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San Joaquin Valley Agricultural Sciences Center



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Introduction

Mission-oriented research at the San Joaquin Valley Agricultural Sciences Center (SJVASC) is conducted by scientists in three Research Units (Commodity Protection and Quality Research Unit, CPQRU; Crop Diseases, Pests and Genetics Research Unit, CDPGRU; and Water Management Research Unit, WMRU). The Parlier Location is also a worksite for the National Arid Land Plant Genetic Resource Unit (NALPGRU). CPQRU research is focused on development of alternative chemical based and non-chemical based (e.g., biological, physical) treatments to replace methyl bromide use on stored products to meet quarantine needs; to preserve or extend domestic and export markets; and to ensure quality maintenance of California-grown fruits and vegetables, extend storage life, and reduce postharvest losses caused by senescence, decay, pathogens, insect pests and postharvest treatments. The CDPGRU develops methods to minimize production losses in horticultural crops in California caused by a variety of endemic, introduced and exotic bacterial and viral plant pathogens and insect pests. These include *Xylella fastidiosa*, citrus tristeza virus, *Spiroplasma citri* (the causal agent of citrus stubborn disease), citrus huanglongbing (greening) and potato zebra chip disorder/disease-associated 'Candidatus Liberibacter species', and insect vectors (e.g., the glassy-winged sharpshooter); develops predictive models to describe, forecast and assess the risk of potential invasive plant pest introduction, spread and establishment; and develops improved almond, stone fruit and grape cultivars with superior horticultural characteristics and enhanced disease and pest resistance for fresh and processing markets. The WMRU develops water management practices to improve sustainability and crop productivity in irrigated agriculture; evaluates and predicts consequences of

- Christopher Wallis joins CDPGRU as a Research Plant Pathologist.
- Gabriela Romano is the new NALPGRU Curator
- David Weaver is selected as the Research Leader for CPQRU.

Introduction (continued)

management practices on water quality; reduces soil and water pollution by water and crop management; develops irrigation management improving sustainability, environmental health and water supplies. The NALPGRU acquires, maintains, regenerates, evaluates, and conducts research on diverse plant germplasm of selected arid land plant species assigned to this Unit. San Joaquin Valley Agricultural Sciences Center (SJVASC) researchers continue to partner with stakeholders to ensure effective use of research results and technology developed by ARS in Parlier. This is achieved through regular customer or stakeholder meetings, workshops and conferences at the SJVASC. These interactive forums enable researchers to update SJVASC customers and stakeholders about current research activities and future research plans, as well as opportunities to gain input from stakeholders and customers regarding their research.

Current Research Highlights

Water Management Research Unit

James Ayars and **Dong Wang** met with representatives from Paramount Farms, researchers from UC Kearney Ag Center, a farm advisor, and Dr. Claude Phene in December 2009 to discuss experimental plans of two extramurally funded joint projects on determining water and nitrogen requirement of pomegranate trees.

Gary Banuelos spent 6 months at the University of Zurich in Zurich, Switzerland. He identified best-performing poplar tree clones that could be used as alternative bio-energy crops grown on contaminated soils in Switzerland and on the westside of the San Joaquin Valley.

Suduan Gao completed a field trial in September 2009 on testing fumigant emissions using different plastic tarps in a strawberry fumigation experiment in Oxnard, CA.

Brad Hanson, Suduan Gao and **Jim Gerik** conducted a fumigation trial in October 2009 at the San Joaquin Valley Agricultural Science Center to test fumigant emission reduction techniques and efficacy on nematode, weeds, and soil-borne pathogen control.

Dong Wang conducted the first year field experiment with soilless substrate media as an alternative to methyl bromide fumigation for strawberry production in CA. Results were presented at the Methyl Bromide Alternatives Conference in November 2009.

Crop Diseases, Pests and Genetics Research Unit

Elaine Backus used electrical penetration graph (EPG) technology to identify differences in feeding behavior of glassy-winged sharpshooter (GWSS) on Pierce's disease susceptible and resistant *Vitis* germplasm. Results suggest that reduced performance of inoculation-related behaviors by the vector may be one mechanism of resistance and indicate that EPG could be used as a tool for screening host plants for resistance to vector inoculation of *Xylella fastidiosa*.

Current Research Highlights (continued)

Crop Diseases, Pests and Genetics Research Unit - continued

Jianchi Chen developed a procedure to enrich and partially purify phage from an almond-infecting strain of *Xylella fastidiosa*.

