

INTEGRATED PEST MANAGEMENT

# insights

January 2015



## Chapter 1

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# A Sustainable Way to Protect Vegetables: Cover Crops

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Growers who use cover crops not only can improve soil health, but also protect vegetables from soilborne pathogens.



## A Sustainable Way to Protect Vegetables: Cover Crops

If you are a vegetable grower, you may spend a fair amount of time thinking about production yield. In studies conducted at Cornell University, researchers are finding that sustainable protection may be equally important. Cover crops have a role in both raising production yield and sustainably protecting cash crops.

Growers who use cover crops not only can improve soil health, but also protect vegetables from soilborne pathogens. These findings come from a study funded by the Northeastern IPM Center and led by George Abawi of Cornell.

Abawi and his team began work on the project in 2008 when they planted eight acres of snap beans in Geneva, New York. They studied eight types of cover crops —plants grown to enrich and protect the soil: winter rye grain and hairy vetch, oat, sudex, forage radish, red clover, rapeseed, buckwheat, and Jensen wheat. They also tested a fallow control. They compared four cropping systems: future IPM, present IPM, organic, and conventional. The researchers followed commercial production guidelines for IPM, organic, and conventional systems. According to Abawi's research team, "future IPM" is a cropping system based on present IPM and the use of rotational and cover crops.

## Cover crop story

"Through our project, growers and industry personnel are learning more about the general benefits of cover crops on root diseases, weeds, soil fertility, and the factors that contribute to overall soil health," Abawi said.

Rye/vetch, wheat, and rapeseed provided the highest biomass in all production systems and during all seasons. Clover, oats, and buckwheat also provided considerable biomass gains. The highest marketable yield of snap bean was grown in the field managed as the future IPM production system. This field also had the highest soil quality level and the lowest ratings for root rot severity. The conventionally managed field had the lowest soil quality and the highest root rot ratings. The lowest bean yields were generally in the buckwheat and fallow fields.

## Preventing weeds and diseases

Researchers documented the prevalent root disease pathogens *Fusarium solani* f. sp. *phaseoli*, *Pythium ultimum*, *Thielaviopsis basicola*, and *Rhizoctonia solani* in study plots. Surprisingly, a cover crop of buckwheat or clover increased root rot severity in snap beans, similar to the fallow check. The lowest accumulated increases of root rot occurred in the cover crop plots of wheat, sudex, oat, and radish. Wheat appeared to be most effective against root rot in the organic production field.

Weed pressure was least in the rye/vetch, wheat, and rapeseed plots, and most severe in the fallow/check, buckwheat, and sudex plots.

In terms of soil health, the highest active carbon values were found in the organic and future IPM system fields. Specifically, rye/vetch, radish, and oats yielded the highest active carbon values in the organic system. Not surprisingly, the lowest values were in the fallow/check plots. Organic matter was highest in the organic and future IPM systems fields.

## Show on the road

Over three years, the researchers presented at nine farm expositions with hundreds of participants. They also published six research papers.

"Although cover crop ratings may change as more data is collected, a pattern is emerging," said Abawi. "Cover crops have indeed become a major tool for the management of soil health."

He hopes to soon make recommendations for cover crops that could be used to manage certain soil health conditions and root disease pathogens.

