June 2011

UPDATE

San Joaquin Valley Agricultural Sciences Center

Inside this issue:

- Program Visioning Workshop
- New Apricot Selection
- Olive Fruit Fly Bio-control

Introduction

The mission of the San Joaquin Valley Agricultural Sciences Center (SJVASC) is to conduct basic and applied research to develop science-based, environmentally acceptable and sustainable agricultural production systems; improve the traits of horticultural crops; control invasive pests and diseases; ensure market access and maintenance of the postharvest quality and safety of tree fruits and nuts, and small fruits; and protect natural resources by improved irrigation and drainage water management, and water productivity.

Input from customers and stakeholders helps ensure that the Center carries out its mission effectively. Accordingly, a Program Visioning Workshop was held at the Center on February 14-15, 2011. The Workshop brought together invited industry stakeholders and partners, the Center Director, Research Leaders and scientists, ARS National Program Leaders, the Leadership of the Pacific West Area and other invited ARS scientists to discuss the major issues that are and will be impacting agricultural production in the region; identify short (3-5 years) and long (>5 years) term problems that are researchable; and identify those research problems for which the unique scientific capacity of the SJVASC and scientists at the Center are positioned to address.

A number of non-researchable, overarching themes were considered by stakeholders to be important issues that provided a framework for the workshop, including the need for communication, collaboration and outreach activities; leveraging limited funds for research programs; balancing long and short term research and being cognizant of new and emerging opportunities; and enhancing economic sustainability. Three major researchable themes emerged from the discussions and breakout groups, including controlling the major quarantine and invasive pests and diseases that impact agriculture in the area, identifying alternatives to, and improvements in, the use of methyl bromide as a pre-plant soil fumigant and for postharvest disinfestations;

Introduction *(continued)*

and improving the quality and quantity of water resources, and maintaining air quality in the greater San Joaquin Valley. Stakeholders unanimously supported the research carried out by ARS and, in particular, at the SJVASC. They recommended ways in which the SJVASC could best utilize its current capacity to address their major concerns and identified additional research that would address their critical needs if additional resources were available.

Current Research Highlights

Water Management Research Unit

James Ayars has received funding from CDFA and California Statewide System Agricultural Research Initiative to conduct research on pomegranate fertilization and water requirements in fields at the SJVASC and UC Kearney Agricultural Research and Extension in Parlier. In addition, the Water Management Unit was awarded a $2.6 million NIFA Specialty Crops Research Initiative Grant for a 5 year study entitled "Developing Sustainable Vineyard Water Management Strategies with Limited and Impaired Water Supplies." Dr. Ayars is the project director for a team of scientists from ARS (Riverside, Davis) the University of California (Davis, Riverside), UC Department of Agriculture and Natural Resources, and Washington State University. The research is investigating deficit irrigation strategies for wine, table, raisin, and juice grapes to respond to future periods of drought and limited water availability. Additional studies are investigating salinity management in vineyards using rainfall and limited irrigation and rootstock evaluations for salt and drought tolerance. Field research is located in vineyards in Mecca, Delano, Caruthers, and Paso Robles in California and Prosser, Washington. The proposal development was guided and supported by representatives from E.J. Gallo, J. Lohr Vineyard and Wines, National Grape and Wine Initiative, California Table Grape Commission, Sun Maid Growers, Airway Farms, Tudor Farms and Sun View Farms.

Gary Banuelos continues to use selenium-laden soils and waters to grow and select salt-and-boron tolerant varieties of cactus, mustard, canola, poplar trees, and salt-tolerant grasses. In addition, biofuel is produced from oil crops, while selenium-enriched plant products are produced from other plant parts.

Suduan Gao completed a collaborative research field trial in February in Gainesville, FL to test carbonated fumigants (Telon C35) and low permeable plastic tarps on emission reduction in a raised bed field prior to planting tomatoes. All sample analyses are completed. Data indicate that a film called "TIF" can reduce emission to 99.9%. However, much higher emissions (27% of applied 1,3-D) were measured from the furrows. Previous California trials with higher bed design showed negligible furrow emissions. This research continues to determine field management methods for effective emission reduction by low permeability tarps in various conditions.

