CGAHR Update

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Inside this issue:

The on-going renovation and construction at the USDA-ARS **Center for Grain and Animal Health Research (CGAHR)** are symbolic of spring's growth and renewal. We finished patching, painting and reroofing our grain elevator and pilot plant building. Renovation of our new milling laboratory is more than half complete. In the next few months we will begin construction of a new Wind Erosion facility, a new standby power system, a new chiller, and resurfacing of our parking lots.

We also celebrate the recognition that two of our Research Leaders (RLs) recently received for their outstanding work and leadership. **Dr. Floyd Dowell**, RL for the **Engineering and Wind Erosion Research Unit** (EWERU) won the ***Andersons Cereal and Oilseeds Award of Excellence*** given by the U.S. Quality Grains Research Consortium. **Dr. James Throne**, RL for the **Stored Product Insect Research Unit** was awarded the ***C.V. Riley Award for Outstanding Contributions to the Science of Entomology*** by the Entomological Society of America, North Central Branch.

Dr. Floyd Dowell
Research Leader, EWERU

Dr. James Throne
Research Leader, SPIRU

A number of special visitors stopped at CGAHR over the past few months. These include **Drs. Steven Higgs** and **Dana Vanlandingham**, University of Texas Medical Branch, Galveston, TX; and a group of 6 agricultural administrators from the Philippines.

CGAHR
Center for Grain & Animal Health Research

New Scientific Staff

Dr. Scott McVey (right) joined ARS in January 2011. He received his DVM degree from the University of Tennessee in 1980. He spent three years in a dairy practice in East Tennessee and then earned the Ph.D. degree in Veterinary Microbiology from Texas A&M University in 1986. Dr. McVey joined the faculty at Kansas State University in 1986 as an Assistant Professor of Immunology. He was promoted to the rank of Associate Professor in 1992. Dr. McVey was awarded the SmithKline Beecham Award for Research Excellence in 1992. In late 1995, Dr. McVey joined Rhone Merieux as a Production Animal Scientist working in developmental research in veterinary biological products and diagnostics. In January of 1998, he joined Pfizer Bioprocess Research as a Senior Research Investigator and his most recent position there was Director of Laboratory Sciences, Biologicals Development of Pfizer Animal Health in Lincoln, NE (through April 2006).

Dr. McVey was most recently at the University of Nebraska, where he was Professor of Clinical Microbiology and Director of the Veterinary Diagnostic Center, where he supervised diagnostic bacteriology and taught microbiology in the University of Nebraska-Iowa State University Program for Veterinary Medicine. Dr. McVey was recipient of the Distinguished Alumni Award from the University of Tennessee, College of Veterinary Medicine, in 2007. He also is President of the American College of Veterinary Microbiologists and has also a served on the Blue Ribbon Panel for Counter measures for Terrorist Threats to Agriculture for the President of the United States (2003-2004). Dr. McVey is the Research Leader for the Arthropod Borne Animal Disease Research Unit and will be investigating vaccines and diagnostic control measures for arboviruses.

Dr. Lee Cohnstaedt joined the Arthropod-Borne Animal Diseases Research Unit (ABADRU) as the new Research Entomologist. Lee replaces Will Reeves, who took a position with the military in Japan. Lee grew up in Corvallis, Oregon, and obtained a B.A. in Spanish at the University of Oregon where he worked with Christina Holzapfel and William Bradshaw in the Biology Department and Janet Hodder at the Oregon Institute of Marine Biology. Later he obtained his Ph.D. from Yale University under the guidance of Leonard Munstermann and Diane McMahnon-Pratt. His work focused on the ecology and genetics of Phlebotomine sand flies of South America and combined field collections, geographic information systems, and population genetics.

Lee will be responsible for entomological collections in addition to disease transmission and disease vector studies for ABADRU. He also examines and models pesticide resistance and disease transmission in arthropods to refine disease mitigation strategies and understand epidemic spread. His interests are in entomological sampling and surveillance methods, techniques and analysis. He uses the target insects positive taxis behavior and physiology to improve trapping methods. Lee also conducts wide scale population genetic studies to understand the abundance and distribution of disease vectors and the biotic and abiotic factors restricting migration between populations.

