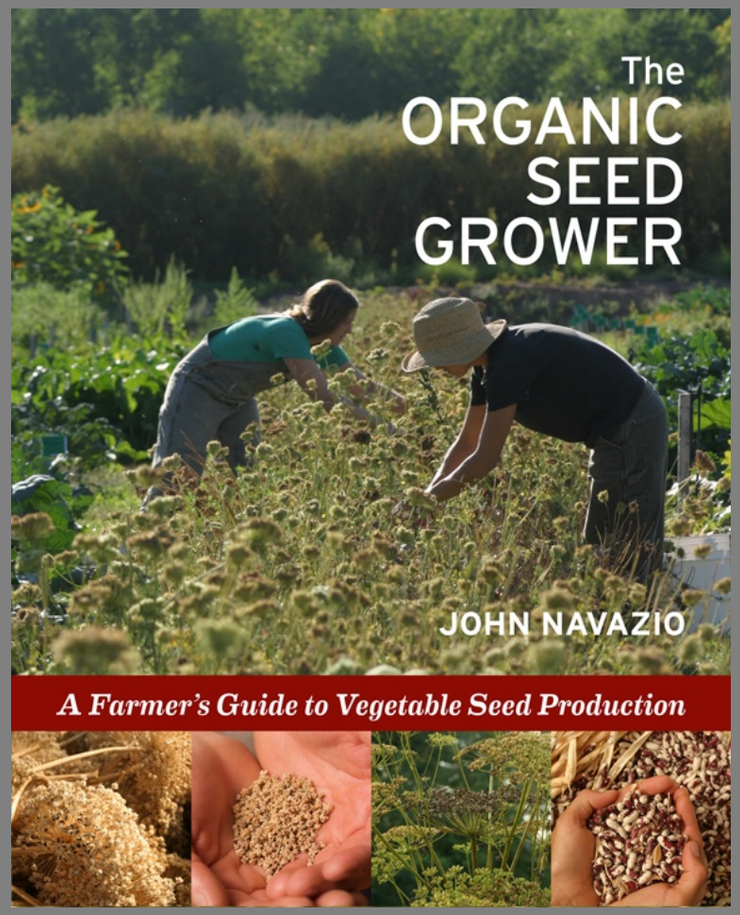
With a robust sampling of nearly 200 cultivars and more than 2,000 individual native and non-native plants, Bergmann and his team observed over 13,000 BMSB and their egg masses for two years.

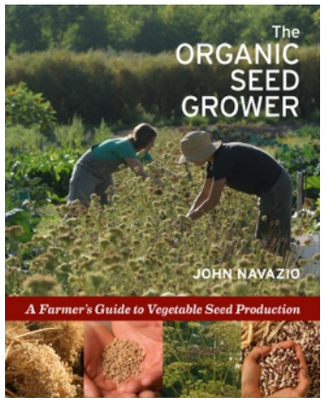
The research focused on which plants most attract BMSB throughout the insects' annual cycles. Researchers honed in on specific characteristics that most appealed to BMSB. "BMSB preferred flowering species, or angiosperms, over evergreens, or gymnosperms, at a ratio of 5:1," said Bergmann. "They also preferred hosts that they 'know' evolutionarily, like cornus (dogwood), but can favor some native hosts like acer (maple) and ulmus (elm)."

Bergmann's team is currently working to compile recommendations for designing BMSB out of the landscape, based on the patterns of behavior discovered during research. "We hope to take our findings on behavior patterns and apply them to smaller residential landscapes," Bergmann concludes. He anticipates publishing his team's recommendations this fall.

Chapter 5

Resources





The Organic Seed Grower is a comprehensive manual for the serious vegetable grower who is interested in growing high-quality seeds using organic farming practices. This book is published by Chelsea Green with support from Northeast Sustainable Agriculture Research and Education (SARE). It is written for both serious home seed savers and diversified small-scale farmers who want to learn the necessary steps involved in successfully producing a commercial seed crop organically.

http://www.chelseagreen.com/bookstore/item/the_organic_seed_grower:hardcover

Grubs in your lawn? A guide for lawn care professionals and homeowners. This five-panel brochure describes the symptoms of a grub-infested lawn. It details the steps to assessing the damage and treating effectively and safely. Photos and illustrations show life stages, natural enemies, different types of grubs, and scouting methods.

http://www.nysipm.cornell.edu/publications/grubs/

Bird Damage Prevention for Northern New England Fruit Growers. A publication on managing bird problems is now available from the University of New Hampshire website. The information is primarily directed toward Northeastern US bird problems in crops, but the principles are broadly applicable.

