March 2009

UPDATE

San Joaquin Valley Agricultural Sciences Center

Inside this issue:

- New SJVASC Administrative Officer—Ms. Tina Jack
- 2009 OECD Grant awarded to Gary Banuelos

Introduction

Partnerships between San Joaquin Valley Agricultural Sciences Center (SJVASC) researchers and stakeholders are essential for ensuring effective use of science and technology developed by the Agricultural Research Service (ARS) in Parlier. Close communication with stakeholders facilitate and expedite timely transfer of scientific knowledge and information developed by SJVASC scientists to the private sector, as well as to State and Federal regulatory agencies. This is currently realized in several ways. SJVASC scientists continue to participate in two area-wide pest management projects for alternatives to methyl bromide for pre-plant soil fumigation in strawberry, grape, perennial and floral crops, and for navel orangeworm management in tree nut crops. The Water Management Research Unit hosted a meeting at the Center to update stakeholders about current research activities and future research plans, and solicited input to identify future research needs. SJVASC scientists in the Crop Diseases, Pests and Genetics and Water Management Research Units have also developed Cooperative Research and Development Agreements with private sector partners. SJVASC researchers continue to participate in stakeholder commodity meetings focused on new technologies, and on exotic, invasive and emerging pests and diseases. These include glassy-winged sharpshooter, *Xylella fastidiosa* diseases of horticultural crops, Asian citrus psyllid, liberibacter species associated with diseases of citrus and solanaceous crops that pose threats to crops nationwide.

National Arid Land Plant and Genetics Resources Unit

The National Arid Land Plant and Genetics Resources repository is regenerating material for other repositories around the country. Accessions of parsley, celosia and sunflowers from the repository in Ames, Iowa are currently being grown out. Over 2,600 cereal accessions from Aberdeen, ID have been planted for seed increases.

Current Research Highlights

National Arid Land Plant and Genetics Resources Unit—continued

Various accessions of cucurbits and peppers are being grown out for the repository in Griffin, GA, and garlic and safflower accessions are being increased for the Pullman, WA repository. *Lesquerella* and *Limnanthes* accessions are also being regenerated. New germplasm has been acquired and established in the system, including the rare/endangered *Lesquerella thamnophila* from Southern Texas, and five Texas/New Mexico accessions of *Parthenium*. Herbarium specimens of *Parthenium* (from Texas & New Mexico) and *Limnanthes* (from Northern California) were recently delivered to the National Arboretum in Washington, D.C.

Crop Diseases, Pests and Genetics Research Unit

Elaine Backus continues to study mechanisms by which glassy-winged sharpshooter (GWSS) delivers *Xylella fastidiosa* (Xf) to grape plants. Feeding of inoculative GWSS on grape petioles was monitored via Electrical Penetration Graph (EPG) technology, followed by histological processing of the fed-upon grape tissues. The enzyme glucanase was found throughout the solid salivary sheath that encases the piercing-sucking mouthparts of GWSS that penetrate the plant. However, glucanase was not found diffused into adjoining plant cells along the stylet pathway. Glucanase was the major constituent of the deep, narrow sheath branches that enter the xylem, indicating that glucanase is injected into xylem during GWSS feeding.

Jianchi Chen, in collaboration with scientists from Guangdong, P. R. China, have discovered and characterized a novel phytoplasma associated with citrus Hunaglongbing (HLB) disease. Discovery of this new plant-infecting agent suggests that the etiology of HLB disease (currently associated with several '*Candidatus*' Liberibacter species) may be more complex than previously realized. This study showed that, in addition to '*Ca.* L. asiaticus', a phytoplasma related to '*Ca.* P. asteri' (aster yellows phytoplasma) can be detected in citrus showing huanglongbing symptoms, and provides potential new insight into the etiology and epidemiology of this disease. Images from the recently published paper "A Phytoplasma Related to '*Candidatus* Phytoplasma asteri' Detected in Citrus Showing Huanglongbing (Yellow Shoot Disease) Symptoms in Guangdong, P. R. China" by **J. Chen** and colleagues (Chen, J., X. Pu, X. Deng. S. Liu and E. Civerolo, 2008. Phytopathology Vol. 99, No. 3, pages 236-242) were selected for the cover of the March 2009 issue of that journal. This is the second time that Dr. Chen's research on fastidious prokaryotes associated with diseases of horticultural crops has been so highlighted by Phytopathology.