Jim Gerik conducted a field trial in Moss Landing to test reduced rates of fumigants to control Pythium root rot of calla lily.

Dong Wang started a project to study feasibility and environmental sustainability of producing advanced biofuel feedstock in Hawaii. He will be developing a decision support system to determine near real-time crop water status and water requirements using remote sensing and to determine the carbon footprint of biofuel crops using on-site soil, plant, and flux measurements.

Current Research Highlights *(continued)*

Crop Diseases, Pests and Genetics Research Unit

Elaine Backus conducted research on glassy-winged sharpshooter feeding as a visiting scientist at the Advanced Photon Source, Argonne National Laboratory, Illinois. Dr. Backus used phase contrast X-ray video microscopy of glassy-winged sharpshooter to determine that feeding does not cause obstruction of the xylem and, therefore, does not disrupt flow of liquids in plant vascular tissue.

Jianchi Chen led the effort to sequence the complete genomes of *Xylella fastidiosa* strains M12 and M23. The annotated genome sequences are deposited in GenBank as accessions NC_010513 (strain M12) and NC_010577 (strain M23).

Rodrigo Krugner evaluated vector ability and reproductive characteristics of glassy-winged sharpshooter populations resident in Southern California and the San Joaquin Valley (SJV). The research indicates no significant differences among populations with respect to transmission of *X. fastidiosa* to grapes, fecundity, or longevity. However, significant differences were observed for preoviposition period, with insects from the SJV population exhibiting delayed maturity relative to insects from the Riverside population.

Craig Ledbetter has been evaluating apricot selections for color retention of sun-dried apricot during long-term storage. Patterson, the predominant variety grown in California for dried apricot, will brown and be unsalable after five months storage unless refrigerated. A new apricot selection has been identified that produces a premium dried product and retains color after seven months storage without refrigeration.

Hong Lin led a project the sequence the genome of the bacterium (*Candidatus* 'Liberibacter solanacearum') associated with zebra chip disease of potato. The annotated genome sequence (1,258,278 nucleotides) has been deposited in GenBank as Accession NC_014774.

David Ramming, in collaboration with USDA researchers in Geneva, NY have identified a single dominant gene for resistance to powdery mildew from *V. romanetii*, a Chinese grape species. This resistance is being incorporated into raisin and table grape germplasm.

Elizabeth Rogers has identified three *Arabidopsis thaliana* ecotypes that support different titers of *Xylella fastidiosa*. Analysis of differential gene expression among the ecotypes may be exploited to identify host genes involved in defense against *X. fastidiosa* infection.

Mark Sisterson, in collaborating with University of California scientists, monitored population levels of sharpshooters in the Central Valley. The results indicated that the green sharpshooter is the most prevalent and widely distributed vector of *Xylella fastidiosa* in and near almond orchards and vineyards.

Drake Stenger and **Elizabeth Rogers** identified and characterized replication and stability modules of *Xylella fastidiosa* plasmid. These modules were used to construct a stable shuttle vector for delivery of DNA to *X. fastidiosa*.

Chris Wallis has initiated research on changes in xylem sap chemistry that occur when grapes are infected with the xylem-dwelling pathogenic bacteria *Xylella fastidiosa*.

Ray Yokomi and **Mark Sisterson** evaluated distribution of *Spiroplasma citri* in mature citrus groves. The results indicated that incidence of citrus stubborn disease in citrus was due to primary spread of the pathogen and not secondary spread from tree to tree.

Current Research Highlights *(continued)*

Commodity Protection and Quality Research Unit

Chuck Burks, in collaboration with **Joel Siegel** and Brad Higbee, Paramount Farming, Bakersfield, CA, recently investigated effects of bait type and orchard characteristics on detection of navel orangeworm with egg traps. Pistachio meal was as effective as almond meal with almond oil, differences between bait types were of secondary importance to the number of traps used, and, in almonds, navel orangeworm abundance influence eggs per trap more than the number of previous-year almonds per tree.