Rodrigo Krugner and **Craig Ledbetter** are investigating the vulnerability of almond nursery stock material to *Xylella fastidiosa* infections. Results have shown that *X. fastidiosa* can establish and multiply in a susceptible rootstock and move to the scion, where it causes almond leaf scorch disease.

Craig Ledbetter, in collaboration with USDA-ARS scientists in New Orleans, LA is examining steam-activated carbons as a value-added product from almond shells. Results indicate that steam-activated carbons derived from a variety of almond types were able to capture similar levels of the environmental contaminants dibromochloropropane and trichloroethylene.

Hong Lin has conducted research indicating that biogenesis of extracellular DNA by *Xylella fastidiosa* may play a role in biofilm formation and could be a critical step in establishment of *X. fastidiosa* in host plants.

David Ramming continues to evaluate grape germplasm for resistance to Pierce's disease. Crosses to make the BC4 generation of table and raisin grapes with *V. arizonica* source of resistance were made in 2009. These families will be 97% *Vitis vinifera* and are expected to have high fruit quality.

Elizabeth Rogers developed a quantitative PCR assay to evaluate levels of *Xylella fastidiosa* supported by susceptible and resistant rootstocks for almonds developed by **Craig Ledbetter** demonstrated that peach-almond hybrid rootstocks are resistant to *X. fastidiosa* and, therefore, are not a potential source of almond leaf scorch disease.

Mark Sisterson has developed a spatially-explicit simulation model to evaluate effectiveness of reducing vector populations and removing infected plants in crops or source habitats. Results indicate that the best management strategy depends on assumptions about primary versus secondary pathogen spread and primary reproductive habitat of the vector.

Drake Stenger has identified *Xylella fastidiosa* plasmid DNA replication and stability factors to facilitate development of a stable gene vector to deliver foreign DNA to *X. fastidiosa*.

Ray Yokomi developed a real time reverse transcription polymerase chain reaction (qRT-PCR) assay that can differentiate Citrus tristeza virus (CTV) strains into genotypes. qRT-PCR can be performed easily in one day and is useful for rapid identification of potentially severe CTV strains. ARS has teamed up with the Central California Tristeza Eradication Agency (CCTEA) in Tulare which has incorporated this new testing procedure into the tristeza eradication program. An ELISA procedure with the monoclonal antibody MCA13, which reacts with a large complex of CTV strains but not with mild strains, is now used. As only a small number of San Joaquin Valley CTV isolates

Current Research Highlights (continued)

Crop Diseases, Pests and Genetics Research Unit - continued

react with MCA13 and some SJV MCA13-reactive isolates are mild, a specific probe (T36NS) to differentiate them was developed. Thus, CTV strain differentiation involves testing CTV-infected trees with MCA13 and only extracts from MCA13-reactive sources are tested by qRT-PCR with strain-specific probes. This reduces greatly the number of qRT-PCR assays necessary. CTV strains which reacts with the VT3 probe constitute a potential severe source and can be targeted for eradication.

National Arid Land Plant and Genetic Resource Unit

Boosting the germination percentage of Guayule, an arid land plant native to the Southwestern US, was the research focus of NALPGRU employee **Frances Rond**. Guayule is a new industrial crop that can be grown with limited inputs and used as a domestic source of non-allergenic latex. As such, growers on the west side of the San Joaquin Valley have interest in evaluating its potential on their marginal soils. Guayule seed are notoriously difficult to culture, and Frances' research involved the application of plant growth regulators during seed imbibition as a means of increasing germination and surviving plants.

Commodity Protection and Quality Research Unit

The Commodity Protection and Quality Research Unit held a stakeholders conference on October 30, 2009. Scientists in the unit presented recent research accomplishments and received feedback during an afternoon discussion section from 18 stakeholders from industry and USDA-APHIS.

Chuck Burks is beginning the third year of a navel orangeworm (NOW) mating disruption technology transfer project in almond orchards near Mendota, California (part of the Area-wide project for control of NOW in almonds, pistachios, and walnuts). Data from the first two years demonstrate a significant effect of the mating disruption treatment on location of females by males, female fertility, and damage to almonds.

L.P.S. (Bas) Kuenen is continuing his research on navel orangeworm (NOW) sex-pheromone biology and behavior. In collaboration with **Spencer Walse** (CPQ), he is measuring the pheromone component release ratios from female pheromone glands, and bioassay-driven studies are underway to develop a viable field lure for NOW. Both scientists also continue to collaborate on research to identify volatiles from pistachios that are attractive to female NOW moths for better trapping and monitoring during field use of mating disruption treatments.