Visitors

Dr. Luis Rodriguez, Research Leader at the USDA-ARS Plum Island Animal Disease Center visited ABADRU as part of the 2011 Kansas State University, College of Veterinary Medicine, Phi Zeta Research Day.

ABADRU News

Meetings/Conferences

Lee Cohnstaedt gave a presentation at the American Mosquito Control Association Meeting in Anaheim, CA.

Barbara Drolet was a speaker and participant at the First International One Health Congress, in Melbourne, Australia. Her presentation was entitled "Multidisciplinary Approaches for Rift Valley Fever Detection, Surveillance and Control."

William Wilson travelled to Nairobi, Kenya, to validate a serological diagnostic test for Rift Valley Fever.

William Wilson was an invited speaker at the FAO-sponsored Rift Valley Fever (RFV) Vaccine Development Progress and Constraints International Workshop in Rome, Italy. He gave a joint presentation with Dr. Cyril Gay, National Program Leader, Animal Health, entitled "Needed Attributes of a RFV Vaccine and the Development of Animal Models to Evaluate Them."

William Wilson attended the 2nd Annual Center of Excellence for Emerging Zoonotic Animal Diseases (CEEZAD) Meeting, Ponte Vedra, FL.

EWERU News

Research Highlight

Impact of land use change on wind erosion and dust emission: scenarios from the central U.S.
There will be significant changes in land cover and land use throughout the central United States in the coming years, particularly as a result of climate change, changes in rangeland/farm policy, and increasing exploitation of land-intensive sustainable energy sources. We investigated the potential of these land use and land cover changes to alter wind erosion and dust emission from these highly erodible lands. Water use from each system was also explored. The Wind Erosion Prediction System (WEPS) was used to evaluate the effects of different land management systems. Results show the conversion of range or CRP lands to cropland or for biomass harvesting run the risk of producing excessive erosion/dust emission if insufficient biomass is left on the soil. The results indicate that policy and economic forces shaping land use decisions can have significant effects on wind erosion and, importantly, dust emission with local and regional consequences. In addition, water use results show the potential effects of land use changes on this precious resource which is a limiting factor in much of the central U.S., particularly in the western Great Plains states.

For more information contact Dr. John Tatarko (785) 776-5542, Email: John.Tatarko@ars.usda.gov
(Collaborators on this work were: G. S. Okin and L. Junran)

Meeting/Conferences

Floyd Dowell, Mark Casada and **Paul Armstrong** attended NC 213 and Wheat Quality Council Meetings in Kansas City, MO in February.

Visitors

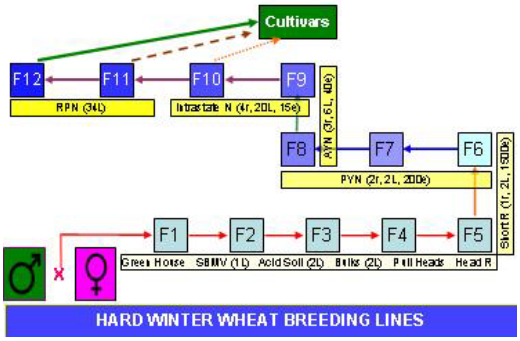
Dr. Aline Noutcha was a visiting scientist in EWERU for the past 3 months. She is originally from Cameroon and has a Ph.D. in Molecular Entomology from the University of Ibadan, Nigeria. She has experience in genetic and molecular characterization of malaria vectors. Dr. Noutcha has been working with Dr. Dowell using NIR spectroscopy to determine its potential for age grading mosquitoes that have been stored. Dr. Noutcha recently gave a seminar on her research experience including challenges she faces in working in developing countries.

Research Highlight

End-use quality evaluation for hard winter wheat breeding programs

One of the most important objectives of successful hard winter wheat breeding programs is to develop new wheat varieties with exceptional end-use quality. The primary end-use wheat quality attributes include physical kernel characteristics, protein quantity and quality, dough rheology, and other physical-chemical aspects. These quality attributes are significantly influenced by genotype, environment and their interaction.

