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IPM At Work: Specialists and Scientists in Puerto Rico Tackle the Coffee Berry Borer

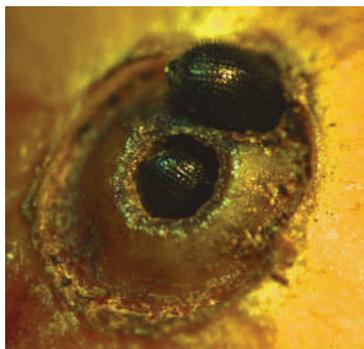


Coffee berries damaged by coffee berry borer

During a routine visit to a coffee plantation in San Sebastián in early August 2007, University of Puerto Rico Extension specialist Miguel Monroig Inglés observed some suspicious symptoms on the berries of the coffee plants. Inglés feared that the damage

was caused by the coffee berry borer—a pest from Africa that was devastating the coffee crop throughout Central America and in the Dominican Republic.

The coffee berry borer (*Hypothenemus hampei*) has caused about \$500 million in losses for coffee growers around the world. Concern in Puerto Rico about the coffee berry borer grew in 1995, shortly after specialists in the nearby Dominican Republic discovered the pest there. As Puerto Rico began importing more coffee in the late 1990s, growers became fearful that the pest would arrive via a shipment. Because the majority of coffee in Puerto Rico is grown in the mountains, the pest could spread to neighboring farms and affect one of the



Two CBB in coffee berry



Coffee berry borer larva

country's major crops. Puerto Rico is home to about 9,000 coffee farms.

Female borers drill their way into the coffee berry, the shell encasing the coffee beans. Inside the berry, the female lays 35 to 50 eggs, either after meeting or parthenogenetically. Once hatched, the larvae feed on the coffee beans until they are adults. Males remain in the berry; females may leave the berry to begin a colony on another berry. Because they spend most or all of their lives inside the berry, pesticides are useless.

Inglés' discovery marked the second time the berry borer was suspected in Puerto Rico. The first time, in 2002, the suspicion was proven to be false by Dr. Fernando Vega at USDA's Biocontrol Laboratory in Beltsville, Maryland.

This time, however, growers were not as fortunate. When Inglés brought samples of the damaged berries to the Extension Plant Diagnostic Clinic at the University of Puerto Rico, plant pathologist Wanda Almodóvar and extension entomologist Hipólito Ofarrill

IPM At Work: Coffee Berry Borer (continued from previous page)

suspected the coffee berry borer. To be certain, they sent the samples to Vega in Beltsville, Maryland. Both Vega and



Fernando Gallardo with his collection of coffee berry borers, caught by traps

entomologist Natalia Vanderberg at the Smithsonian Institute confirmed that the berries were indeed damaged by the coffee berry borer.

Fortunately Puerto Rico's Extension Service and growers had been prepared for this eventuality after the 2002 scare. That year, Inglés and Ofarrill traveled to El Salvador to learn more about the coffee berry borer and to gather educational materials to teach growers how to identify the pest. The coffee berry borer had been in El Salvador since 1981, and because of the country's proximity to Puerto Rico, Inglés and Ofarrill knew they would eventually find the pest in their own country.

Since the 2007 discovery, entomologists in Puerto Rico have been experimenting with non-chemical methods to manage the coffee berry borer. Edwin Abreu is studying the effectiveness of the parasitoids, *Phymastichus coffea* and *Cephalonomia stephanoderis* for biological control. *P. coffea* (LaSalle) feeds on borer adults, while *C. stephanoderis* preys on adults and eggs. Several countries in Central and South America are already using both parasitoids for biological control.

Another promising possibility is the insect-killing fungus *Beauveria bassiana*. This fungus enters the borer while in the berry and eats its organs. As a fungus, it must be cultivated, and specialists are currently seeking inexpensive ways to cultivate enough for Puerto Rico's coffee growers. *B. bassiana* grows naturally in the soil, but in the lab, it usually grows in rice. Almodóvar says growers can't afford to use rice to grow the fungus.

"Because we don't grow rice in Puerto Rico, rice is very expensive," Almodóvar says. "Gallardo has to find a substrate that growers can use to cultivate the fungus that is not expensive."

Gallardo and coffee specialist Wigmar González are trying to find a successful medium that growers may already have. They are currently exploring the use of decaying coffee berries.

"We can experiment with a technique that uses infected, decaying coffee berries as a substrate to grow the fungus," says González.