Craig Ledbetter is researching utilization of almond shell waste as value-added products. Eight diverse almond selections were evaluated for shell cracking strength and kernel percentage. In general, there was a strong relationship between shell strength and kernel percentage, with stronger shelled almonds being those having a lower kernel percentage (higher shell percentage). However, some varieties did not differ in kernel percentage, but did differ a great deal in shell strength. This indicated chemical differences in the shell composition, and demonstrated the non-homogeneous nature of almond shell materials. This observation is an important first step in determining which varieties produce shells best suited to new industrial processes utilizing agricultural by-products.

Current Research Highlights (continued)

Crop Diseases, Pests and Genetics Research Unit continued—

Hong Lin led a team investigating the effects of purified cell wall constituents and xylem sap from Pierce's disease (PD) resistant and susceptible *Vitis* germplasm on growth, biofilm formation and cellular aggregation of *Xylella fastidiosa* in culture. The results indicate that differences in cell wall constituents and xylem sap chemistry among PD-resistant and PD-susceptible grapes may influence disease development of grapevines infected with *X. fastidiosa*.

David Ramming continues with efforts to breed table and raisin grapes with improved resistance to Pierce's disease. Resistance is being added to high quality table and raisin germplasm by hybridizing with different sources of Pierce's disease resistance. Recently, 22 seedless cross combinations were made and plants are being produced. Molecular markers have been used to identify 363 resistant seedlings from over 1,000 seedlings in 14 families from the *Vitis arizonica* source of resistance.

Elizabeth Rogers is investigating use of the model plant *Arabidopsis thaliana* as a tool to understand plant host response to the Pierce's disease pathogen *Xylella fastidiosa* (Xf). A pin-prick inoculation method was developed and the bacterium was detected in plants by microscopy and PCR. Xf has been re-isolated from infected *Arabidopsis* tissue. Timecourse studies following Xf growth and changes in pathogenesis-related gene expression are in progress, as is the testing of various pathogenesis-related mutants and *Arabidopsis* ecotypes.

Mark Sisterson has assessed egg load dynamics of the glassy-winged sharpshooter (GWSS). Studies determined that female GWSS emerged as adults without mature eggs but matured eggs rapidly after a brief preoviposition period of ~1-2 weeks. The maximum number of eggs matured/female/day was 5 and varied with time of year. A detailed understanding of the reproductive biology of this insect pest will aid in developing novel control strategies.

Drake Stenger has characterized a phytoreovirus infecting the glassy-winged sharpshooter (GWSS), designated as *Homalodisca vitripennis* reovirus (HoVRV). The genome of HoVRV was determined to be composed of 12 segments of double-stranded RNA contained within double-shelled isometric particles. Analysis of the complete genome of HoVRV revealed that the virus was most closely related to *Rice dwarf virus*, a phytoreovirus that infects both plants and its leafhopper vector. HoVRV infection of GWSS was common in both California and the Carolinas. Although related to plant-infecting viruses, no plant hosts of HoVRV have been identified to date.

Ray Yokomi utilized a real time PCR assay to detect the causal agent (*Spiroplasma citri*) of Citrus Stubborn Disease (CSD) in infected trees. The assay was used to determine incidence of CSD in five Navel orange orchards in Kern and Tulare Counties in central California. A systematic sampling plan was used in which 25% of the trees in each orchard were sampled. Results indicated CSD incidence in the different plots were 58.9%, 4.2%, 0%, 22.4%, and 28.6%. These data are being used to examine if secondary spread of *S. citri* is occurring and to facilitate identification of leafhopper vector(s) responsible for pathogen spread.

Current Research Highlights (continued)

Commodity Protection and Quality Research Unit

Charles Burks determined navel orangeworm infestation levels of almond mummies including soft-shell (Nonpareil, Monterey) and hard-shell almond varieties (Butte, Padre) for the winter of 2008-2009 in a mating disruption area-wide research site in western Fresno County. In some cases high levels of mummy infestation were found in Padre, a variety thought of as less susceptible to navel orangeworm infestation.

Vicky Yokoyama, working with colleagues in California and Guatemala, have imported and released a small brown wasp, *Psyttalia* cf. *concolor*, to help control the olive fruit fly in infested olive groves. The parasitoid was mass produced on sterile Mediterranean fruit fly in the Moscamed, Petapa Biological Control Laboratory in Guatemala by a USDA-APHIS-PPQ team. Released parasitoids successfully located and oviposited their eggs in olive fruit fly larvae in olive trees identified by growers, and U.C. Cooperative Extension and County Departments of Agriculture personnel in eleven counties. Subsequent generations of the parasitoid developing from olive fruit fly larvae have been collected from most of the release sites suggesting that biological control of the pest may be sustainable.