Fig 1. Wheat Breeding Program



To develop a new wheat variety with desirable quality characteristics is a long (approximately 10-12 years, Fig. 1) and costly (several million dollars) process if conventional breeding methods (F2 progeny method) are utilized. During this period of segregation and selection, wheat quality attributes are evaluated at various stages of development in these "experimental" lines in order to ensure desired traits are inherited to the next generation. This also helps the breeder select advanced breeding lines and develop new wheat varieties.

The USDA-Hard Winter Wheat Quality Laboratory (HWWQL) works with hard winter wheat breeders in the Great Plains growing region to conduct quality tests on thousands of breeding lines, coordinates regional hard winter wheat projects (e.g. HWW Crop Quality Survey, Regional Performance Nursery, Wheat Quality Council), as well as evaluating the quality of hard red winter (HRW) wheat adapted outside its traditional growing area. The wheat breeding lines and existing hard winter wheat varieties are evaluated using well-established officially approved methods (Fig. 2). The results from these tests play a significant role in helping wheat breeders eliminate undesirable lines and advance superior ones until a new variety is ultimately produced and released to the general public. Without these results, the development of high quality wheat varieties would be very difficult, resulting in a decline or loss of end-use quality in wheat that could have an enormous and negative impact on the U.S. economy.

Fig 2. Wheat Quality Evaluation

For more information contact: Dr Richard Chen, 785-776-2750, Richard.Chen@ars.usda.gov

Grants

Scott Bean and Kansas State University collaborators received $38,000 for "Developing sorghum flours with increased resistant starch content for health benefits" from the Kansas Grain Sorghum Commission.

Jeff Wilson and **Scott Bean** were awarded $12,364 for their project "Effect of starch content on the functional quality of sorghum" from the Kansas Grain Sorghum Commission.

GQSRU News

Meeting/Conferences

Richard Chen and **Margo Caley** attended the Pacific Northwest (PNW) Wheat Quality Council Meeting in Seattle, WA.

Scott Bean, **Mike Tilley**, **Jeff Wilson** and **Tom Herald** attended the Celiac Sprue Association National Meeting in Kansas City, MO.

Mike Tilley was an invited speaker at the 6th International Food Science Symposium in Beijing, China. While in China, he also visited Jiangnan University in Wuxi, China.

Mike Tilley was an invited speaker at the 2nd Latin American ICC Cereal Conference in Santiago, Chile.

Mike Tilley attended the 2010 Tortilla Industry Association Technical Conference in Las Vegas, NV.

Prini Gadgil attended Mass Spectroscopy training in Orlando, FL.

Brad Seabourn, **Richard Chen**, **Margo Caley**, **Theresa Sutton**, **Laura McLaughlin**, **Mike Tilley** and **Tom Herald** attended the Wheat Quality Council Meeting in Kansas City, MO.

Brad Seabourn and **Tom Herald** attended the Kansas Commodity Classic in Great Bend, KS.

Scott Bean, **Deidre Blackwell** and **Brian Ioerger** attended the American Chemical Society Meeting in Anaheim, CA.

Visitors

Recent visitors to the GQSRU have included sorghum producer and NuLife Foods CEO, Earl Roemer; Mark Hodges, CEO of Plains Grains Inc.; and Sydney Carlin, Manhattan Representative to Kansas House of Representatives.

HWWGRU News

Research Highlight

A new virus infecting wheat

Triticum mosaic virus (TriMV) is a newly discovered virus that infects wheat. It was originally found at the KSU Agricultural Research Center-Hays by Drs. Dallas Seifers and Joe Martin of Kansas State University. While scouting research plots, they found virus-like symptoms in the variety RonL, which is resistant to *Wheat streak mosaic virus* (WSMV). Tests proved that the symptoms were not caused by WSMV or other known wheat viruses. Dr. Seifers named the virus *Triticum mosaic virus*, purified it from infected plants, and sent a sample to Dr. John Fellers of the USDA-ARS Hard Winter Wheat Genetics Research Unit who characterized the physical properties of the virus. Dr. Fellers sequenced the TriMV coat protein of the virus and discovered it was clearly distinct from other viruses, but distantly related to WSMV. Under the electron microscope, the virus looked like flexible rods (Fig. 1). Dr. Fellers further characterized TriMV by sequencing the complete genome. Together, the virus shape and the genome sequence classified TriMV as a Potyvirus. Using the genome sequence, a polymerase chain reaction (PCR) test for TriMV has been developed through a collaboration with Dr. Charles Rush and Jacob Price of Texas A & M University. This test is now being used in plant disease diagnostic labs.

