Western IPM Center
Fostering responsible pest management for a sustainable future.

The Western Front

NEWSLETTER OF THE WESTERN INTEGRATED PEST MANAGEMENT CENTER February 2011

WIPMC-FUNDED PROJECT *Profile*

Understanding Thousand Cankers Disease: Center-Funded Project Contributes Findings on Invasive Disease of Walnut Trees in the West

By Diane Clarke

A Western IPM Center-funded project completed in December has made important contributions toward understanding Thousand Cankers Disease (TCD), a newly-recognized invasive disease in the West. This pest/disease complex has caused extensive mortality in black walnut (*Juglans nigra*) in the West over the last decade. *J. nigra*, one of the most highly valued timber species in North America, is native to eastern North America, but it has been extensively planted in the West as an ornamental and for its nuts and timber. TCD results from the combined activity of the walnut twig beetle (*Pityophthorus juglandis*) and a canker-producing fungus (*Geosmithia morbida*) vectored by the beetle. Until recently, TCD appeared to be confined to the West. However, in July 2010 the disease was discovered in the Knoxville, Tennessee area, near the geographic center of *J. nigra*'s native range, and it is now expected to spread to most if not all of *J. nigra*'s native range within the next century.

WIPMC Funds TCD Project

In 2009 the WIPMC awarded $79,931 to principal investigator Ned Tisserat and his co-investigators for a 2-year project entitled "Biology of the Walnut Twig Beetle (*Pityophthorus juglandis*) and the Fungus *Geosmithia* Associated with Walnut Mortality in the Western United States." Tisserat, a plant pathology professor and Extension Specialist at Colorado State University, collaborated on the project with Whitney Cranshaw and William Jacobi, also of Colorado State University; Steven Seybold, USDA Forest Service Pacific Southwest Research Station; and C. Reed Funk of the nonprofit Improving Perennial Plants for Food and Bioenergy, Inc.

Researchers Identify the Disease

The first published record of a cluster of black walnut tree deaths associated with the walnut twig beetle was in northern New Mexico in 2001, but this may have been preceded in Utah in the early 1990s. *J. nigra* deaths were also observed in Colorado as early as 2001, but TCD was not identified as the cause until 2008, when Tisserat and Cranshaw were the first to recognize and name the disease.

How TCD Occurs and Causes Tree Death

The disease occurs when a tiny (1/16 inch) bark beetle, the walnut twig beetle, carries spores of the newly-identified fungus, *Geosmithia morbida*, into the phloem of a tree as it tunnels through the bark and constructs galleries. The fungus causes cankers around the galleries. When many of these small, individual cankers coalesce, they can girdle twigs and branches, causing dieback. The total number of cankers on a tree can be enormous, thus the name of the disease. The beetle and the fungus occur only on walnut species. So far, English walnut (*J. regia*), an important commercial walnut, has only rarely shown symptoms of the disease. Walnut twig beetle is native to Arizona, California, and New Mexico. It has invaded Colorado, Idaho, Oregon, Utah, and Washington. The origin of the fungus is unknown.

Ned Tisserat, Colorado State University, Bugwood.org

Coalescing cankers caused by Geosmithia morbida *consistently form around beetle galleries. Outer bark must be scraped off to see the damage. Coalescing cankers can eventually girdle twigs and branches, causing dieback.*

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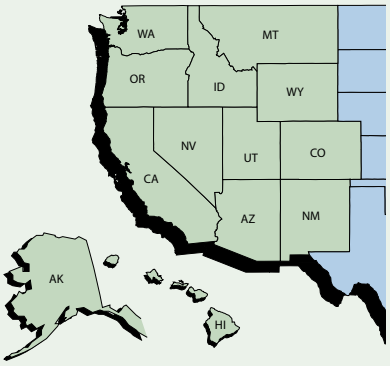
Center Scope

The Western IPM Center enhances communication between federal and state IPM programs in the western United States: Alaska, Arizona, California, Colorado, Hawaii and the Pacific territories, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. It serves as an IPM information network, designed to quickly respond to information needs of the public and private sectors.



What's Inside

Rick Melnicoe

Director's Comments

As of January 14 there has been no new information from USDA regarding the fate of the Regional IPM Centers. A number of very convincing letters have been sent to the Secretary of Agriculture and others in support of continued funding for the Centers, and work is under way to include IPM Centers in the next Farm Bill. However, nothing has been said about the fate of the Centers after funds run out by September 2012. Currently, the 4-year grants end in September 2011. However, no-cost extensions can keep them active up to September 2012. A big question that comes to mind is how USDA will deal with the continuing resolutions (CRs) passed so far by Congress. The last CR runs to March 4. This may mean that USDA is obligated to fund all programs, including the Regional IPM Centers, for the time that the CR is in effect (5 months more in this case). If this is the situation, will USDA issue an RFA or find another way to keep the Centers functioning with these funds and extend their longevity? These and other unanswered questions remain.