L.P.S. (Bas) Kuenen is continuing his research on navel orangeworm (NOW) sex-pheromone biology and behavior. Lab and field experiments led to development of field lures that lasted for more than a week and were equivalent to females for the first week. Longer field activity is being pursued. In collaboration with **Spencer Walse**, he is continuing research to elucidate volatiles from pistachios that are attractive to female NOW moths for better trapping and monitoring during field use of mating disruption treatments.

David Obenland, in collaboration with Dr. Mary Lu Arpaia (University of California), conducted the second year of a project to determine the influence of storage at warm temperatures on mandarin flavor. They found that warm temperatures, as might commonly be experienced by the fruit prior to sale, caused a large loss in flavor quality that could be avoided if the fruit were kept refrigerated prior to eating. Dr. Obenland also participated in a project with Dr. Arpaia and Dr. Anuradha Prakash (Chapman University) to determine the influence of a quarantine irradiation treatment on navel orange quality.

Victoria Yokoyama, in collaboration with Sue Cambron, ARS West Lafayette, Indiana conducted basic tests to determine hay harvesting effects on Hessian fly survival as a quarantine strategy to control the pest in hay exported from the western states to Asia. This research is funded in part by The National Hay Association. The 2010-11 seasonal parasitoid release program was completed for biological control of olive fruit fly using *Psyttalia humilis*, imported from the USDA -APHIS-PPQ, Moscamed biological control laboratory in Guatemala. Xingeng Wang, University of California at Berkeley has found the parasitoid established on olive fruit fly in a coastal location. A novel attract-and-kill trap was assembled from yellow corrugated plastic to evaluate a parasitoid from a coastal California location for control of olive fruit fly, oriental fruit fly, and cherry fruit fly control in California, Hawaii, and Utah, respectively. The parasitoid release program and research to develop cultural control methods for olive fruit fly is funded in part by the California Olive Committee.

Spencer Walse is currently working on development and application of novel systems-based approaches and methyl bromide fumigation treatments to control quarantine insect pests in postharvest channels that threaten domestic transportation and/or international trade of specialty crops. Specifically, the research on spotted wing drosophila (SWD), Asian citrus psyllid (ACP), light brown apple moth (LBAM), and peach twig borer (PTB) has directly preserved, or expanded, specialty crop trade with an estimated value of $350 million annually. Predictive kinetic models, which have been implemented by industry and USDA-APHIS for the evaluation of new treatment schedules, have also been developed to ensure a fumigant is applied at doses sufficient to maintain toxic exposures during commercial and confirmatory fumigations.

Meetings, Conferences & Workshops

James Ayars was a keynote speaker at the Water for Food Conference held in Lincoln, Nebraska at the University of Nebraska, May 1-4, 2011.

Elaine Backus will be attending the 1st International Hemipteran-Plant Interactions Symposium in Piracicaba, Brazil, July 11-14, 2011, where she will present results of current research on glassy-winged sharpshooter.

Entomologists **Elaine Backus, Mark Sisterson,** and **Rodrigo Krugner** gave research presentations at the Entomological Society of America Annual Meeting, San Diego, CA, December 12-15, 2010. **Mark Sisterson** and **Rodrigo Krugner** also gave research presentations at the Pacific Branch Meeting of the Entomological Society of America, Waikoloa, HI, March 27-30, 2011.

Gary Banuelos was an invited speaker to Reedley College at the Green Conference in April 2011 held in Reedley, CA.

Jianchi Chen, Hong Lin, and **Ray Yokomi** attended the 2nd International Research Conference on Huanglongbing organized by Florida Citrus Mutual, Orlando, FL, Jan. 10-14, 2011.

Chuck Burks gave an invited symposium presentation on management of navel orangeworm in figs at the Annual Meeting of the Pacific Branch of the Entomological Society of America, March 27-30, at Waikoloa, Hawaii.

Jim Gerik was a speaker and session chair at the Conference on Soilborne Plant Pathogens held in Davis, CA in March 2011.