Current Research Highlights (continued)

Commodity Protection and Quality Research Unit - continued

David Obenland initiated a project in collaboration with Dr. Mary Lu Arpaia (University of California) to determine the effects of different storage protocols on the flavor of mandarin oranges. He is seeking to identify changes in the chemical components in the fruit that are responsible for the poor flavor that is often observed in mandarins that have been stored. In December, he helped conduct a consumer taste panel on mandarin fruit given different storage regimes in conjunction with the Annual Citrus Fruit Display Day held at the University of California Lindcove Field Station. This project was funded by the Citrus Research Board.

Joe Smilanick's research about the influence of vineyard practices on the postharvest quality of table grapes will appear in the February 2010 issue of the journal Plant Disease. In this work, supported by the California Table Grape Commission, the practice of vineyard applications of fungicides to increase the postharvest shelf life of table grapes was evaluated. Although fungicide use did provide some postharvest protection of the grapes from decay pathogens and extend their storage life, it was insufficient to eliminate the need for postharvest actions, such as ozone or sulfur dioxide fumigation, to provide adequate shelf life of the fruit for marketing purposes.

Victoria Yokoyama in collaboration with Sue Cambron, ARS West Lafayette, Indiana, and Jeannette Muhareb, Dried Fruit Association, Fresno, CA began basic tests to develop quarantine strategies using hay processing techniques and new fumigants to control Hessian fly in hay exported from the western states to Asia. This research is funded in part by the National Hay Association. The 2009 seasonal parasitoid release program was completed for biological control of olive fruit fly using *Psytalia humilis*, imported from the USDA-APHIS-PPQ, Moscamed, Petapa Biological Control Laboratory in Guatemala. The parasitoid release program and research to develop cultural control methods for olive fruit fly is funded in part by the California Olive Committee.

U.S. Patent 7,655,253 was issued to **Bas Kuenen**, and collaborators, on February 2, 2010 related to compounds useful for preparing synthetic pheromone compositions for controlling the navel orange worm and meal moth insect pests.

Meetings, Conferences & Workshops

Elaine Backus presented guest lectures on insect vectors of plant pathogens in the Department of Entomology, University of California, Davis, October, 6-8, 2009.

Meetings, Conferences & Workshops (continued)

Elaine Backus, Rodrigo Krugner, and Mark Sisterson attended and presented research results on glassy-winged sharpshooter at the Entomological Society of America Annual Meeting, Indianapolis, IN., December 11-15, 2009.

Elaine Backus, Rodrigo Krugner, Hong Lin, David Ramming, Mark Sisterson, and Drake Stenger attended and presented research results on glassy-winged sharpshooter and xylella diseases at the GWSS/Pierce's Disease Research Symposium, Sacramento, CA., December 9-10, 2009.

Elaine Backus, Jianchi Chen, and Hong Lin attended and presented research results at the HLB-ZC meeting, McAllen, TX., November 16-19, 2009.

Jianchi Chen attended the Centennial Celebration of South China Agriculture University, Guangzhou, China and presented research on Huanglongbing disease of citrus, November 3-13, 2009.

Craig Ledbetter presented an update on the USDA-ARS almond breeding program at the Almond Board of California Annual Meeting, Modesto, CA, December 8-9, 2009.

Hong Lin presented research seminars on *Liberibacter* genomics at the China Agricultural University, Beijing, China (Oct. 10, 2009), Guangxi Citrus Research Institute, Gulin, China (October 14, 2009), and the University of Tennessee, Knoxville (January 10, 2010).

David Ramming presented an update on the USDA-ARS raisin and table grape breeding program at the San Joaquin Valley Grape Symposium, Easton, CA., January 6, 2010.

Drake Stenger presented a research seminar on reverse genetics at California State University, Bakersfield, CA., November 18, 2009.

Ray Yokomi presented research results on citrus tristeza virus at The Second International Citrus Biotechnology Workshop, Catania, Italy, November 30-December 3, 2009.

James Ayars was a keynote speaker at the US Committee on Irrigation and Drainage Conference held in Salt Lake City, UT., in November 2009.

Suduan Gao and Dong Wang attended and made research presentations at the 2009 ASA-CSSA-SSSA Annual Meetings in Pittsburgh, PA in October 2009. **Dong Wang** also co-organized two symposia within the ASA-CSSA-SSSA Annual Meetings.