We appreciate all the efforts of support for the Regional IPM Centers that have been directed to Congress, the Secretary of USDA, the director of NIFA, and other influential people. It has been gratifying to see the diverse and unanimous support from public interest groups, grower organizations, university administrators, and many others. Thank you for your support.

The Western IPM Center released what may be our last RFA last summer, depending upon the outcome of the Congressional budgeting. We had a number of excellent applications in the categories of Work Groups, Surveys, and Publications/Outreach. Four work groups, two survey projects, and 10 publications/outreach projects were funded (see details, below). Additionally, the Center is funding continuing "Addressing Western IPM Issues" projects that were first funded in the previous year. If additional funding becomes available, a special RFA is likely to be released.

For those of you who could not attend in person or via live webinar the "Planning and Managing Systems Based Trans-disciplinary Projects for USDA/NIFA Programs," it is archived and available at ***http://arc.wsu.edu/grant-writing/index.html***. This workshop was held on September 8, 2010, at Washington State University, Pullman. I highly recommend viewing this for those of you who are planning to submit grant applications to SARE, SCRI, OREI, AFRI, or other programs where collaborative efforts are required. The videos and PowerPoint presentations offer a lot of insight into successful projects, what USDA-NIFA is looking for, and tips on how to garner collaborations.

The Western IPM Center manages the grant review process for USDA-NIFA's Regional IPM Grants Program—Western Region. There were 26 accepted proposals that underwent relevance and technical reviews the last week of January. Thirty applications were submitted to Grants.gov from the West. Unfortunately, two were submitted past the deadline and two were missing the Conflict of Interest form. USDA adheres strictly to the requirements of the RFA and would not accept these applications or any excuses. While this seems particularly harsh, it does ensure an even playing field.

There are two important meetings for western pest managers coming this spring: WERA-69 on April 19 and 20 in Santa Fe, New Mexico, and the Western Region Pesticide meeting in Sacramento, California, May 17 through 19.

—Rick Melnicoe

Western IPM Center 2011 Funded Projects

The Western IPM Center funded four work groups, two surveys, and 10 publications/outreach projects, totaling $183,423.

Work Groups

Southeastern Arizona-Southwestern New Mexico Noxious Weed Work Group
PI: Kim McReynolds, University of Arizona

Western Region Choke Disease Management Work Group
PI: Sujaya Rao, Oregon State University

Western Region Functional Agricultural Biodiversity Work Group
PI: Gwendolyn Ellen, Oregon State University

Western Region School IPM Implementation and Assessment Work Group 2011
PI: Tim Stock, Oregon State University

Surveys

Survey of Insect Management Practices of Stored Rice in California
PI: Luis Espino, University of California Cooperative Extension

Survey to Assess IPM Implementation in Utah Vegetable Crops
PI: Marion Murray, Utah State University

Publications/Outreach

Adopting IPM on Oregon's School Landscapes
PI: Aimee Code, Northwest Coalition for Alternatives to Pesticides

An Illustrated Field Guide to the Pests of Bivalve Aquaculture in Washington and Oregon
PI: Steven Booth, Pacific Shellfish Institute

Developing an Educational Program on Semiochemical-Based IPM Methods for Weevil Pests on Guam
PI: Gadi Reddy, University of Guam

Growing the Sustainable Parks Information Network
PI: Josh Vincent, Northwest Coalition for Alternatives to Pesticides

IPM Education and Outreach for Public Housing in Arizona and Oregon
PI: Dawn Gouge, University of Arizona

Integrated Weed Management in the Great Basin of Nevada and Utah—Education and Outreach: Sixth Annual Winter Weed Meeting
PI: Betsy Mcfarlan, Eastern Nevada Landscape Coalition

IPM Education Program for Vineyards and Orchards to Prevent and Manage Glyphosate-Resistant Weeds
PI: Kassim Al-Khatib, University of California Statewide IPM Program

IPM/Beneficial Insect Outreach and Demonstration
PI: Tessa Grasswitz, New Mexico State University

Southeastern Arizona-Southwestern New Mexico Noxious Weed Rapid Response Teams
PI: Kim McReynolds, University of Arizona

Video Production: "An Introduction to IPM" and "The City of Phoenix IPM Program"
PI: Glenn Gigstad, University of Arizona

Courtesy of USDA-NRCS

Project Objectives and Progress

This project's first objective was to understand the biology and interactions of *P. juglandis* and *Geosmithia* for the purpose of developing an integrated management strategy. By conducting seasonal beetle trapping in California and Colorado, researchers determined that the walnut twig beetle's peak flight period was in late summer in both states, extending into November in California. They also determined that, in spite of its name, walnut twig beetle does not attack just twigs, but actually prefers to breed in bark on branches that are greater than 1 inch in diameter. The second objective was to determine whether *Geosmithia* is a natural associate of *P. juglandis* within its native range. Researchers determined that both the pathogen and beetle are present in Arizona and New Mexico on the Arizona walnut (*J. major*), but there was no noticeable morbidity, suggesting that *J. major* is the native host of the beetle and fungus. The project's third objective was to determine relative susceptibility to canker formation by *Geosmithia* of certain other related species, including hickory. They observed a decline and mortality of native Northern California walnut (*Juglans hindsii*) and southern California walnut (*Juglans californica*) associated with the beetle and fungus. Hickory species appeared immune.