While he and other specialists continue to research long-term control options, González is promoting integrated pest management through the use of traps to monitor populations, crop management and good sanitation practices. In addition to helping to manage the pest, the practices will encourage healthy crops.



Wigmar González with a typical trap for coffee berry borer

Director's Notes

One of our charges as a regional IPM Center is to respond to changing needs in the region. As IPM expands to schools and homes and IPM funding hinges on evidence of impacts, the Southern Region IPM Center has proposed two new projects for the next year.

The first is a Sustainable Homescaping Initiative. This new project will address the needs of those who manage residential yards and gardens. Beginning as a work group, we will investigate development of an online decision support system to facilitate selection of sustainable plant species and cultivars for the yard and garden. The work group will be comprised of experts and other stakeholders from the public and private sector, including entomologists, plant pathologists, weed scientists, horticulturalists, water quality experts, environmental scientists and others. These experts will design a system to help consumers make choices about plants that

are low input and are suitable to the climate conditions of the planting site. SRIPMC, under the direction of the Advisory Council, plans to devote up to \$25,000 this year on the Sustainable Homescaping Initiative.

The second project is a working group to facilitate IPM impact evaluation. Working with baseline data from the NAPIAP surveys, this group will undertake new surveys to compare how IPM practices have changed environmental and economic conditions for specific crops. From these studies, the working group will compose multiple impact studies and a procedural template for others to duplicate the methodology.

We have always done our best to respond to needs in the region, such as collaboration needs, school IPM issues and other critical needs that have emerged in the past six years. We look forward to serving the region again through these two new initiatives.

Friends of IPM Award: Chris Mills, IPM Implementer



Chris Mills (L) with Steve Toth (R)

Chris Mills keeps the bugs out of Union County Schools. As the Integrated Pest Management (IPM) Specialist for the district, Mills has changed the way the schools control pests.

On March 3, 2009, staff from the Southern Region Integrated Pest Management Center presented him with the 2009 Friends of IPM "Implementer" Award for successfully managing an IPM program for the school district. The Implementer award recognizes those who demonstrate excellence in the day to day implementation of IPM. The award is one of six Friends of IPM awards; others are given for excellence in education, innovation, teamwork, leadership and long-term influence.

Continued on next page

Chris Mills (continued from previous page)

According to Steve Kisiah, Assistant Director of Operations and Custodial Services, before Mills took on the role of IPM Specialist two years ago, the school system contracted with pest control companies to spray monthly for pests. Mills introduced the concept of monitoring for pests before deciding on treatment, key to integrated pest management.

Mills also taught the school maintenance staff how to look for and seal cracks and openings. He talked to principals and teachers about keeping snacks in sealed plastic containers and ensuring that children placed trash in the trash cans rather than throwing it on the floor.

By the end of the year, he saw significantly fewer reports of pest problems.



From L to R: Godfrey Nalyanya, Steve Kisiah, Chris Mills, and Steve Toth

“I admit, I was skeptical at first,” said Kisiah. “I didn’t think he would be able to control the pests without monthly sprays. But Chris was determined to pull it off. And he did.”

Before his designation as IPM Specialist in 2006, Mills had no background in IPM. He began his job with the district maintenance

department in September 2003, after teaching for several years in one of the county high schools. He gained his knowledge of IPM by researching the subject on the Internet and with the guidance of Dr. Godfrey Nalyanya, director of the School IPM program at NC State University. Nalyanya nominated Mills for the Friends of IPM Award.

Union County is one of the fastest growing counties in the state, with 50 existing schools and over 50,000 students. Mills said he would not have been able to implement a district-wide IPM program without the help of school administrators, staff and teachers.

“I could not do this without all of you,” Mills said to an audience of parents, teachers and staff at a school board meeting on Tuesday night, where he received the award. “Your cooperation has meant the world to me and made this a really successful program.”

After the program’s first year, the school district saved between \$50,000 and \$60,000 from terminating contracts for indoor pest control and instituting an inspection and monitoring system. The schools have substituted reduced-risk baits for scheduled indoor sprays, and Mills says that he receives frequent requests for the secret behind his fire ant control program.

“We don’t have a fire ant problem anymore,” he says.

Union County School Superintendent Dr. Ed Davis and school district administrators say they are proud of Mills’ accomplishments with the IPM program.

“Union County Schools keep growing,” said Don Hughes, Executive Director of Facilities. “But we’re keeping the bugs out.”