Suduan Gao, Jim Gerik, Brad Hanson and Dong Wang attended and made presentations at the 2009 Methyl Bromide Alternatives Conference in San Diego, CA., in November 2009.

Gary Banuelos attended, and was a co-organizer of, the First International Conference on Selenium in the Environment and Human Health held in Suzhou, China in October 2009.

Judy Johnson attended the International Conference on Methyl Bromide Alternatives and Emissions Reduction in San Diego, CA., November 10-13, 2009, presenting a paper titled "Radio frequency heat treatments to disinfest dried pulses of cowpea weevil."

Meetings, Conferences & Workshops (continued)

L.P.S. (Bas) Kuenen presented two talks on "New Monitoring Tools for NOW" for the Almond Pest Management Alliance's PCA training courses November 4-5 2009 in Parlier and Stockton, CA, respectively.

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

David Obenland attended the Methyl Bromide Alternatives Outreach Meeting in San Diego, CA., on November 10-12 and presented his research on the use of forced hot air quarantine treatments for boxed peaches and nectarines stacked onto pallets.

Joe Smilanick presented a talk on "Potassium impacts on maturity and yield" to the "Hot Topics" session of the "Innovative Grape Growing Solutions Workshop" at the California State University, Fresno on January 20, 2010. Recently, this project was supported by the California Table Grape Commission, **Smilanick** and coworkers found that potassium applied to table grapes before harvest accelerates color development, firmness, and sugar accumulation, and this practice may become a significant new management tool for grape growers.

Joel Siegel and **Chuck Burks** gave invited presentations at the Kern County Almond Pest Management Meeting, January 27, Bakersfield. **Joel Siegel** gave an invited presentation at the Statewide Annual Pistachio Day in Visalia on January 13.

Chuck Burks attended the 2009 International Research Conference on Methyl Bromide Alternatives and Emissions Reduction; November 10-13, 2009, San Diego, California; and gave a presentation entitled, "Mating Disruption for Control of Navel Orangeworm in Central California."

Chuck Burks gave an invited presentation entitled, "Update on the Mendota Areawide Mating Disruption Project in Almonds," on January 27, 2010 at the Kern County Almond Pest Management Meeting coordinated by David Haviland at the Kern County University of California Cooperative Extension Center in Bakersfield, California.

Victoria Yokoyama co-organized the Plant-Insect Ecosystems Symposium, "Biological, Social, and Political Challenges of Detection, Quarantine, and Eradication of Insect Invaders," and presented the symposium talk, "Medfly Terminator-California Salvation," at the 57th Annual Meeting of the Entomological Society of America, Indianapolis, Indiana, December 13-16, 2009.

Visitors

Ragip Ozkan, from the University of Uludag, Bursa, Turkey, will be a visiting scientist in the laboratories of **Joe Smilanick** and **Spencer Walse** from mid-February until July, 2010. Among other projects, **Ragip** will examine the influence of ozone fumigation on the mortality of decay pathogens and pesticide residues. **Ragip** is the fourth Turkish visitor to the San Joaquin Valley Agricultural Sciences Center. He will continue and expand the work of **Hakan Karaca** who returned to Ankara, Turkey.

Dr. Alberto Pantoja, Research Leader, ARS Fairbanks, Alaska visited the SJVASC on January 19-21, 2010 to discuss collaborative research to develop quarantine treatments for straw imported into Alaska and to view a demonstration test of a vacuum-steam chamber as a potential quarantine treatment for exported logs. **Dr. Pantoja** presented a seminar, "Alaskan Crop Production and Pest Control," during his visit.

J. Alfonso Cabrera joined the Water Management Unit in September 2009 as a temporary nematology Research Associate. He will be participating in research activities on methyl bromide alternatives regarding nematode control using chemical or non-chemical approaches in various California cropping systems. He recently graduated with a Ph.D. in nematology from the University of Bonn in Germany.

Joanna Lado from the Instituto Nacional de Investigación Agropecuaria, INIA Salto Grande, Uruguay, visited the SJVASC and gave a seminar on "The Citrus Industry of Uruguay: postharvest situation and challenges" on February 5, 2010.

News

Christopher Wallis joined the Crop Diseases, Pests and Genetics Research Unit as a Research Plant Pathologist, September 27, 2009. Dr. Wallis is establishing a research program focused on diseases of horticulture crops caused by *Xylella fastidiosa*.