The Threat Posed by TCD

TCD is difficult to detect in its early stages, since detectable symptoms may not occur for 10 years or longer. Infested trees usually die within 3 years after initial symptoms are noted. Since there are no successful treatments for TCD at present, the disease is of serious concern in the West and now in *J. nigra*'s native range in the eastern United States as well. A major focus is preventing TCD's spread, which can happen very easily through the transport of beetle-infested cut wood from trees that have died of TCD.

The disease poses a threat to wildland and landscape trees. Economic impacts are not well documented yet but could include losses to the wood industry and losses to forest and other landowners with black walnut trees on their property. There are also losses to communities as trees on residential streets die. Tisserat said, "Right now the most critical economic impact is associated with tree removal costs in cities where TCD is epidemic. This is a huge cost to local governments and to homeowners." In addition, there is the potential for huge losses to the nut industry, especially if the disease were to spread to English walnuts. Tisserat added, "The loss of black walnuts in much of the West is tragic, but probably the greatest concern now is that the beetle and fungus will change such that they are able to seriously damage the commercially-important (over $500 million) English walnut industry in California."

Preventing Further Spread of TCD

Rapid detection and removal of infected trees remains the primary way of managing the disease. Removed trees must be properly disposed of by immediate burning or grinding, insuring that beetles are destroyed so they cannot move to unaffected trees. Stopping the spread from infected areas depends on quarantine as well as public education about the dangers of transporting black walnut wood with bark attached. (The disease affects only the bark, not the wood.) The number of beetles in an infested tree can be huge. In just two fireplace-sized logs examined for walnut twig beetle in Colorado, Tisserat and his colleagues counted 23,040 beetles. It is likely that TCD's recent appearance east of the Mississippi was due to movement of wood with attached beetle-infested bark.

Project Impacts and Future Research Needs

This project's research has led to greater awareness of TCD in the eastern United States, with Nebraska, Iowa, Missouri, and Kansas implementing quarantines to prevent the movement of walnut wood with bark attached into these states. Project researchers are working with arborists and city foresters in Colorado to develop best management practices for the safe disposal and use of walnut trees killed by the disease, and they are developing (with USDA) a project through the American Recovery and Reinvestment Act for strategies to prevent and mitigate impacts of the disease. The researchers hope their work will lead to a national quarantine on the movement of certain types of walnut wood from the western United States to the native range of *J. nigra*.

Tisserat mentioned a couple of important directions for research. These include developing an effective means of monitoring for the walnut twig beetle. Current trapping methods are very inefficient. Tisserat said Steven Seybold, a co-investigator, is trying to identify chemical attractants that will increase trapping efficiency and improve surveillance. He added, "Another important project is to identify surviving black walnut trees in the West, determine if they are truly resistant to TCD, and to preserve germplasm."

Curtis Utley, Colorado State University

Row of black walnut trees in Colorado killed by thousand cankers disease.

Leveraged Funding

Researchers have acquired additional funding because of the data and results yielded in this project, including two USDA-NIFA "Critical Issues: Emerging and New Plant and Animal Pests and Diseases" grants totaling $165,000 and a USDA Forest Service grant for $20,000.

Conclusion

Tisserat said what surprised him most in his research for this project was that an apparently native insect and fungus (at least native to North America) could be so destructive on another native North American species. "Typically we associate this kind of damage with the introduction of an exotic pest from another continent," he said, adding, "It also emphasizes that we need to take great care in moving plant materials and their associated pests from one location to another."

For further information, contact Ned Tisserat at ***ned.tisserat@colostate.edu***. The most recent report for this project can be viewed at ***http://www.wripmc.org/CenterProjects/criticalissues.html#Twig***.

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PROFILE

By Diane Clarke

Ronda Hirnyck

Professor and Statewide Pesticide Program Coordinator, University of Idaho

Ronda Hirnyck is Professor and Statewide Pesticide Program Coordinator at the University of Idaho—Boise Center. Since the inception of the WIPMC in 2000, Ronda has been an active participant, supporting and furthering Center goals and partnering with the Center in a number of different ways. WIPMC Associate Director Linda Herbst said, "From the very beginning, Ronda enthusiastically bought in to what the Centers were trying to do. Her activities have really helped the success of the WIPMC." Director Rick Melnicoe said, "The spirit of regional cooperation is epitomized in Ronda and her activities with the Center." He added, "Ronda has taken the concept of regional collaborative projects and promoted it within the Pacific Northwest. She has been a leader in this and has done it very effectively. She has been a tremendous resource to Idaho and the Pacific Northwest, and a conduit to our stakeholders there."