Friends of IPM Award: Western NC Christmas Tree IPM Program, Pulling Together

The North Carolina Christmas tree industry received several accolades for their environmental stewardship at the annual North Carolina Christmas Tree Association meeting on March 5. One of those included a regional award for excellence in integrated pest management, given to the Western NC Christmas Tree IPM Program.



Front row (left to right): Jeff Vance, Jill Sidebottom, Meghan Baker, and Della Deal. Back row (left to right): Steve Toth, Jim VanKirk, Doug Hundley, Bryan Davis, Jeff Owen, John Frampton, and Jerry Moody.

The North Carolina State University-based team received a Friends of IPM “Pulling Together” award from the Southern Region IPM Center. The award recognized the team’s success in assisting Christmas tree growers implement pest management that is effective yet minimal in pesticide use.

In addition to the Friends of IPM Award, two awards given by the NC Christmas Tree Association recognized IPM successes; Christmas tree grower Larry Smith received the Environmental Stewardship Award, and Jeff Owen received the Educator of the Year Award.

The Christmas Tree IPM Program began in 1988, when Area Mountain Conifer Specialist Jill Sidebottom started work at the Mountain Area Agricultural Center in Fletcher, NC (now Mills River) to evaluate replacements of

granular Di-Syston for twig aphid and spider mite control.

Fraser firs, popular Christmas trees in the US, play host to a plethora of insect pests and diseases. As Fraser fir production increased and became more profitable, growers used more insecticides and fungicides to prevent and control damage. North Carolina supplies 15 percent of the nation’s Christmas trees, with a wholesale value exceeding \$120 million.

As use of pesticides increased, growers discovered that they had new problems: some of the chemicals caused soil erosion and poor tree health. Jeff Owen, Regional Christmas Tree Specialist, recalls visiting Christmas tree farms in the late 1980s and seeing two-inch metal posts in the soil. Growers used the posts to measure the depth of the soil when planting their trees; exposure of the posts meant exposure of the roots as well. As he began telling growers that the chemicals were causing the erosion, growers became more receptive to alternatives for pest management.



Jim VanKirk, with Doug Hundley and Bryan Davis

“The neat thing has been seeing the growers make incremental steps toward IPM,” said Owen.

Western NC Christmas Tree IPM Program (continued from previous page)

The Christmas Tree IPM Program covers the entire western part of the state. Sidebottom specializes in pest control and scouting. Owen has been instrumental in deer IPM. John Frampton is evaluating Fraser resistance to pests and disease control. Kelly Ivors is evaluating mulching methods to reduce problems with *Phytophthora* root rot. Ron Gehl is evaluating the use of phosphorus and ground covers. And Doug Hundley and Bryan Davis conduct yearly on-farm demonstrations that continue to draw grower participation and interest.

Christmas tree growers are now one of the biggest proponents and role models for IPM use. A 2007 grower survey concluded that use of the pre-emergent herbicide Simazine has been reduced from 72 percent in 1995 to only 16.8 percent in 2007. Insecticide use has decreased nearly by half since 2006.

"This award is really for you," Sidebottom said as she addressed growers at the annual Association meeting. "IPM is a success because you're making it happen."



Steve Toth, with Jeff Owen and Jill Sidebottom

The Friends of IPM "Pulling Together" Award recognizes a team from diverse specialties and backgrounds that work as a cohesive team to help growers use IPM successfully.

"I usually stand up here and preach about IPM," said Jim VanKirk, director of the Southern Region IPM Center, addressing growers. "But I don't need to preach to you. You already know the benefits of IPM."

Training Teleconferences for Evaluating IPM Programming

The IPM Centers, USDA-CSREES and EPA are co-sponsoring two training teleconferences. The first session, "Evaluating State-based IPM Programming," will be held Wednesday, Sept. 9 at 3 p.m. ET. This session will provide basic information on the use of logic models and third party data to demonstrate IPM program impacts. This teleconference is open to IPM coordinators from 1862, 1890 and 1994 Land Grant Institutions and other individuals involved in state-based IPM programs including governmental employees. Drs. William Coli and William Miller, University of Massachusetts, will provide the content for the training.

The second session, "From Research to Implementation to Impact," will be held Tuesday, Oct. 13 at 3 p.m. ET. This session will provide more advanced perspectives on how various elements can contribute to a broader understanding of successful IPM program models

and will focus in particular on research, program development and evaluation activities.

This training is voluntary and offered at no cost to the participants thanks to funding support from USDA-CSREES, EPA and the IPM Centers. Interested individuals must register online at <http://www.ncipmc.org/teleconference/>. Once registered, the automated system will provide updates regarding call-in information as well as access to PowerPoint slide sets that will be used during the training. We suggest use of a central location if you have several participants. For groups who plan to participate using this approach, please have only one member of the group register for the session.