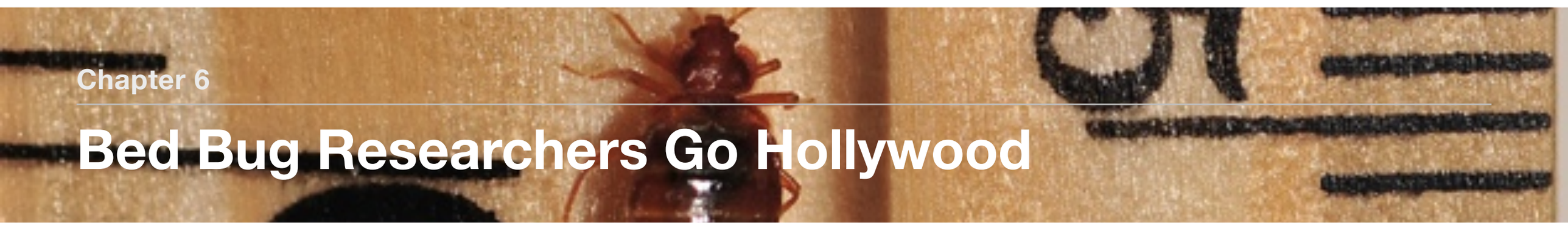
http://extension.unh.edu/resources/files/Resource001797_Rep2514.pdf

Chapter 6

Researchers Make Movies to Get a Jump on Bed Bugs

Scientists are sharing their knowledge in the battle against bed bugs by fashioning themselves after Hollywood stars. They've launched three videos on the web as part of their multi-faceted outreach.

Two bed bugs hide in the hole of a ruler. A third looks on from the edge.
Source: Changlu Wang, Rick Cooper, Department of Entomology, Rutgers New Jersey Agricultural Experiment Station, Cooperative Extension.



Chapter 6

Bed Bug Researchers Go Hollywood

PESTS AT THE MOVIES

"Making resources available to those with limited time to travel may be the key."

Changlu Wang and Rick Cooper, researchers at Rutgers University, say that while the bed bug problem has grown, in-person trainings can be expensive and attendance may be hit-or-miss. "It's not a lack of interest that keeps people from attending training events, it's lack of time," Cooper says. "Making resources available to those with limited time to travel may be the key."

With support from the Northeastern IPM Center and EPA, the bed bug team at Rutgers has produced three videos, recorded live presentations at multifamily properties, written fact sheets, and published research on key aspects of the bed bug puzzle. All of these resources are now available at http://njaes.rutgers.edu/bedbug/.

Cooper points out, "Videos offer a great opportunity for those who want to see and hear the information presented." Through two IPM Partnership Grants, the Northeastern IPM Center funded the construction of the website and these videos:

- *Bed Bugs and Integrated Pest Management*, a seven-minute overview of the biology, behavior, and control options;
- *Las Chinches de Cama y el Manejo Integrado de Plagas*, a Spanish version of the seven-minute English video; and

- *Bed Bug Management for Professionals*, which details how a Pest Management Professional conducts a bed bug service. Cooper says, “This 40-minute video is good for both new technicians and those who have been working in the pest management industry.”

The videos are intended to speak to a wide audience. Cooper says, “We are using the seven-minute video to train housing managers, staff, and residents. The video delivers the messages in a concise manner that keeps their attention as much, and sometimes more, than an in-person presentation.”

Chapter 7

Credits

Photo Credits

Cover: Magnolia. Source: Jason Sharman, Vitalitree, Bugwood.org

“Collaborators in Region Join Chorus against Spotted Wing Drosophila.” Cacophony: SWD damages raspberry. Source: Hannah Burrack, North Carolina State University, Bugwood.org

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“Setting the Gold Standard for Tomatoes.” Tomatoes susceptible to late blight, on the left, contrast with tomato hybrids resistant to late blight, early blight, and septoria leaf spot. Source: Mike Gloss, Kingbird Farm; Martha Mutschler, Cornell University.

“Small Steps to Help Honeybees.” Small hive beetle among honeybees. Source: Jessica Lawrence, Eurofins Agroscience Services, Bugwood.org

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Northeastern IPM Center

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