Ronda Hirnyck

Well before the WIPMC came into being, Ronda had seen the benefits of regional collaboration and cooperation, so she was eager to develop her relationship with the Center. "I consider myself a team player and really enjoy working on ideas together in a group," said Ronda. "It was a natural fit, and I felt vested from the beginning. Rick and Linda were very welcoming of new ideas." Ronda started by serving on the WIPMC Advisory Committee for 4 years, beginning in 2000. And in 2004 she submitted a proposal and secured Center funding to support Idaho's existing information network. In her resulting role as the Center's Idaho contact, she was "the backbone of our state contacts," according to Linda. Ronda has also been an integral part of the Pacific Northwest work group, which began in 2001 when Ronda and other state information network contacts from Oregon, Washington, Alaska, Montana, and Utah joined together to form this subregional group. The group focused on collaboration in the Pacific Northwest to enhance adoption, measurement, and creation of methods to promote IPM in agricultural settings. In 2004 and 2005, Alaska's state contact, Tom Jahns, secured WIPMC funding for this work group, and Catherine Daniels, Washington's state contact, wrote successful proposals for Center funding for the group from 2006 through 2009.

> ***"The spirit of regional cooperation is epitomized in Ronda and her activities with the Center."***
>
> **—Rick Melnicoe, WIPMC Director**

Ronda has been the principal investigator on 18 successful grant proposals with the Center. Altogether, these have garnered close to $470,000 for Ronda and her co-investigators in support of IPM-related activities benefiting Idaho and the Pacific Northwest. This funding has contributed to:

- Completion of five Pest Management Strategic Plans for Idaho and other Pacific Northwest states
- Development of a potato scouting manual in English, Spanish, and soon, Russian
- Convening a work group and identifying a process and system for utilizing farm planning (in conjunction with the Idaho OnePlan farm conservation planner) to deliver IPM guidelines and resources to farmers
- Development of a crop/pest/IPM practices matrix to be used as a decision support tool by Natural Resources Conservation Service (NRCS) field staff to help farmers write IPM plans
- Convening a meeting of Pacific Northwest work group members and regional Water Quality personnel
- Seven years of support for the Idaho information network

Ronda has successfully used limited funds from the Center as seed money, leveraging these funds to accomplish many of the objectives the Center promotes (e.g., outreach to underserved populations with the potato scouting manual in Spanish and Russian). Center-funded projects by Ronda and her co-investigators have leveraged more than $700,000 in federal grant money. And Ronda has partnered with Center staff on a number of projects, including facilitating a collaboration among Pacific Northwest researchers, commodity groups, and other organizations to foster the use of green manures as biofumigants in Idaho potato and sugar beet production. She recently worked with Center staff to organize a symposium that brought IPM and Water Quality practitioners together to discuss possibilities for collaboration. The result is a new proposal for creation of a Western Education/Extension and Research Activity (WERA) group to focus on reducing pesticide impacts on water quality in urban, agricultural, and natural resource settings in the West.

Ronda's professional background includes 4 years as Bureau Chief of the Agrichemical Standards Bureau, Idaho State Department of Agriculture, where she was responsible for managing program managers, supervisors, and clerical support for the Bureau. While there, Ronda served for 3 years on the State-FIFRA Research and Evaluation Group (SFIREG), in the Water Quality working group. SFIREG plays a valuable role in maintaining information exchange and cooperation between the states and EPA to enable states to play a meaningful role in the development of pesticide policies and regulations. SFIREG identifies issues, analyzes them, and provides oral and written comments to EPA's Office of Pesticide Programs. Ronda also served for 2 years as an Agrichemical Specialist at the Idaho State Department of Agriculture, Agrichemical Standards Bureau. In this role she was the program manager for the state registration of pesticides, fertilizers, and soil and plant amendments, and for the endangered species protection program. Prior to that, Ronda worked for 8 years as a Sales Representative for CIBA-GEIGY Corporation's Agricultural Division. These professional experiences equipped Ronda with a well-rounded perspective on pesticide-related issues.

Ronda's appointment at the University of Idaho, where she has been the Statewide Pesticide Program Coordinator since 1997, is 80% extension and 20% research. On the research side, Ronda assists in the development of new pesticides for minor crop producers through USDA's IR-4 program. Ronda's extension duties are many. She is Idaho's State Liaison Representative for IR-4, responsible for

coordinating the program in Idaho and working with all crops. She supervises the field station and identifies state needs and presents them at the annual IR-4 Food Use Workshop. Referring to all of her extension activities, Ronda said, "I use commodity group representatives as my advisory committee on everything I do to make sure that what I'm doing is meeting the needs of Idaho."

Ronda serves as Idaho's Statewide Pesticide Program Coordinator and manages the Pesticide Safety Education Program (PSEP). In this role she is responsible for gathering, storing, and disseminating information on the use, registration, and legal aspects of pesticide use to the Idaho public, government, and university personnel. She said, "There's always something to talk about with pesticides, and I'm supposed to keep up with it." Ronda develops curricula for and conducts various types of training, including pesticide safety training, pre-license and recertification applicator training, IPM training, etc. "Right now there are new labeling requirements for soil fumigants. I go out and visit with farmers to let them know what the new regulations are," said Ronda. She holds Idaho's statewide Pest Control Consultant's license.