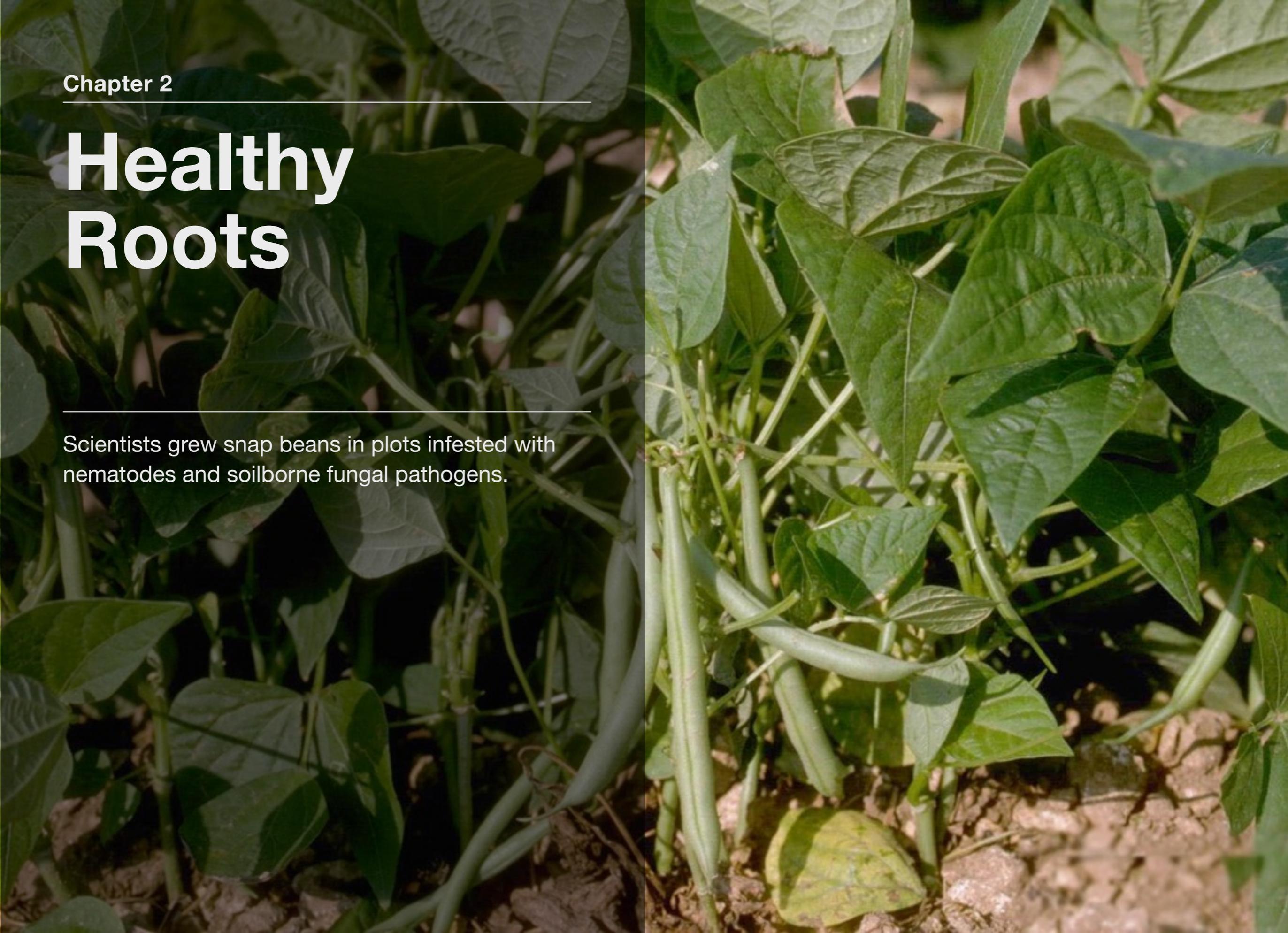
Chapter 2

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# Healthy Roots

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Scientists grew snap beans in plots infested with nematodes and soilborne fungal pathogens.



# Healthy Roots

In Connecticut, a team led by George Abawi of Cornell University grew snap beans in plots infested with nematodes and soilborne fungal pathogens. They then tested how various cover crops protected the cash crop.

The highest shoot and root weights resulted after a cover crop of forage radish and rapeseed. Also, beans grown after radish, rapeseed, sorghosudangrass and millet had the lowest root rot ratings. Highest shoot, root and bean yield were again obtained after forage radish and rapeseed. Pearl millet also resulted in increased bean growth and yield.

In Pennsylvania, researchers located four fields with a history of significant root disease pressure. They set up plots, half with and half without a cover crop. Scientists found a reduction in soilborne pathogens in rye and rapeseed cover crop fields. Root health ratings also improved.

## Chapter 3

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# New Director Assesses Priorities for Region

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Steve Young, the new director of the Northeastern IPM Center, will emphasize communication and education as he assesses priorities for the region.