Judy Johnson attended the 2010 International Conference on Alternatives to Methyl Bromide and Emissions Reductions, November 2-4 2010, Orlando, FL, presenting the paper "Development of Radio Frequency Treatments for Dried Pulses."
http://mbao.org/2010/Proceedings/051JohnsonJ.pdf

Judy Johnson presented "Stored Product Pests" at the American Council for Food Safety & Quality Pesticide & Fumigation Safety Training Seminar, November 10, 2010 in Fresno, CA.

L.P.S. (Bas) presented a poster "Pheromone Component Ratios in Glands and Volatile Emissions From the Navel Orangeworm (Amyelois transitella)" at the Annual National Meeting of the Entomological Society of America , December 12-16, 2010; San Diego, CA.

L.P.S. (Bas) attended the annual meeting of pistachio growers; "Pistachio Day" sponsored by the UCCE.

Craig Ledbetter will be traveling to Yerevan, Armenia to present current research results on apricot breeding at the XV International Symposium on Apricot Breeding and Culture, June 20-14, 2011.

Craig Ledbetter presented research results on the utilization of non-domesticated *Prunus* species in the USDA-ARS stone fruit breeding program at the 1st International Symposium on Wild Relatives of Subtropical and Temperate Fruit and Nut Crops, Davis, CA, March 19-23, 2011.

CDPG held a Stone Fruit Stakeholder Conference May 25, 2011,. **Craig Ledbetter** and **David Ramming** presented summaries of ARS research and breeding programs on peach, plum, nectarines and apricots.

Meetings, Conferences & Workshops *(continued)*

David Obenland attended the Postharvest Unlimited Meeting in Leavenworth, WA on May 23-26, 2011, and presented research showing that mandarin varieties differ greatly in the production of aroma-active compounds following waxing. He also gave a presentation on the influence of warm temperatures on mandarin flavor at the Postharvest Pest Control Course in Santa Barbara, CA on April 5, 2011.

Eight Crop Diseases, Pests and Genetics Research Unit scientists attended and presented research results at the CDFA Pierce's Disease Research Symposium, San Diego, CA, Dec. 15-17, 2010. **David Ramming** was an invited speaker presenting research on breeding PD resistant table and raisin grapes. **Drake Stenger** was an invited speaker presenting research on development of a stable gene shuttle vector for *Xylella fastidiosa*.

Joe Smilanick attended the conference "Postharvest Unlimited" and delivered an oral presentation "Evaluation Under Commercial Conditions of the Application of Continuous, Low Concentrations of Ozone during the Cold Storage of Table Grapes." Held every four years, the conference was in Leavenworth, WA, from May 23-26, 2011. A manuscript by Joe and co-workers F. Mlikota Gabler, and D.A. Margosan describing this work which was supported in part by a grant from the California Table Grape Commission, will soon be published in Acta Horticulturae.

Joel Siegel and **Chuck Burks** gave invited presentations at the USDA-ARS/UC Area-wide navel orangeworm and pest management update seminar for almonds and pistachios on April 5 at Tulare, California.

Dong Wang was an invited speaker at the On-Farm Integrated Water Management Conference, San Jose, CA in March 2011.

Ray Yokomi and Georgios Vidalakis (University of California) organized and hosted the Citrus Pathogen Detection Workshop at the SJVASC, Parlier, CA, Feb. 1-3, 2011. The workshop was supported by a grant from the California Citrus Nursery Board and was attended by 32 participants. The workshop featured serological– and nucleic acid-based detection platforms for citrus tristeza virus, viriods, and *Spiroplasma citri*.

Four Crop Diseases, Pests and Genetics Research Unit scientists attended the California Citrus Research Board New Technologies Conference, Berkeley, CA, Feb. 23-25, 2011.

Victoria Yokoyama presented, "Hessian fly (*Mayetiola destructor*) Response to Harvesting Conditions for Hay Exported from the Western States," at the Entomological Society of America 58th Annual Meeting, San Diego, CA, December 12-15, 2010.