While teaching and training account for about 25 to 30 percent of the extension part of her job, the rest of her extension work is devoted to writing publications and grant proposals and working on individual projects not related to PSEP or IR-4. Right now this includes working on the Russian-language potato scouting guide and another publication on managing voles and gophers. She is also working on a homeowner project and a project on the impacts of pesticides on groundwater. Ronda serves on a number of national, regional, state, district, and college committees. In addition, she manages two employees (a third position is currently vacant). This scale of management is satisfying to Ronda, since it allows her to still do her technical work and also make a difference in helping her employees out. "I like to spend the time helping people develop. It's really fun to see them expand on their existing knowledge base and grow in their positions."

Some current challenges and issues Ronda is facing include:

- *Soil fumigant label changes:* This is a big issue for Idaho right now, and Ronda is involved in many aspects of it.
- *National Pollutant Discharge Elimination System (NPDES):* Recent court decisions have mandated that certain uses of pesticides over and near water require NPDES permits. The implementation of the permit system is resulting in uncertainty and confusion about pesticide applications on and/or near water resources. EPA is developing training materials to assist educators.
- *Endangered species:* Similar in some regards to the NPDES issue, court decisions have mandated restrictions on certain pesticides and require new labeling to protect salmonid species (salmon, trout, etc.). Additional restrictions for other endangered species are likely via court or regulatory decisions.
- *Lack of resources:* Shrinking budgets at the university level, lost people, shuffled people, shortage of people who work in traditional agriculture and pest management that Ronda can partner with around the state.
- *Dwindling grant funds:* Ronda says she is always looking for new things to generate funding. Her list of commitments gets bigger, and she has to try to decide between what she needs to do and what she can do based on her resources.
- *Lack of support (money) for minor crops:* She said, "Funding doesn't seem to be there." There are not enough resources to generate baseline data for IR-4.

Ronda made a point to counter the challenges by saying, "The good side is that Idaho's traditional agriculture is still a main player in support of Extension. Commodity groups keep me in their loop and are interested in working with us in Extension. We still see strength, respect, and support from our commodity groups."

Current and future projects Ronda is excited about include working on the potato scouting manual in Russian and developing a soil fumigant management planner that will be part of the Idaho OnePlan. The planner will be an online tool that farmers can use to keep extremely complex records in a fairly user-friendly manner. And she is enthusiastic about the potential of the IPM and Water Quality WERA group. She said, "I march to a different beat: for many years I have had a vision about IPM and Water Quality."

Ronda loves the flexibility and creativity of her work. She said, "Within the parameters of stakeholder need, I enjoy determining the kinds of things I am involved with. I really enjoy the camaraderie of working on regional projects, seeing ideas evolve into something that is productive and useful. I really like to help people—help them do their jobs better, help them learn." She added, "Overall, my personal goal in this job is to try to bring agriculture and food production together with protecting the environment and keeping ourselves sustainable and not overusing our land. If we can help farmers become partners in this in a way that's meaningful to them, then I think we have done our job."

Ronda was born and grew up in Arkansas City, Kansas, where she also attended community college. She earned a B.S. in Wildlife Conservation and Management at the University of Wyoming, Laramie, and an M.S. in Entomology at the University of Nebraska, Lincoln. She and her husband, Bob, have three daughters, all currently attending college. Bob is a state park ranger for Idaho and an alpine ski patroller. Ronda enjoys many outdoor activities, including skiing (her whole family skis), sports, swimming, running, bike riding, and backpacking. She also likes to garden and raise her own food, and she loves to read. Ronda said she has been learning to knit, but laments that she seems to be "stuck at the beginning level."

Contact Ronda at ***rhirnyck@uidaho.edu***.

PMSP Update

Ongoing:

- **Cucurbit Crops (Hawaii, Guam)**
- **Desert Turf (Arizona, Nevada, and Southeastern California)**
- **Grass Seed (Idaho, Oregon, and Washington)**
- **Low Desert Cotton (Arizona and Southeastern California)**
- **Orchid (Hawaii):** Workshop held in September 2010
- **Pear (California):** Being updated
- **Seed Potato (Alaska, California, Colorado, Idaho, Montana, Oregon, Washington):** Currently being reviewed
- **Turf (Hawaii):** Currently being reviewed

Completed:

- **Citrus (California):** Completed
- **Wine Grape (California):** Update completed

Highlights of Western IPM Center Grants Programs

The following highlights of WIPMC grants programs show the breadth of projects funded and the impacts made to improve the economic benefits of adopting IPM practices and to reduce potential risks to human health and the environment caused by the pests themselves or by the use of pest management practices.