# New Director Assesses Priorities for Region



Steve Young, the new director of the Northeastern IPM Center, says that communication and education will be the defining tune as he takes to the podium to promote integrated pest management in the region.

That trajectory is evident in several recent moves the new director has made. As part of these initiatives, the Center is building a webinar series—a recent webinar on bed bugs attracted over 3,000 people. Print issues of the IPM Insights newsletter will arrive quarterly, and content will roll onto the web and through social media throughout the year. Young’s team is updating the website to make it more mobile friendly and streamline access to information.

“Ultimately, I want our Center to be the unifying spokesperson on integrated pest management for the region,” Young said.

Not every detail of work will happen online. The new director Young recently embarked on a two-week tour of the Northeast region to meet partners and stakeholders face to face.

“This work is valuable as we understand the priorities and look at what lies ahead,” Young said. “Our state IPM coordinators, researchers, Extension personnel, and supporters from federal agencies and the private sector are going to be critical to this process.”

## Signature Programs

Young envisions five signature programs under which all efforts of the Center will be organized. The programs were shaped by the Steering Committee and informed by the Advisory Council at meetings in the fall of 2014. At present, the areas of focus for the programs are IPM and organic systems, rural and urban IPM, climate change and pests, next generation education, and advanced production systems.

- IPM and organic systems: The Center is interested in the intersection of IPM and organic methods.
- Rural and urban IPM: IPM works in all environments where food is produced and where people live, work, and play.
- Climate change and pests: Changes in climate could bring shifts in the distribution and occurrences of pests.
- Next generation education: Students and professionals trained and certified in the fundamentals of IPM will be critical in maintaining the knowledge base for the future.
- Advanced production systems: This area is focused on how technology—from robots to geographic information systems to apps to computers to entirely new types of farming—could help advance the development and adoption of IPM.

“I have been telling people that we want to engage with them,” Young said. “We want to help them get their message out, support them in numerous other ways, and promote the adoption of IPM.”

Chapter 4

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# Growers, Scientists Tackle Spotted Wing Drosophila

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Growers in the Northeast could lose tens of thousands of dollars per farm each year as they try to manage SWD.



# Growers, Scientists Tackle Spotted Wing Drosophila

A vineyard owner who runs a small operation remembers the day when he took some softened grapes to the Hudson Valley Laboratory for analysis. The entomologist there found 17 young flies under the skin of the first berry. “They just poured out,” the owner recalls.

The culprit: spotted wing drosophila (SWD), a small vinegar fly about three millimeters in length. The male of the species has dark spots on the wing tips. The female uses its large, serrated ovipositor to saw into healthy, ripe fruit such as raspberries, blueberries, blackberries, strawberries, grapes, and late-season peaches, all crops in high demand in the Northeast. First detected in California in 2008, the invasive insect has disrupted fruit production as it has swept eastward since then. High rainfall and humidity in the Northeast have been favorable to SWD. Plus, there’s an abundance of wild hosts. Entomologist Peter Jentsch of Cornell University estimates that growers in the Northeast could lose tens of thousands of dollars per farm each year as they try to manage SWD.

## **Reason for Hope**

Alan Eaton, an entomologist at the University of New Hampshire, determined that through the efforts of New England collaborators, growers in New Hampshire alone were able to reduce their losses from \$1.5 million in 2012 to \$526,000 a year later.

The Northeastern IPM Center awarded about \$215,000 for SWD research in the region in 2013, including a Regional IPM Competitive Grant of \$175,000 to Cesar Rodriguez-Saona, a scientist at Rutgers University, for research on sustainable management of SWD. In 2014 the Center funded the SWD Working Group with a grant of \$10,000. The Working Group met in September of 2014 in Highland, New York to coordinate research and extension activities and set priorities for the region.

### **Probing a Variety of Questions**

Is it better to place traps on the edge of farm fields, in the woods near fields, or in the fields themselves? Jentsch is studying *Beauveria bassiana*, a fungus that grows naturally in soils throughout the world, which could control SWD larvae. Dale Ila Riggs, a grower who runs the Berry Patch and leads the New York State Berry Growers Association, is testing netting on a large scale to exclude SWD. Her prototype contraptions look like high tunnels made of netting.