If you have questions about the training, please contact Susan Ratcliffe, Director of the North Central IPM Center at 217-333-9656 or via email at ipm@illinois.edu.

Urban Pest Management New Feature on eXtension Web Site

Bees, bats, ants, cockroaches, head lice, mosquitoes, nuisance birds, rats and stinging wasps: this array of critters and insects can be pests if they're in or around structures where they're not wanted!



To the rescue -- Pest Management in and Around Structures, a new resource from eXtension (pronounced E-extension, <http://www.extension.org>). Urban Integrated Pest Management (IPM) is a process that manages pests in a way that will reduce pests long term while minimizing the risks associated with pests and pesticides. IPM uses a variety of management practices. Control strategies in an IPM program include structural and procedural modifications that reduce the food, water, shelter and access used by pests.

The eXtension resource links to some of the best urban IPM Web sites for each state and has a complete glossary. Have a question? Ask an expert, or search for your answer in the frequently asked questions (FAQs) that have been compiled from existing urban extension material. They address topics such as general household pests and wood destroying organisms.

"This resource will aid decision making about pest management and is based on a comprehensive approach that includes sanitation, maintenance and if needed, pesticides," said Fudd Graham, Auburn University coordinator for fire ant management and pesticide safety programs.

Contributors

Experienced researchers and extension personnel in the United States contributed to the new site. The experts are based in 1862 and 1890 land-grant universities, other universities, education centers and the USDA-CSREES.

24 eXtension resource areas

Urban integrated pest management is one of many Web communities within eXtension, www.extension.org, a national project of the U.S. Cooperative Extension System. Other topic resources include information on the financial crisis; animal manure management; bee health; beef cattle; corn and soybean production; cotton production; dairy cattle; disasters; diversity across higher education; entrepreneurs and their communities; families, food and fitness; family caregiving; geospatial technology; goats; horses; horticulture; imported fire ants; niche meat processing; organic agriculture; parenting; personal finance; science, engineering and technology for youth; and wildlife damage management.

eXtension is an educational partnership of more than 70 land-grant universities helping Americans improve their lives with access to timely, objective, research-based information and educational opportunities. eXtension's interactive Web site is customized with links to local Cooperative Extension sites. Land-grant universities were founded on the ideals that higher education should be accessible to all, that universities should teach liberal and practical subjects and share knowledge with people throughout their states.

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Giving a D.A.M. about Pests: Bugwood Network Serves IPM Professionals through Digital Asset Management

Why would anyone want to collect thousands of pictures of creepy bugs and annoying weeds and throw them up on the Internet for all to see? Ask “Bugwood Network” creators Keith Douce and David Moorhead, and they’ll tell you that those pictures have helped millions of people correctly identify some of those bugs, the first step to using integrated pest management. Housed at the University of Georgia, the Bugwood Network (www.bugwood.org), is a searchable image library. It contains more than 100,000 images of insects, plant disease symptoms, invasive species and weeds.

that, they created a collection of photographs on CD. As Extension agents continued to send photos to the university, Douce and Moorhead needed a larger viewing medium that would give them the flexibility to catalog, organize and reorganize their photos.



From IPM Images: Green stinkbug on cotton boll

The Bugwood Network, now formally known as the Center for Invasive Species and Ecosystem Health, began in 1994 as a collection of a few hundred photos of forest pests. Douce, a forest entomologist, and Moorhead, a forest ecophysiologicalist, frequently fielded questions from county Extension agents asking about insect identification. Douce and Moorhead soon realized they needed a convenient way to give the agents needed information. To do

The organization and searchability of the photos and related reading material is what sets Bugwood Network apart from other Internet image libraries. In fact, Douce and Moorhead had used many of those image libraries before and grew frustrated at the inability to narrow down search results. So when they developed Bugwood, they set a rule: each photograph had to be tagged with a title, subject, photographer, location and accurate identification, including genus and species names, life stage, and other categorical descriptors, such as “wood boring insect” or “foliage disease.”

All of Bugwood’s photos are contained in one database. That’s why identifying information is crucial; without it, Douce and Moorhead can’t classify the photos. Douce says they have hundreds of photos they still need information about, before they can add them to the system and make sure they appear in the correct categories. Often they have to contact the photographer several times before they have enough information to include the photo in the database.