Developing a Monitoring Program for Thrips-Iris Yellow Spot Virus Complex: Adding a Novel Management Component to the IPM Program in Bulb and Seed Onion Crops

Principal Investigator: Hanu Pappu, Washington State University

Summary: Onion is an economically important crop in the United States. Several states in the West have recently experienced the introduction and subsequent rapid spread of a viral disease of onion caused by iris yellow spot virus (IYSV). The disease is one of the major constraints to bulb and seed onion production in the West, affecting both yield and grade. The virus is transmitted by onion thrips (*Thrips tabaci*). First reported in Idaho in the 1990s, the virus suddenly and rapidly spread to several other western states, including Arizona, California, Colorado, New Mexico, Oregon, Utah, and Washington, and instances of near total crop loss in seed crops were reported in Idaho, Oregon, and Washington. Thrips-mediated spread is the primary means of virus outbreaks. Weed hosts and susceptible and overlapping bulb and seed onion crops are considered to provide the bridge for the survival of both the virus and the thrips vectors from season to season. For these reasons, IPM efforts should include management of viruliferous thrips populations and weed hosts and the use of resistant cultivars.

The overall goal of this project was to identify factors contributing to the survival and spread of the thrips-virus complex and to utilize the information in developing an integrated disease management program. The specific goal was to develop and apply tools that could be used in a monitoring program for the virus-thrips complex and to integrate this approach as a management tactic in onion IPM. The project's objectives were to 1) develop and utilize tools to determine the role of thrips vectors in disease spread, 2) develop sensitive, rapid-detection tools for virus detection in thrips and apply this technology for developing a monitoring program for viruliferous thrips populations, and 3) identify crops and weeds that are important reservoirs for the virus.

Results: *Objective 1:* One of the prerequisites for a better understanding of the epidemiology of IYSV and for development of a management program is the ability to detect the virus in plants and thrips vectors. A rapid and practical assay was developed to identify potential virus transmitters among onion thrips populations. *Objective 2:* Onion thrips were monitored in two field plots on a weekly basis. Preliminary data showed that onion fields planted next to overwintering onions, a potential source of onion thrips for the following season,

Howard F. Schwartz, Colorado State University, Bugwood.org

Field onion plants showing symptoms caused by the iris yellow spot virus (IYSV).

did not increase the mean number of onion thrips per plant per week in the field planted adjacent to it. However, numbers of symptomatic leaves were higher in fields planted next to overwintering onion plots (25%) as compared to the field planted on the bare area (4%). The thrips samples are being tested for the presence of IYSV using an assay to determine the proportion of viruliferous thrips. *Objective 3:* Garlic was confirmed as a naturally-susceptible host of IYSV. While IYSV is an important constraint to onion bulb and seed production in several onion growing regions of the United States, there had been no information on the status of garlic as a host of IYSV. There are reports of several weeds found naturally infected with IYSV; however, there is no report of IYSV infection of a grass species. Leaves of green foxtail were collected from naturally-occurring plants in a weed trial conducted in commercial onions grown in Utah. Leaves displayed a range of symptoms that included streaking, purpling, and chlorotic and necrotic lesions along leaf margins, and tests confirmed IYSV infection.

Impacts and Potential Impacts: While it is too early to document impacts, the ability to detect viruliferous thrips would provide important information on the seasonal dynamics of thrips transmitters that could be targeted for control. This could reduce the number of sprays that are used to combat the thrips-mediated spread of IYSV. Identificaiton of weed hosts that could be serving as reservoirs for IYSV would be useful in formulating weed control strategies to reduce the virus inoculum.

Effect of Primary Tillage Sequence, Insecticides, and Weed Seed Placement on Seed Predator Conservation, Efficacy, and Weed Emergence

PI: Edward Peachey, Oregon State University

Summary: Summer annual weeds are a problem for row crop producers, even though they have access to many weed management tools. Producers have learned to control weeds but are less adept at controlling weed seeds. Herbicides, tillage, and cultivation are commonly used strategies, but these can cause problems. Unintended losses of herbicides (to surface and ground water) and soil (loosened during tillage or cultivation) can threaten environmental quality and human health. Primary tillage and pesticides may disrupt populations of organisms, such as invertebrate seed predators, that help to regulate weed populations. On the other hand, reduced tillage is known to improve habitat for soil-dwelling seed predators, and when soil is not tilled weed seeds remain near the surface where seed predators are more likely to come in contact with them.

Weed seed predation by carabid beetles (ground beetles) may be a significant cause of weed seed mortality in some agricultural fields, but the potential to enhance carabid abundance and weed seed predation through tillage rotational systems and other cultural practices is poorly understood. Tillage kills

Alysia Greco, Oregon State University

Graduate students Jess Green (left) and Laurel Moulton install pitfall traps and seed predation stations on a farm in Oregon to track potential movement of carabids between fields. In the background are pitfall traps installed in plots within a field just planted to snap beans.

Jess Green, Oregon State University

Conservation (strip) tillage treatments applied to the tillage sequence rotation plots at the experimental farm.

both larval and adult carabid beetles, destroys their habitat, and buries weed seeds so that carabid beetles cannot find them. The overall goal of this project was suppression of summer annual weed populations in vegetable row crop systems through development of cropping systems that conserve seed predators and enhance weed seed predation. Specific objectives were to 1) survey the species diversity and estimate the activity-density and seed predation potential of adult ground beetle and seed bug populations in vegetable crop rotations (conventional and organic) in western Oregon and eastern Washington; 2) determine the effect of tillage system and sequence, insecticide use, and weed seed position in the soil on weed seed predation, subsequent weed seedling recruitment or emergence, and weed seed mortality and dormancy; and 3) evaluate the seed predation potential of the Julid millipedes, seed bugs, and other potentially key maritime northwest seed predators in the laboratory.