Victoria Yokoyama served as Co-Program Chair for the Entomological Society of America, 95th Pacific Branch Annual Meeting, Waikoloa, Hawaii, March 27-30, 2011, and was invited to present, "Subtropical Fruit Fly Invasions into Temperate Fruit Fly Territory in California's San Joaquin Valley," in the symposium, "The Increasing Frequency of Tephritid Outbreaks in California; What is Going On?"

Victoria Yokoyama, presented by proxy, Jorge Peña, University of Florida, Miami, "Rearing, Importation, and Release of *Psyttalia humilis* for Biocontrol of Olive Fruit Fly in California," at the IOBC/NTRS Joint Meeting with the International Seminar on Animal and Plant Health, Havana, Cuba, May 3-6, 2011.

Visitors

Jaime Piñero, Lincoln University of Missouri, Jefferson City, MO, visited to collaborate on developing attract-and-kill traps for fruit fly pests in a trip sponsored by **Victoria Yokoyama** on January 26-29, 2011.

Isabel Abrisqueta from Murcia, Spain joined **Jim Ayars'** research team and will oversee the operation of the NIFA-SCRI grape project.

News

Jim Ayars completed his second term on the Board of Directors of the United States Committee on Irrigation and Drainage at a meeting in Mesa, Arizona on March 17-18, 2011. He also presented a lecture to a Graduate Class in water management from CSU Fresno for Dr. Sharon Benes.

Suduan Gao was selected to serve as the Scholarship Committee Chair for Associations of Women Soil Scientists (AWSS).

Sadikshya and Mohan Dangi recently welcomed the arrival of a daughter, Suyasha, who was born on January 11, 2011.

Huihui Zhang joined the Water Management Research Unit (WMRU) as a headquarter-funded research associate. She will be working on deficit irrigation of peach using thermal infrared canopy temperature and provide remote sensing assistance to the biofuel project.

Rebecca Tirado-Corbala joined the WMRU as a postdoctoral research associate. She will be studying carbon and soil hydrologic processes of the biofuel project.

SJVASC hosted students from the Future Farmers of America California Leadership Conference April 18, 2011. Scientists discussed their research with students, who were also given a tour of the Center's experimental fields.

In conjunction with the Kearney Agricultural Center, 70 8th grade science students from Riverview K-8 School were given a tour of the SJVASC laboratories on May 11, 2011.

Sean Pelham, joined **Victoria Yokoyama**, in the Commodity Protection and Quality Research Unit, as a Biological Science Technician after he received his M.S. degree in Entomology at University of California, Riverside.

Recent Publications

Alhaddad, H., Coudron, T. A., **Backus, E. A.**, and Schreiber, F. 2011. Comparative behavioral and protein study of salivary secretions in *Homalodisca* spp. sharpshooters (Hemiptera: Auchenorrhyncha: Cicadellidae). Annals of the Entomological Society of America 104:543-552.

Backus, E. A., and Morgan, D. 2011. Spatiotemporal colonization of *Xylella fastidiosa* in its vector supports the role of egestion in the inoculation mechanism of foregut-borne plant pathogens. Phytopathology, *in press*. DOI: 10.1094/PHYTO-09-10-0231.

Recent Publications *(continued)*

Carpane, P., Wayadande, A., **Backus, E. A.,** Dolezal, W., and Fletcher, J. 2011. Characterization and correlation of new EPG waveforms for the corn leafhopper *Dabulus maidis* (Hemiptera: Cicadellidae). Annals of the Entomological Society of America 104:515-525.

Banuelos, G.S., S.C. Fakra, S.S. Walse, M.A. Marcus, S.I. Yang, I.J. Pickering, E.A.H. Pilon-Smits, and J.L. Freeman. 2011. Selenium accumulation, distribution, and speciation in spineless prickly pear cactus: a drought-and salt-tolerant, selenium enriched nutraceutical fruit crop for biofortified food. *Plant Physiology,* 155: 315-327.