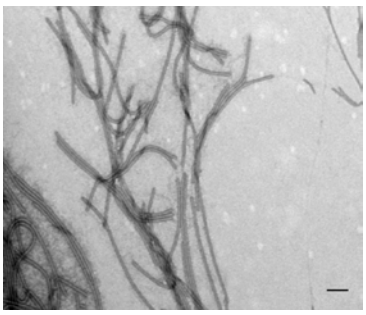


Fig. 1. Electron micrograph of TriMV virus particles (Photo J. Fellers)

Research Highlight (continued)

We have learned a lot about the biology of the virus and how widespread it is. Dr. Seifers discovered that TriMV was transmitted by the Wheat Curl Mite and found that TriMV can be present as a single infection or present with WSMV in a co-infection. Surveys from around the Great Plains have found TriMV from Texas to Wyoming. A graduate student in the lab of Dr. Fellers, Irazema Fuentes-Bueno, sequenced the TriMV coat protein from isolates from Oklahoma, Kansas, and Texas and found the field populations of the virus to have little differences in their proteins. Dr. Seifers has shown that TriMV can cause significant yield losses in wheat and unfortunately, there are no resistance genes for TriMV available in wheat varieties at this time. We do not know where TriMV came from or how long it has been in the U.S., but is very possible that symptoms that have attributed to WSMV in the past may have been from TriMV or mixed infections. Dr. Fellers, in collaboration with Dr. Harold Trick of Kansas State University and through funding from the Kansas Wheat Commission, is currently developing experimental lines with genetically engineered resistance to both WSMV and TriMV. If successful, these experiments could someday result in new virus-resistant varieties of hard winter wheat.

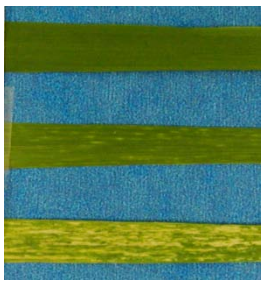


Fig. 2 . Tomahawk wheat (Top) non-inoculated control; (Middle) TriMV 18 days post-infection; (Bottom) TriMV 35 days post-infection. (Photo: J. Fellers)

For more information contact Dr. John Fellers (785) 532-2367, Email: John.Fellers@ars.usda.gov

Meeting/Conferences

Guihua Bai traveled to Kansas City, MO, to attend the 2011 Wheat Quality Council Annual Meeting.

Robert Bowden, **Guihua Bai**, **John Fellers** and **Jesse Poland** attended the PAG (Plant and Animal Genome) Meeting in San Diego, CA.

Ming-Shun Chen traveled to the University of Illinois to give an invited seminar in the Department of Entomology.

John Fellers traveled to Washington, DC, to take part in the AFRI panel and served on a grant review panel.

Jesse Poland traveled to Obergon, Mexico, in to attend the 2011 Wheat Yield Consortium Field Workshop.

Visitors

Dustin L. Severtson from the Australian Department of Agriculture visited HWWGRU to learn about Hessian fly research.

About 15 graduate students from the Kansas State University Biochemistry Department visited Dr. Guihua Bai's lab to learn DNA sequencing techniques and high-throughput DNA isolation and genotyping.

Dr. Jun Ji from Chinese Academy of Science will spend 6 months in Dr. Bai's lab. He is working on a wheat marker-assisted breeding project.

Research Highlight

Evaluation of impact of management tactics on stored-product insect populations in food processing facilities

A major research focus is evaluating the impact of different pest management tactics on stored-product insect populations in food facilities such as wheat mills, rice mills, processing plants, and warehouses. Methyl bromide has been widely used as a fumigant for the control of stored-product insects infesting food facilities, but it is an ozone-depleting substance and its use is being phased out worldwide under the Montreal Protocol. Limited information on the effectiveness of methyl bromide and potential alternatives such as other fumigants, heat treatments, and integrated pest management (IPM) programs under real world conditions has hampered adoption of alternatives.