Results: Investigators measured the number of carabid beetles and the weed seeds they eat in farmers' fields and developed and tested conservation tillage sequence strategies to increase weed seed mortality by enhancing infield habitat for ground beetles that eat weed seeds. The tillage-sequence treatments were designed to preserve habitat at critical life-stages for carabid populations and to synchronize weed seed availability with periods of high ground beetle activity. The number of carabid beetles found in fields varied greatly among farms and geographic regions over the 3 years of the study. Weed seed removal rates from seed stations attributed to carabid beetles ranged from zero to four seeds per day in on-farm assessments. Carabid beetle activity and weed seed predation in conventional fields was similar to rates measured in organic fields. Some insecticides reduced carabid activity and weed seed loss from seed stations. Fields that were conservation-tilled typically had greater activity density and seed loss than fields that were conventionally tilled in the spring. Results from one experiment in Oregon found that both spring tillage and insecticide use had a significant effect on carabid beetle activity. A vegetable row-crop rotation without spring tillage or soil-applied insecticide had the greatest carabid activity. In another study where carabid beetles were confined by fences placed around the plots, survival of a common grass weed seed was directly related to the number of ground beetles present.

Impacts and Potential Impacts: Understanding the processes within landscapes or fields that lead to enhanced seed predation potential will allow growers and other agricultural professionals to build cropping systems that constrain populations of target weeds. The project's results pave the way for development of diverse, biologically-based rotational strategies in cropping systems of the Pacific Northwest and other regions that conserve invertebrate weed seed predators and reduce the impact of invasive and economically-significant weeds on agricultural and natural systems. Outcomes from this research also may provide incentives for producers to reduce insecticide use in the interest of conserving biological diversity and increasing weed seed predation.

Economic Analysis of Host-Based Ectoparasite Control

PI: Bradley Mullens, University of California, Riverside

Summary: Almost all commercial laying hens are kept in groups in wire cages. Close proximity encourages spread of the northern fowl mite, *Ornithonyssus sylviarium,* and the chicken body louse, *Menacanthus stramineus,* the two key poultry ectoparasites (parasites that live on the surface of the host). The northern fowl mite ranks as the top ectoparasite concern in laying hens. Mites and lice damage production and bother workers. Once birds are infested, producers depend exclusively on pesticides for control, and resistance is a serious issue. In addition, animal welfare issues in poultry systems have recently received significant attention, and one of the issues is beak trimming, done to prevent pecking damage and reduce feed waste. Nearly all egg production is from beak-trimmed hens. Beak-intact hen ectoparasite populations are far lower due to better hen grooming. Project researchers conducted experiments to quantify hen grooming behavior and to determine whether hens with intact beaks could control mite and louse populations well enough to prevent economic damage. Project objectives were to 1) determine the economics of production for beak-trimmed and beak-intact hens challenged with either northern fowl mites or body lice; 2) determine interactions of ectoparasite grooming behavior with beak condition and age of beak trimming; and 3) inform the industry of the potential benefits of using beak-intact hens for eliminating worker pesticide exposure, reducing or eliminating worker nuisance concerns, eliminating ectoparasite control concerns in an economic sense, and perhaps reducing animal welfare concerns and criticism.

Results: *Objective 1:* Three complete trials were done using a docile hen strain (Hyline W-36). Trials differed somewhat in overall results. In trial 1, uninfested, beak-intact controls were 17 cents more profitable (per hen) than uninfested, trimmed hens. In trial 2, this advantage was 20 cents per hen, but in trial 3 it was negligible. Louse damage was slight to negligible in intact hens in all three trials. Mite damage in intact hens was not seen in trial 1 and was slight to moderate in trials 2 and 3 (17 and 5 cents per hen, respectively). Trimmed hens sustained damage from lice and especially mites in most trials. *Objective 2:* Louse-infested hens spend more time grooming. Among intact hens, louse-infested hens spent about 30 percent more time grooming than uninfested hens. But among trimmed hens, infested hens (with far higher louse loads) groomed drastically more (about 400%) than their uninfested counterparts. *Objective 3:* Researchers presented the project's results at two state UC Cooperative Extension poultry producer meetings.

Impacts and Potential Impacts: Producers and the scientific community have been made explicitly aware of the commanding role of beak condition in ectoparasite control. The project's findings have high potential to influence how hens are managed, and certainly how ectoparasites are managed. Data thus far indicate that use of beak-intact hens greatly reduces parasite numbers and mitigates mite and louse damage to egg-laying hens, probably below the level requiring control in most situations. The reduction in pest numbers alone likely will eliminate worker complaints, a primary reason that producers apply pesticide treatments. The demonstration that pest-driven economic losses are also much less in intact hens should get people thinking about development of more docile strains and resulting advantages of using beak-intact hens.