Banuelos, G.S., D. Leduc and J. Johnson. 2011. Evaluation of hybrid polar tree tolerance to irrigation with high salinity under microplot conditions. *Journal of International Phytoremediation,* 12:419-439.

Higbee, B.S., **Burks, C.S.**, 2011. Effect of bait formulation and number of traps on detection of navel orangeworm oviposition using egg traps. J. Econ. Entomol. 104, 211-219.

Burks, C.S., Higbee, B.S., **Siegel, J.P.**, Brandl, D.G., 2011. Comparison of trapping for eggs, females, and males of the naval orangeworm (Lepidoptera: Pyralidae) in almonds. Environ. Entomol. 40, 706-713.

Chen, J., Deng, X., Civerolo, E. L., Lee, R. F., Jones, J., Hartung, J. S., Manjunath, K. L., and Brlansky, R. H. 2011. "*Candidatus* Liberibacter species", without Koch's Postulates completed, can the bacterium be considered as the causal agent of citrus Huanglongbing (yellow shoot disease)? Acta Phytopathologica Sinica 41:113-117.

Liu, Q., Li, Y., and **Chen, J.** 2011. First Report of Bacterial Wilt Caused by *Ralstonia solanacearum* on *Mesona chinensis* in China. Plant Disease 95:222.

Liu, R., Zhang, P., Pu, X., Xing, X., **Chen, J.**, and Deng, X. 2011. Analysis of a prophage gene frequency revealed population variation of `*Candidatus* Liberibacter asiaticus' from two geographically distinct citrus growing provinces in China. Plant Disease 95:431-435.

Gao, S., B. Hanson, **D. Wang**, G. Brown, **R. Qin**, H. Ajwa, and S.R. Yates. 2011. Methods evaluated to minimize emissions from pre-plant soil fumigation. *California Agriculture* 65: 41-46.

Jiao, S., **Johnson, J.A.,** Tang, J., Tiwari, G., and Wang, S. 2011. Dielectric properties of cowpea weevil, black-eyed peas and mung beans with respect to the development of radio frequency heat treatments. Biosystems Engineering 108:280-291. http://www.ars.usda.gov/SP2UserFiles/Place/53021565/Jiao%20et%20al%202011.pdf

Wang, X., Johnson, M.W., Opp, S. B., **Krugner, R.**, and Daane, K.M. 2011. Honeydew and insecticide-bait as competing food resources for a fruit fly and common parasitoids. Entomologia Experimentalis et Applicata pp.128-137.

Kuenen, L.P.S., McElfresh J.S. & Millar, J.G. Identification of critical secondary components of the sex pheromone of the Navel Orangeworm, (Lepidoptera: Pyralidae). Journal of Economic Entomology. 103(2):314-330, 2010.

Kuenen, L.P.S., Leal, W.S. Millar, J.G., Pesak, D.J., Parra-Pedrazzoli, A.L. & Zalom, F.G. U.S. Patent Number US 7,655,253 B2. Navel Orangeworm Pheromone Composition. Feb., 2010.

Lin, H., Lou, B., Glynn, J. M., Doddapaneni, H., Civerolo, E. L., Chen, C., Duan, Y., Zhou, L., and Vahling, C. M. 2011. The complete genome sequence of `*Candidatus* Liberibacter solanacearum', the bacterium associated with potato zebra chip disease. PLoS One. 6:e19135. (doi:10.1371/journal.pone.0019135).

Recent Publications (continued)

Cabrera, J.A., **D. Wang**, S. Schneider, and B. Hanson. 2011. Effect of methyl bromide alternatives on plant parasitic nematodes and grape yield under vineyard replant conditions. *American Journal of Enology and Viticulture* 62:42-48.

Yokomi, R. K., Saponari, M., and Vidalakis, G. 2011. Molecular analysis among MCA13-reactive isolates reveals a rapid strategy for assessment of *Citrus tristeza virus* severity. Acta Horticulturae 892: 251-256.