Water Management Research Unit

Dong Wang and others initiated new research with funding from California Strawberry Commission to develop a raised-bed trough (RABET) system with soilless substrate for strawberry production. In collaboration with the California Strawberry Commission, field trials are being carried out in Watsonville and Santa Maria to evaluate various soilless substrate materials in two trough designs. Laboratory and modeling studies are planned for screening possible substrates and trough configurations for the system.

Suduan Gao received funding from California Strawberry Commission for 2009 to evaluate low permeable tarp performance and potential to reduce fumigant emissions and application rates under field conditions."

Brad Hanson received funding from Arkema Chemical Co. to assess dimethyl disulfide for pest control.

Gary Banuelos received a 2009 fellowship/travel grant from the Organization for Economic Co-operation and Development (OECD) to spend 19 weeks at the Swiss Federal Institute of Technology at Zurich, Switzerland to identify hybrid poplar trees for boron tolerance. Also, **Gary Banuelos'** field research on using canola to uptake selenium on John Diener's ranch was reported in a news article by Capital Press (11/29/2008).

Current Research Highlights

Water Management Research Unit—continued

Suduan Gao, **Jim Gerik**, **Brad Hanson**, and **Dong Wang**, each leading a separate research project under the Pacific Component of the areawide pest management project for methyl bromide (MB) alternatives, received continued funding in 2009. **Suduan Gao** is testing and calibrating new designs of a dynamic flux chamber system for measuring fumigant emissions. **Dr. Gerik** is responsible for transferring technology for adoption of MB alternatives in California cut flower and ornamental crops. **Dr. Hanson** will lead a study of the efficacy and 1,3-D emissions of approved nursery stock certification treatments applied with two shank designs. **Dr. Wang** will lead an investigation of MB alternatives for vineyard replant including assessment of control efficacy, fumigant movement, and crop response. These projects also have close collaborations with researchers from UC/UCCE and other USDA-ARS locations (e.g. ARS Davis and ARS Riverside), and supported strongly by the respectively grower groups and the industry (e.g. TriCal and Dow AgroSciences).

Meetings, Conferences, Workshops & Visitors

Jim Ayars made presentations at:

- Mountain Home, California on "Site Evaluation for Percolation and Drainage" at the "Soils, Water and Drainage: The Rest of the Recycled Water Story" conference, sponsored by the Santa Clara Water District. The meeting was attended by professionals in the landscape industry in preparation for using recycled municipal water for irrigation of urban landscapes (February 17, 2009);
- The Wild Horse Winery in Templeton, California titled "Water Management for Salinity Control" to wine grape growers in the Paso Robles area of California. The meeting was organized by Mark Battany with the U.C. Cooperative Extension in response to the continuing drought in California that has led to the accumulation of salt in many vineyards on the central coast of California (March 10, 2009).

Brad Hanson made presentations at:

- UC Citrus Meeting (October 10, 2008 Tulare, CA);
- UC / ARS Almond Field Day (October 28, 2008 Parlier, CA);
- California Weed Science Society Meeting (January 12-14, 2008 Sacramento, CA);
- Western Society of Weed Science (March 9-11, 2009 Albuquerque NM);
- Lectured on Fumigants and Nematicides in undergraduate "Pesticides" class at Fresno State (November 5, 2008 Fresno CA).

Suduan Gao gave a presentation titled "Behavior of Fumigants in Soil" at the Pesticide Applicators Professional Association (PAPA) Seminar, Fresno, California, January 22, 2009.

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Meeting, Conferences, Workshops & Visitors (continued)

Dong Wang made a presentation at the 2009 San Joaquin Valley Grape Symposium, titled "Vineyard Soil Fumigation – Alternatives to Methyl Bromide" in Easton, CA (January 7, 2009).

Jim Ayars and **Dong Wang** hosted a planning meeting at the SJVASC for the work group developing a proposal to the Specialty Crops Research Initiative. This was a follow up meeting to a stakeholders and working group meeting held at the J. Lohr Visitor Center in Paso Robles in February. The workgroup includes representatives from three ARS locations, the University of California, E.J. Gallo, J. Lohr, Washington State University, National Grape and Wine Initiative, Sun-Maid and the California Table Grape Commission. The proposed project is focused on developing sustainable water management strategies for vineyards. (March 11, 2009).