Bradley Mullens, University of California

Beak trimming a 1-week-old chick to reduce or prevent later feed waste and cannibalism.

> continued on page 8

Highlights—*from page 7*

Epidemiology and Integrated Management of the Cucurbit Yellow Stunting Disorder Virus in Sonoran Desert Cucurbits

PI: Judith Brown, University of Arizona

Summary: Mixed melon and other cucurbits are major commodities in the Sonoran Desert. In fall 2006, a new disease reached pandemic proportions in the cucurbit-producing areas of Arizona, California, and Sonora, Mexico, resulting in losses greater $14 million to Arizona fall melon production alone, and an estimated 60 to 70 percent reduction in marketable melon yield in Arizona, California, and Sonora. The causative agent was identified as cucurbit yellow stunting disorder virus (CYSDV), a whitefly-transmitted virus that causes yellowing of the leaves between the veins, shortened stems between the nodes, leaf brittleness, and reduced sugar content.

The project's overall goal was to assess regional prevalence of CYSDV and develop a region-wide program to minimize losses and achieve sustainable cucurbit production. Specific objectives were to 1) determine the distribution of CYSDV in a) cucurbit and non-cucurbit crops and b) desert weeds in order to clarify the disease cycle and identify over-seasoning hosts in local production areas; 2) determine the experimental host range of CYSDV; 3) develop chemical and cultural control management practices to reduce regional whitefly and CYSDV pressures; 4) screen promising melon germplasm for CYSDV resistance under natural infection conditions in Arizona and California study areas; and 5) establish a regional education and management program for Arizona and California producers to encourage implementation of best practices.

Results: Researchers determined that the best management practices included a voluntary melon/watermelon host-free period to abate early season fall CYSDV outbreaks and subsequent virus overwintering; seasonal monitoring of whitefly and virus prevalence to better time pesticide applications; encouraging managers to respond to virus survey/whitefly sticky trap information by applying pesticides when whiteflies disperse to melon fields; implementing best practices

John Palumbo, University of Arizona/Yuma Cooperative Extension

CYSDV symptoms in melon fields in Yuma, Arizona.

pesticide regimes; and continuing the development of CYSDV-resistant germplasm. Numerous research updates were presented at extension-sponsored educational meetings, a CYSDV bulletin was produced and distributed in Arizona, and information was posted at the UC Statewide IPM Program Web site. Task force and Melon Board meetings were held several times a year to provide producers and field managers with the most up-to-date information. Researchers presented abstracts at professional meetings, and refereed journal articles were published on the topic.

Mark Your Calendar

2011

- Pacific Branch Entomological Society of America Annual Meeting, March 27–30, Waikoloa, Hawaii. ***http://www.acteva.com/booking.cfm?bevaid=204974***
- WERA-69 Annual Meeting, April 19–20, Santa Fe, New Mexico.
- Western Region Pesticide Meeting, May 17–19, Sacramento, California. ***http://pep.wsu.edu/wrpm/WRPM_11.pdf***
- Resistance 2011 International Conference, September 5–7, Rothamsted Research, West Common, Harpenden, Hertfordshire, United Kingdom. ***http://www.rothamsted.bbsrc.ac.uk/resistance2011.html***
- XIII International Symposium on Biological Control of Weeds (ISBCW 2011), September 11–16, Waikoloa, Hawaii. ***http://uhhconferencecenter.com/xiii_isbcw.html***
- IR-4 Food Use Workshop, September 13–14, Raleigh, North Carolina.
- 2011 National Plant Diagnostic Network meeting, November 6–9 (field trip November 10), San Francisco, California.
- Entomological Society of America 59th Annual Meeting, November 13–16, Reno-Sparks Convention Center, Reno, Nevada. ***http://www.entsoc.org/am/fm/index.htm***

2012

- 7th International IPM Symposium, March 27–29, 2012, Memphis, Tennessee.

Mary Ellen (Mel) Harte, Bugwood.org

Impacts and Potential Impacts: In Arizona the first Melon Task Force, comprised of producers, field managers, University of Arizona (UA) Extension, and UA researchers, was established to solve a common problem and save the melon industry. The California Melon Board supported research in Arizona and California, furthering the regional effort to manage the disease based on knowledge. Based on growing recognition of the symptoms of CYSDV and accurate identification of the disease, producers and field managers were able to plant more tolerant melon and watermelon varieties, reducing lost profits. Interest was strengthened in continuing research to identify important over-seasoning virus and whitefly reservoirs throughout the region. As a result of regional outreach, producers and field managers are more aware of how their practices affect others. Knowledge-based research has given producers and field managers facts upon which to base their actions and management strategies. Progress has been made toward identifying several CYSDV-tolerant accessions.

See the Western IPM Center Web site, **http://www.wripmc.org**, *for further details about objectives, results, and impacts of WIPMC-funded projects.*

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