The National Arid Land Plant Genetic Resource Unit welcomed **Gabriela Romano**, the unit's new Curator on December 21, 2009. Prior to this position, Dr. Romano was an ARS post-doctoral Research Associate in Stoneville, MS where she worked as a Research Geneticist in a cotton breeding program. For the past five years she has been assisting in the development of gossypol-free cotton lines to boost quality of cottonseed meal as feed supplements for non-ruminant stock, as well as in introgressing resistance to reniform nematode, an important root-pest of upland cotton.

Jim Ayars will be in Australia for a four-month visit in 2010. He plans to conduct analysis of data taken on the water management of vineyards in water stressed environments, and use the DESTINY model to explore the impacts of spatial variability and irrigation uniformity on vineyard growth under deficit irrigation conditions.

Brad Hanson took a UC Cooperative Extension specialist position with Department of Plant Sciences at the University of California at Davis in December 2009.

News (continued)

Dong Wang, assisted by **Jim Gartung**, designed an irrigation system for the USDA organic vegetable garden—the Peoples Garden, outside the Jamie L. Whitten Federal Building in Washington, DC. The system includes three types of irrigation; drip tubing for the raised beds with mixed vegetables, stake drippers for the containers/pots, and spray jets for the transition plants.

Gary Banuelos will be in Switzerland for a 2-week trip in April 2010. He plans to set up a field trial with poplar trees, which will be grown on contaminated soil in Switzerland, and then eventually harvested for biofuel production.

David Weaver has been selected as the new Research Leader of the Commodity Protection and Quality Research Unit. **Dr. Weaver** received his Ph.D. in Entomology from McGill University in Montreal, Quebec, Canada in 1990 where his dissertation research was focused on the chemical ecology of stored product insects. He is one of only a few entomologists who conduct research on stored product insects with formal training in chemical ecology. He is currently an Associate Professor of Entomology at Montana State University in Bozeman, MT. His current assignment is to conduct research on the chemical ecology, spatial ecology and integrated pest management of agricultural pests and their natural enemies. **Dr. Weaver** was a postdoctoral Research Associate with ARS from 1992 -1997 in Savannah, GA and in Manhattan, KS.

Recent Publications

Yokoyama, V. Y. 2009. Biological and Cultural Control of Olive Fruit Fly in California--- Utilization of Parasitoids from USDA-APHIS-PPQ, Guatemala and Cultural Control Methods, pp. 62-71. In M. W. Johnson [ed.], California Olive Committee Ann. Final & Interim Res. Rept. 2009. California Olive Committee, Fresno, CA.

Qin, R., **S. Gao**, **D. Wang**, **B. Hanson**, T. Trout, H. Ajwa. 2009. Relative effect of soil moisture on emissions and distribution of 1,3-dichloropropene and chloropicrin in soil columns. *Atmospheric Environ.* 43:2449–2455.

Gao, S., R. Qin, **B. Hanson**, N. Tharayil, T. Trout, **D. Wang**, **J. Gerik**. 2009. Effects of Manure and Water Applications on 1,3-Dichloropropene and Chloropicrin Emissions in a Field Trial. *J. Agric. Food Chem.* 57:5428–5434.

S. Schneider, **Hanson, B.D.**, **J. Gerik**, A. Shrestha, T. Trout, **S. Gao**. 2009. Comparison of shank-and-drip-applied methyl bromide alternatives in perennial crop field nurseries. *HortTechnol.* 19:331-339.

Wang, D., C. Rosen, L. Kinkel, A. Cao, N. Tharayil, **J. Gerik**. 2009. Production of methyl sulfide and dimethyl disulfide from soil-incorporated plant materials and implications for controlling soil-borne pathogens. *Plant Soil* 324:185-197.

Recent Publications (continued)