The red flour beetle (*Tribolium castaneum*, Fig. 1 at right) is a major pest of mills and a major target for fumigation with methyl bromide. Recently, data from five to six years of red flour beetle monitoring using traps (see Fig. 2) in two wheat mills was used to evaluate the impact of fumigations on pest populations and the factors that might influence fumigation efficacy.

Fig. 1. The Red Flour Beetle

Fig. 2. Pheromone trap used for monitoring red flour beetle abundance in a wheat mill

The first issue that we were interested in evaluating was the immediate reduction in beetle activity following fumigation. Fumigations, most of which were with methyl bromide, resulted in an 85% reduction in average number of beetles captured per trap. The greater the average capture of beetles prior to fumigation the greater the number captured immediately after fumigation, suggesting presence of beetles after fumigation was more likely due to survival of treatment. Reduction in beetle captures was not significantly affected by the time of year the fumigation was performed (spring versus fall).

The second issue was how quickly beetle numbers increased following fumigation treatments. A threshold of 2.5 beetles/trap/two week monitoring period was developed. The time it took captures in traps to meet or exceed this value was longer after fall fumigations than spring fumigations, probably due to slightly cooler interior temperatures (Fig. 3) and reduced immigration of new beetles following treatment. When average beetle captures exceeded this threshold value there was also an increased number of large increases in beetle capture over time, which could be associated with increased risk.

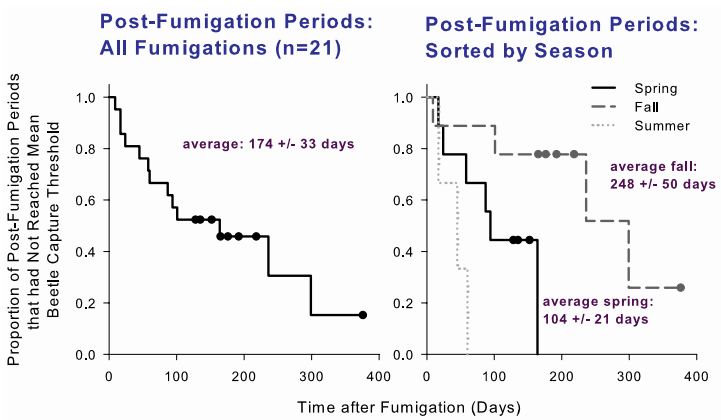


Fig. 3 . Rebound in red flour beetle captures following fumigation as time after treatment to reach or exceed threshold value of 2.5 beetles/trap/2 week monitoring period.

These results provide baseline information on trends in pest populations and fumigation efficacy to which methyl bromide alternatives can be compared. Managing rate of rebound and using thresholds in capture as management targets can be an important tool to maintain pests at low and stable levels, reduce risk of product infestation, reduce need to fumigate, and make methyl bromide alternatives more cost effective. Research is now focused on the evaluation of other locations and treatment types.

For more information contact Dr James Campbell, 785-776-2717, or James.Campbell@ars.usda.gov.
(Collaborators were: Drs. R.T. Arbogast, USDA ARS CMAVE, Gainesville FL; F.H. Arthur, USDA ARS CGAHR; and M.D. Toews, University of Georgia, Tifton GA.)

Grants

A new 3-year grant "Functional analysis of proteins involved in dynamic assembly of chitin/chitosan laminae in the insect exoskeleton" from the National Science Foundation was awarded to **Dick Beeman** from CGAHR along with **Subbaratnam Muthukrishnan** and **Karl J. Kramer** (Biochemistry, Emeritus) from Kansas State University, and **Yasuyuki Arakane** from the Chonnam National University, Gwangju, South Korea.

Meeting/Conferences

Jim Campbell attended the Insect Behavior, Monitoring, and Mating Disruption Technical/Commercial Training Seminar hosted by Trece Inc., Bentz Jaz Inc, and the Singapore Pest Control Association in Singapore and presented the invited talk "Insect behavior, insect monitoring and mating disruption applications and interaction and advances in experimental monitoring systems."