Meanwhile, scientists are trying to determine the best bait and trap design to control SWD.

Dean Polk of Rutgers said a fermentation product (flour and yeast in apple cider vinegar) is the best type of bait, followed by Trece, a commercial lure. He says researchers have not yet developed threshold limits for SWD management, because trap catches are inconsistent relative to infestation in fruit.

### **Recommendations**

One grower recommends getting more susceptible varieties of fruit out locally and quickly. Pick every day. (But then, labor costs increase.)

The vineyard owner in the Hudson Valley recommends cleaning the floor of the vineyard, not composting on the ground to avoid creating a breeding habitat for SWD.

It's important to properly manage pomace, the pulpy residue remaining after fruit has been crushed in order to extract its juice. Don't put this back next to the crop. Either put a sheet of plastic over it to solarize it or spread it over a field with a manure spreader so it will dry out faster.

Richard Cowles of the Connecticut Agricultural Experiment Station recommends an SWD trap made by placing a whole wheat mixture in a vented, sealed cup inside a second, larger cup. For more on SWD traps, see the sidebar, right.

For more recommendations including identification, monitoring, and chemical options that can help manage SWD, visit:

[NortheastIPM.org/swd](http://NortheastIPM.org/swd)

*Image: Ross MacKeil identifies SWD catch in a Londonderry, NH orchard. Source: A. Eaton, Univ. of NH*

# How to Trap Spotted Wing Drosophila

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Catch spotted wing drosophila by placing homemade kombucha in a trap made from a two-liter bottle.



# How to Trap Spotted Wing Drosophila



For monitoring purposes, the commercial baits available through Trece perform very well. For mass trapping, such an attractant would be prohibitively expensive. Homemade kombucha as a liquid bait has many advantages, including its low cost.

The bottle trap is a major advance over the cup trap. Starting materials are inexpensive, the trap is relatively easy to make, and having the opening at the bottom of the trap will be compatible with use of insecticide and sugar baited sprays in an attract-and-kill program.

The two-liter bottle trap with the small head space is statistically indistinguishable in trap efficiency from the Trappit design, which costs about \$12 per trap. The material cost for the bottle trap is about \$0.07 per trap, and it takes five to ten minutes to convert a two-liter bottle into such a trap.

A mesh with three millimeter openings will exclude larger insects from entering the trap. This reduces the trap catch by about fifty percent; since the trap could be used with insecticides, the number of flies removed in total would not be compromised. Assessing the trap contents certainly is easier without the large insects.

## **How to Make Kombucha**

To make kombucha, the starting materials are water, sugar, white vinegar, and a SCOBY (symbiotic community of bacteria and yeast) that can be inexpensively obtained online. An adequate recipe for kombucha is to use 4 cups of sugar added to 4 gallons of extremely hot water in a 5 gallon bucket. Cover (butcher paper or newspaper) while the mixture cools. Once cool, add 1 fluid ounce (30 ml, or 2 tbsp) of white vinegar, and then add the SCOBY to start the fermentation. Cover the bucket, and hold in a warm location for one to two weeks. At the end of this period, the kombucha should be effervescent and have an aroma reminiscent of apple cider that has started fermenting. Be sure, if you transfer the kombucha to plastic jugs, to leave the lid loose so that the bottle will not explode. At a cost of about \$1 per gallon for an attractant that can last two or more weeks, kombucha will be very difficult to beat.

## **How to Make the Two-Liter Bottle Trap**

The bottle trap is a major advance over the cup trap. Starting materials are inexpensive, the trap is relatively easy to make, and having the opening at the bottom of the trap will be compatible with use of insecticide and sugar baited sprays in an attract-and-kill program.