Jim Ayars, **Brad Hanson**, **Suduan Gao**, and **Dong Wang** attended and gave presentations at the 2009 California Plant and Soil Conference in Fresno, CA (February 3-4, 2009).

Suduan Gao, **Jim Gerik**, **Brad Hanson**, **Ruijun Qin**, and **Dong Wang** attended and each made presentations at the 2008 MBAO annual meeting in Orlando, FL (Nov 10-13, 2008).

Suduan Gao, **Ruijun Qin**, **Peter Vaughan**, and **Dong Wang** attended and each made presentations at the 2008 ASA-CSSA-SSSA Annual meetings in Houston, TX (Oct 5-9, 2008).

Chuanw Chen of the Guangxi Citrus Research Institute, P. R. China is a visiting scientist in the laboratory of **Hong Lin** working on DNA-based detection assays for '*Candidatus'* Liberibacter species associated with citrus Huanglongbing and potato zebra chip diseases.

Maria Saponari of the Istituto di Virologia Vegetale del CNR, Sezione di Bari, Italy is spending 6 months in the laboratory of **Ray Yokomi** to validate strain differentiation of Citrus tristeza virus (CTV) by TaqMan real time PCR and to evaluate the role of gene silencing in CTV cross protection.

Elaine Backus, Jianchi Chen, Rodrigo Krugner, David Ramming, Elizabeth Rogers, Mark Sisterson, and Drake Stenger attended and presented research results at the CDFA Pierce's Disease Control Program Research Symposium, December 15-17, 2008, San Diego, CA.

Jianchi Chen and Hong Lin attended and presented research results at the International Research Conference on Citrus Huanglongbing, December 1-5, Orlando, FL.

David Ramming presented research progress on breeding raisin grapes at the San Joaquin Valley Grape Technical Group, October 12, 2008, Fresno, CA.

Ray Yokomi presented an invitational paper entitled "Threat to Italian citrus production by the introduction and establishment of *Toxoptera citricida*" at La tristeza degli agrumi in Puglia 2003 -2008 Valutazioni e strategie di lotta, Puglia, Italy, October 17, 2008.

Meeting, Conferences, Workshops & Visitors (continued)

Charles Burks presented a paper entitled "Comparison of NOW trap activity and damage in almonds using egg and pheromone traps" at the Annual Meeting of the Entomological Society of America in Reno, Nevada (November 16-20, 2008).

Joel Siegel presented "Navel orangeworm control in almonds and pistachios" at the Bayer Crop Sciences Vine and Tree Nut Conference, Monterey, California. The presentation described results of his research in 2007 and 2008 on control strategies for navel orangeworm in pistachios and almonds (January 6, 2009).

Joel Siegel presented "Navel orangeworm sanitation, insecticide efficacy and factors related to damage" at the Annual Pistachio Day, sponsored by the University of California, in Visalia, California. The presentation described results of his 6 year research program in pistachios as well as analysis of the 2008 pistachio harvest (January 16, 2009).

Joel Siegel presented "In season control of NOW, assessment of application coverage" as a research proposal to the Pistachio Research Board. The proposal reported the results of the research from the summer of 2008 as well as proposed new research in collaboration with **Spencer Walse** of the Commodity Protection and Quarantine Unit (January 17, 2009).

Spencer Walse presented "Multifactor exploration of the insecticidal efficacy and degradation of surfuryl fluoride in stored walnuts" at the annual Walnut Board Research Conference in Bodega Bay, California. This is part of an ongoing research project that has a goal of providing practical and safe chemical-based strategies for controlling insect pests within durable commodities, particularly California dried fruit and nuts (January 23, 2009).

Joel Siegel, **Charles Burks**, and **Lodewyk 'Bas' Kuenen** were invited participants in a panel discussion on research priorities for control of navel orangeworm damage in pistachios conducted at the Fresno Farm Bureau and sponsored by the California Pistachio Research Board (February 4, 2009).