“Sometimes people send only partial information, or they don’t send who took it or what growth or life stage it’s in,” Douce says. “Pathogen on soybeans’ isn’t enough; we need to know what pathogen it is, what kind

Continued on next page

Bugwood Network (continued)

of soybeans they are, and who took the picture.”



Bugwood Network contains photos of damage as well as the insects; this photo from forestpests.org shows webworm larvae on a sourwood leaf.

As a result of the rule, Bugwood staff can easily organize images and Bugwood users can easily find images. Bugwood houses five different image libraries: forestry images (www.forestryimages.org); forest pests (www.forestpests.org); agricultural and household pests (www.ipjimages.org); invasive species (www.invasive.org) and insect images (www.insectimages.org).

Someone who wants to know what is eating his or her tomato plants would visit IPM Images and click on “Vegetables,” and then “Tomato.” Someone else who wants to determine if the beetle defoliating trees in a state park is the emerald ash borer would go to forestpests.org and search for beetle photos under “foliage feeding” insects. Pests are categorized by site (such as crop, forest, or structure) so that people who need to identify a bug on a specific plant can do it quickly.

“People call and tell us something like, ‘There’s an insect on my eggplant,’ but don’t know what it is,” says Joseph LaForest, IPM and Forest Health Specialist for the Center. “So I tell the person to go to IPMImages.org and click on ‘Vegetables’ and then on ‘Eggplant.’ The person then has only 11

pictures to sift through instead of thousands, and he or she can usually find the pest.”

Users will also often find several different images of the same insect or weed. Douce says that’s because some people need a close-up of a particular insect, while others need a picture of the leaf it’s been eating.

“Sometimes we’re asked why we have 300 pictures of the gypsy moth,” Douce says. “There are a lot of different vantage points for the same pest. Sometimes you want a leaf with damage and sometimes you don’t. If you’re giving a presentation to cotton farmers in Georgia, and you’re showing California cotton fields with lofty mountains in the background, you lose credibility with your audience. So we provide a repertoire of pictures so people can choose the one that best fits the situation.”

A new Bugwood “Wikipedia” contains detailed information about invasive plants, plant diseases and plant diagnostic recipes for specialists who need to solve a problem before it gets out of control. The vast number of different photos has enticed educators, agricultural experts, authors, musicians, editors and many other professionals and laymen to use Bugwood’s photos for a variety of endeavors.

Bugwood is accessed every year by approximately 19 million users from around the world. Country singer Charlie Daniels used Bugwood images for the cover of his *Songs from the Longleaf Pines* CD. Several images appear in Whitney Cranshaw’s *Garden Insects of North America*. Native plant guide authors from Japan and Slovakia have used Bugwood photos of US invasive species to illustrate their books. Specialists from the US Department of Agriculture, Plant Health, Plant Protection and Quarantine (PPQ) Division rely on the photos to identify newly identified invasive insects and weeds before the exotics can get a foothold.

The Bugwood Network has remained the fastest-growing, most widely used image

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Bugwood Network (continued)

database for integrated pest management because its creators listen to its users.

“Anytime I call the staff there and ask about adding or changing something, the answer is always ‘yes,’” says Carrie Harmon, Associate Director of the Southern Plant Diagnostic Network. “They have a vision about what can be done that makes it a real pleasure to work with them.”



A picture is worth a thousand words: Joe LaForest took a picture of this pecan tree that had been used to straighten the forks of the “dumpster lifter” on a garbage truck. The truck did so much damage that the garbage company tried to “mend” the tree by applying silver spray paint (not a recommended practice). Laforest now uses this photo when he trains people on the ways NOT to treat a tree.



Publications and Events

September 9, 2009: Evaluating State-based IPM Programming, 3:00 p.m. ET (first training teleconference for evaluating IPM Programs, sponsored by USDA)

September 24, 2009: Ecologically Based Weed Management for Sustainable/Organic Vegetable Production, Madren Conference Center Auditorium, Clemson University, Clemson, SC, 8:30 AM—4:30 PM. Presented by Dr. Mark Schonbeck. Contact Geoff Zehnder at zehnder@clemson.edu.

October 13, 2009: From Research to Implementation to Impact, 3 PM ET (second training teleconference for IPM Programs, sponsored by USDA)

Publications

Field Guide to Stink Bugs of Agricultural Importance in the Upper Southern Region and Mid-Atlantic States, Virginia Tech. Contact Ames Herbert at herbert@vt.edu

Invasive Weeds of the Appalachian Region, University of Tennessee. Contact Rebecca Koepke-Hill at rkoepke@utk.edu

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