Frank Arthur, Dick Beeman, Jim Campbell, Paul Flinn, Jeff Lord, Brenda Oppert, Joel Perez-Mendoza, and **Jim Throne** attended the Annual Meeting of the Entomological Society of America in San Diego, CA. Frank Arthur gave an invited talk "The Peer Review Process: A new editor's view," Dick Beeman gave the invited talk "The *Tribiolium* genome sequence: offshoots and enhancements," Jim Campbell gave the invited talk "Advances in the implementation and interpretation of stored-product insect monitoring programs in food facilities," Brenda Oppert presented the talk "Effect of *Bacillus thuringiensis* Cry3Aa intoxication on the expression of cysteine and serine peptidase transcripts in the midgut of the yellow mealworm, *Tenebrio molitor,*" and Jim Throne gave the invited talk "Publications and the ARS Evaluation System." Jeff Lord presented the poster "Comparison of entomopathogenic fungi for hide beetles on various substrates," Brenda Oppert presented the poster "Microarray analysis reveals adaptive strategies of *Tribolium castaneum* larvae to compensate for cysteine and serine proteinase inhibitors," and Joel Perez-Mendoza presented the poster "Effect of physiological factors on flight initiation of the red flour beetle, *Tribolium castaneum* (Herbst)."

Brenda Oppert presented the talk "Large-scale gene expression patterns are altered in *Tribolium castaneum* larvae to compensate for cysteine and serine protease inhibitors" at the 19th Annual International Plant and Animal Genome Conference in San Diego, CA.

Jim Campbell attended the Annual Meeting of the North Carolina Pest Management Association in Raleigh, NC, and presented the talk "Stored product pests."

Brenda Oppert presented the talk "*Bacillus thuringiensis* Cry3Aa intoxication significantly impacts the expression of serine peptidase transcripts in Yellow Mealworm larvae" at the 12th Annual Advances in Genome Biology and Technology (AGBT) Meeting on Marco Island, FL.

Frank Arthur presented the talk "Insect growth regulators as an alternative in controlling stored product insects," and **Jim Campbell** presented the talks "Biology, habitat and control of Indianmeal moths" and "Surveillance and monitoring programs for foreign stored grain pests" at the Nebraska Urban Pest Management Conference in Lincoln, NE.

Frank Arthur presented the talk "Stored product insects and control in structures: Pilot-scale studies" at a departmental seminar at the Department of Entomology, Kansas State University, Manhattan, KS.

Frank Arthur presented the talk "Integrated pest management for stored product insects" at the Industrial Fumigant Co. 2011 Training Conference for Food Industry Pest Management in Overland Park, KS.

Emily Fontenot conducted a training session titled "Packaging to protect against insects" at the Minnesota Food Plant Pest Management Conference held at the University of Minnesota in Minneapolis, MN.

Visitors

Marce Lorenzen, Assistant Professor of Entomology at North Carolina State University, visited SPIRU in February to discuss research collaborations. Dr. Lorenzen was formerly a postdoc with SPIRU.

Community Service

Adopt-a-Highway CGAHR staff picked up litter along a 2.1 mile section of highway in Manhattan this spring, the first of three scheduled collections in 2011 to remove accumulated litter along the road. This is the 4th year that CGAHR staff have helped to keep our community's road clean and litter-free.

Personnel News

Theresa Sutton joined the GQSRU as a Support Scientist.
Dianna Halcumb joined SPIRU as a Program Support Assistant.
Zina Haden retired from GQSRU at the end of 2010.
Lee Cohnstaedt joined the ABADRU as a Research Entomologist.
Scott McVey joined ABADRU as the Research Leader and a Supervisory Veterinary Medical Officer.
Christopher Lehiy joined ABADRU as a Post-doctoral Research Associate.
Jim Adrianos, Facility Operations Specialist, was awarded the Safety, Health and Environmental Management Award for the Northern Plains Area.
JoAnne Gresens, Safety Officer, was part of the Diversity Task Force that won the NPA EEO-Diversity Award for the Northern Plains Area.