Joe Smilanick and UC Farm Advisor, **Jennifer Hashim-Buckey**, presented "The effects of cluster thinning and tipping and applications of growth regulators, fungicides, and mineral salts on table grape bunch rot, berry quality, and postharvest decay" to attendees at the San Joaquin Valley Table Grape Seminar, sponsored by the California Table Grape Commission in Visalia, California. The presentation described results of their four year collaborative research project to optimize viticultural practices to improve grape quality and prolong their shelf-life (February 18, 2009).

Judy Johnson presented "Methyl Bromide Alternatives for Postharvest Insect Disinfestation of California Walnuts" at the 6th International Walnut Symposium held in Melbourne, Australia. She then met with walnut growers at the Victoria Department of Primary Industries Center at Tatura, touring a local walnut processing plant (February 25-27, 2009).

Upcoming Events

The 93rd Annual Meeting of the Pacific Entomological Society of America in San Diego, California, March 29-April 1, 2009.

Crop Diseases, Pests and Genetics Research Unit—Stakeholder Conference, May, 2009.

Recent Publications

Higbee, B. S., **Burks, C. S.** 2008. Effects of mating disruption treatments on navel orangeworm (Lepidoptera: Pyralidae) sexual communication and damage in almonds and pistachios. J. Econ. Entomol. 101:1633-1642. Available http://www.bioone.org/doi/pdf/10.1603/0022-0493%282008%29101%5B1633%3AEOMDTO%5D2.0.CO%3B2

Hanson, B.D. and S.M. Schneider. 2008. Evaluation of weed control and crop safety with herbicides in open field tree nurseries. Weed Technol. 22:493-498.

Guo, M., and **S. Gao.** 2009. Degradation of methyl iodide in soil: effects of environmental factors. J. Environ. Qual. 38: 513-519.

McDonald, J.A., **S. Gao**, **R. Qin**, **B.D. Hanson**, T.J. Trout, and **D. Wang**. 2009. Effect of water seal on reducing 1,3-dichloropropene emissions from different soil textures. J. Environ. Qual. 38: 712-718.

Backus, E.A., and Labavitch, J.M. 2008. Immunohistochemistry of ß 1,4-glucanase, the major enzymatic component of glassy-winged sharpshooter saliva, in probed grape petioles. Proceedings of the CDFA Pierce's Disease Control Program Research Symposium, December 15-16, 2008, San Diego, California. p.3-6.

Chen, J., Pu, X., Deng, X., Liu, S., Li, H., **Civerolo, E.** 2009. A phytoplasma related to '*Candidatus* Phytoplasma asteri' detected in citrus showing huanglongbing (yellow shoot disease) in Guangdong, P. R. China. Phytopathology 99:236-242.

Cheng, D.W., **Lin, H.**, Walker, A., **Stenger, D.C.**, **Civerolo, E.L.** 2008. Effects of Grape Xylem Sap and Cell-Wall Constituents on In Vitro Growth, Biofilm Formation and Cellular Aggregation of *Xylella fastidiosa*. Proceedings of the CDFA Pierce's Disease Control Program Research Symposium, December 15-17, 2008, San Diego, California. pp.118-122.

Krugner, R., Johnson, M.W., Daane, K.M., Morse, J.G. 2008. Olfactory responses of the egg parasitoid, *Gonatocerus ashmeadi* Girault (Hymenoptera: Mymaridae), to host plants infested by *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae). Biological Control. 47:8-15.

Ledbetter, C.A. 2008. Shell Cracking Strength in Almond (*Prunus dulcis* [Mill.] D.A. Webb.) and its implication in uses as a value-added product. Bioresource Technology. 99(13): 5567-5573.

Sisterson, M. S. 2008. Egg load dynamics of *Homalodisca vitripennis*. Environmental Entomology 37: 1200-1207.

Stenger D. C., French, R. 2009. Wheat streak mosaic virus genotypes introduced to Argentina are closely related to isolates from the American Pacific Northwest and Australia. *Archives of Virology*: 154:331-336.

Recent Publications—continued

Yao, J., **Lin, H.**, Vandeyne, A., Doddapaneni, H., Francis, M., Macedo Lemos, E., **Civerolo, E.L.** 2008. PrimerSNP: a web tool for whole-genome selection of allele-specific and common primers of phylogenetically-related bacterial genomic sequences. BMC Microbiology, 8:185doi:10.1186/1471-2180-8-185.

News

In December 2008, **Ms. Tina Jack** became the new Administrative Officer for the San Joaquin Valley Agricultural Sciences Center. She came to ARS from the private sector.

Research Units and Contact Information