Siegel, J.P., **Kuenen, L.P.S.,** & **C. Ledbetter**. Variable Development Rate and Survival of Navel Orangeworm (Lepidoptera: Pyralidae) on Wheat Bran Diet and Almonds. J. Econ. Entomol. 103(4): 1250–1257, 2010.

Yokoyama, V. Y., Cáceres, Carlos E., **Kuenen**, **L.P.S.,** Wang, Xin-Geng, Rendón, Pedro A., Johnson, M.W., Daane, K.M. Field performance and fitness of an olive fruit fly parasitoid, *Psyttalia humilis* (Hymenoptera: Braconidae), mass reared on irradiated Medfly. Biological Control 54(2):90–99, 2010.

Obenland, D., S. Collin, B. Mackey, J. Sievert, and M.L. Arpaia. 2011. Storage temperature and time influences sensory quality of mandarins by altering soluble solids, acidity and aroma volatile composition. Postharvest Biol. Technol. 59:187-193.

Daane, K. M., Wistrom, C. M., Shapland, E. B., and **Sisterson, M. S.** 2011. Seasonal abundance of *Draeculacephala minerva* and other *Xylella fastidiosa* vectors in California almond orchard and vineyards. Journal of Economic Entomology 104:367-374.

Lee, M. W., **Stenger, D. C.**, and **Rogers, E. E.** 2010. Functional characterization of replication and stability factors of an incP-1 plasmid from *Xylella fastidiosa*. Applied and Environmental Microbiology 76:7734-7740.

Stenger, D. C. and Lee, M. W. 2011. Phylogeny of replication initiator protein TrfA reveals a highly divergent clade of incompatibility group P1 plasmids. Applied and Environmental Microbiology 77:2522-2526.

Wallis, C., Eyles, A., Chorbadjian, R. A., Riedl, K., Schwartz, S., Hansen, R., Cipollini, D., Herms, D. A., and Bonello, P. 2011. Differential effects of nutrient availability on the secondary metabolism of Austrian pine (*Pinus nigra*) phloem and resistance to *Diplodia pinea.* Forest Pathology 41:52-58.

Wallis, C. M., Huber, D. P., and Lewis, K. J. 2011. Ecosystem, location, and climate effects on foliar secondary metabolites of lodgepole pine populations from central British Columbia. Journal of Chemical Ecology: DOI 10.1077/s10886-011-9958-8).

Kanno, H., **Kuenen, L.P.S.,** Klingler, K.A., Millar J.G. and Cardé R.T. Attractiveness of a four-component pheromone blend to male Navel Orangeworm moths. Journal of Chemical Ecology. 36:584–591, 2010.

Kuenen, L.P.S. & **Siegel, J.P.** Protracted Emergence of Overwintering *Amyelois transitella* (Lepidoptera:Pyralidae) From Pistachios and Almonds in California. Environ. Entomol. 39(4): 1059–1067, 2010.

Yokoyama, V. Y. 2011. Approved quarantine treatment for Hessian fly (Diptera: Cecidomyiidae) in large-size hay bales and Hessian fly and cereal leaf beetle (Coleoptera: Chrysomelidae) control by bale compression. J. Econ. Entomol. 104: 792-798.

Recent Publications (continued)

Yokoyama, V. Y. 2011. Development of Biological and Cultural Control of Olive Fruit Fly in the Central Valley of California, pp. 46-57. In M. W. Johnson [ed.], California Olive Committee Final Res. Rept. 2010. California Olive Committee, Fresno, CA.

Yokoyama, V. Y., P. A. Rendon, X. G. Wang, S. B. Opp, M. W. Johnson, and K. M. Daane. 2011. Response of *Psyttalia humilis* (Hymenoptera: Bracondidae) to olive fruit fly (Diptera: Tephritidae) and conditions in California olive orchards. Environ. Entomol. 40: 315-323.

Wang, X. G., M. W. Johnson, **V. Y. Yokoyama**, C. H. Pickett, and K. M. Daane. 2011. Comparative evaluation of two olive fruit fly parasitoids under varying abiotic conditions. BioControl 56: 283-293.

Research Units and Contact Information