To make the bottle trap, cut the top of a two-liter bottle so that you have an opening 3.5 cm in diameter. Push the top of the

bottle into the interior of the bottle, until the cut edge is 6 cm on the inside of the trap. Cut the bottle 6 cm from the bottom. Take the bottom portion of the bottle, and using a hole punch, make two holes on opposite sides. These holes will be used for hanging the trap on a string. Insert a 50 cm length of string through the holes, and tie a 2 cm length of small diameter dowel to each end of the string. When using this trap, partially fill the bait reservoir with kombucha or a 60:40 mixture of red wine and vinegar. Insert what used to be the bottom of the bottle into the top of the trap, so that there is only about a 1 – 2 cm space between the opening into the trap, and the “ceiling” of the space inside the trap. Use tape of any sort to hold the two parts together, and hang the string over a branch of a blueberry or raspberry plant so that the trap will mostly be kept in the shade. The upper part of the trap will form a second reservoir that may retained rain water, which may improve attraction of SWD to the trap.

*Image: The red cup trap, two bottle traps, and the Trappit trap.*

*Source: R. Cowles, Connecticut Agricultural Experiment Station*

*Article Source: Richard Cowles, Connecticut Agricultural Experiment Station*

# Thousands Line Up for Bed Bug Webinar

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Over 3,000 people registered for a recent webinar on bed bug prevention and management hosted by the StopPests in Housing Program of the Northeastern IPM Center.



# Thousands Line Up for Bed Bug Webinar



Over 3,000 people registered for a recent webinar called “Lowering Costs with an In-House Bed Bug Prevention and Management Plan” hosted by the StopPests in Housing Program of the Northeastern IPM Center. WebEx, the webinar hosting provider, enabled the first 1,000 users to sign in; over 2,000 people have watched the recording. The event took place on September 10.

Dini Miller and Molly Stedfast from Virginia Tech University shared their extensive knowledge on bed bug prevention and management in multifamily housing. The audience was mainly from the affordable housing community including property managers, maintenance staff, contract officers, and service coordinators. Professor Miller is an internationally recognized expert on bed bug biology, behavior, and control. She is the urban pest management specialist for the State of Virginia and heads up the Dodson Urban Pest Management Lab at Virginia Tech. Molly Stedfast is the director of the new Bed Bug and Urban Pest Information Center at Virginia Tech.

Attendees learned about the importance of inspection, monitoring devices, staff education, and working with pest management companies. The pros and cons of treatment options including heat, diatomaceous earth, and chemicals were discussed but all who attended now know there is no silver bullet in bed bug control. Success depends on an integrated pest management (IPM) approach combining varied methods of monitoring, prevention, and treatment.

The interest in this webinar reflects the growing demand for information on bed bug prevention and management.

“To my knowledge, this is the biggest WebEx webinar we’ve had,” said, M. Scott Walters, instructional technology specialist at Cornell.

The recorded webinar is available at:

<http://stoppests.org/vtechbedbug>

Chapter 7

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# Resources

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# Resources

**29** plant species are deterred from flourishing in close proximity to black walnut, *Juglans nigra*, and butternut, *Juglans cinerea*.

<http://neipmc.org/go/KrgN>

**27** known and novel viruses were found in New York City rats. Urban rats are reservoirs for microbes that may affect human health.

<http://neipmc.org/go/SBaH>

**125,000** cases of Lyme disease were confirmed in the U.S. in five recent years. Find tick tips as well as a guide to preventing Lyme.

<http://neipmc.org/go/YANk>

Chapter 8

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# Our Story on Spotted Wing Drosophila an Example of Successful IPM

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A story about our team's work on spotted wing drosophila now appears in eLS, published through Wiley and Sons.



## Our Story on Spotted Wing Drosophila an Example of Successful IPM

A story about our team's work on spotted wing drosophila now appears in eLS, published through Wiley and Sons. It's part of an article on the fundamentals of IPM.

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Steve Young: Chris Gonzales, Northeastern IPM Center.

Identifying SWD Catch: Alan Eaton, University of New Hampshire.

SWD Traps: Richard Cowles, Connecticut Agricultural Experiment Station.

Bed Bugs on a Ruler: Changlu Wang, Rick Cooper, Department of Entomology, Rutgers New Jersey Agricultural Experiment Station, Cooperative Extension.

DNA: iStock.

SWD in Laboratory: Hannah Burrack, North Carolina State University, Bugwood.org.

## Northeastern IPM Center



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