- Wang, D.**, G. Browne, **S. Gao**, **B. Hanson**, **J. Gerik**, R. Qin, N. Tharayil. 2009. Spot fumigation: fumigant gas dispersion and emission characteristics. *Environmental Science and Technology* 43:5783-5789.
- Qin., R., **S. Gao**, H. Ajwa, **B. Hanson**, T. Trout, **D. Wang**, M. Guo. 2010. Interactive effect of organic amendment and environmental factors on degradation of 1,3-dichloropropene and chloropicrin in soil. *Journal of Agricultural Food Chemistry* 57:9063-9070.
- Smilanick, J. L.**, Mansour, M. F., Mlikota Gabler, F., Margosan, D. A., and Hashim-Buckey, J. 2010. Control of postharvest gray mold of table grapes in the San Joaquin Valley of California by fungicides applied during the growing season. *Plant Disease* 94:250-257.
- Charles S. Burks**, B. S. Higbee, **L. P. S. Kuenen**, & D. G. Brandl. 2009. Monitoring *Amyelois transitella* males and females with phenyl propionate traps in almonds and pistachios. *Entomologic Experimentalis et Applicata* 133(3):283-291.
- Guo, W., Wang, S., Tiwari, G. **Johnson, J. A.**, and Tang, J. 2010. Temperature and moisture dependent dielectric properties of legume flour associated with dielectric heating. *LWT - Food Science and Technology* 43:193-201.
- Johnson, J. A.**, and Zettler, J. L. 2009. Response of postharvest tree nut lepidopteran pests to vacuum treatments. *Journal of Economic Entomology* 102:2003-2010.
- Arthur, F. H.; **Johnson, J. A.**; Neven, L. G.; Hallman, G. J.; Follett, P. A. 2009. Insect pest management in postharvest ecosystems in the United States of America. *Outlooks on Pest Management* 20 (6) 279-284.
- Backus, E. A.**, Holmes, W., Schreiber, F., Reardon, B., Walker, G. 2009. Sharpshooter X-wave: correlation of an electrical penetration graph (EPG) waveform with xylem penetration supports a hypothesized mechanism for *Xylella fastidiosa* inoculation. *Annals of the Entomological Society of America* 102(5):847-867.
- Krugner, R.**, Johnson, M. W., Morgan, D. J., Morse, J. G. 2009. Production of *Anagrus epos* Girault (Hymenoptera: Mymaridae) on *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae) eggs. *Biological Control* 51(1):122-129.
- Ledbetter, C. A., Rogers, E. E.** 2009. Differential susceptibility of *Prunus* germplasm (Subgenus Amygdalus) to a California strain of *Xylella fastidiosa*. *HortScience* 44 (7):1928-1931.
- Lin, H., Cheng, D. W., Civerolo, E. L.** 2009. *Xylella fastidiosa* extracellular genomic DNA may play a role for enhancing biofilm formation in vitro. In: CDFA Pierce's Disease Control Program Research Symposium, December 9-11, 2009, Sacramento, CA. pp. 96-99.

Recent Publications (continued)

Mello, A. F., Wayadande, A., **Yokomi, R. K.**, Fletcher, J. 2009. Transmission of different strains of *Spiroplasma citri* to carrot and citrus by *Circulifer tenellus* Baker (Hemiptera:Cicadellidae). *Journal of Economic Entomology* 102(4):1417-1422.

Mello, A. F., **Yokomi, R.K.**, Melcher, U., **Chen, J.**, Fletcher, J. 2009. Citrus stubborn severity is associated with *Spiroplasma citri* titer but not with bacterial genotype. *Plant Disease* 94:75-82.

Ramming, D. W., Walker, A., **Lin, H.** 2009. Breeding Pierce's disease resistant table and raisin grapes and the development of markers for additional sources of resistance. In: CDFA Pierce's Disease Control Program Research Symposium, December 9-11, 2009, Sacramento, CA. pp. 192-196.

Wen, A., Mallik, I., Alvarado, V. Y., Pasche, J. S., Wang, X., Li, W., Levy, L., **Lin, H.**, Scholthof, H., Mirkov, E., Rush, C. M., Gudmestad, N. C. 2009. Detection, distribution and genetic variability of '*Candidatus Liberibacter*' species associated with zebra complex disease of potato in North America. *Plant Disease* 93:1102-1115.

Turechek, W., Gottwald, T. R., Hartung, J. S., Hilf, M. E., Keremane, M. L., **Lin, H.**, Shatters, R. G., Irely, M., Sieburth, P., Brlansky, R., DaGraça, J., Graham, J., Kunta, M., Roberts, P., Rogers, M., Sun, X., Wang, N. 2009. Evaluation of quantitative real-time PCR assays for detection of citrus greening, Proceedings of HLB-ZC Workshop, McAllen Tx., November 16-18, 2009.

Vahling, C., Duan, Y. P., **Lin, H.** 2009. Characterization of an ATP translocase identified in the destructive plant pathogen "*Candidatus Liberibacter asiaticus*". *Journal of Bacteriology* doi:10.1128/JB,01279-09.

Research Units and Contact Information

Water Management

Research Unit

Commodity Protection &

Quality Research Unit

Crop Diseases,

Pests & Genetics

Research Unit

National Arid Land Plant

Genetic

Resource Unit

USDA United States Department of Agriculture
 **Agricultural Research Service**
 the in-house research arm of the U.S. Department of Agriculture

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