San Joaquin Valley Agricultural Sciences Center
9611 S. Riverbend Avenue, Parlier, California 93648-9757
(559) 596-2700 http://ars.usda.gov/pwa/sjvasc

SJVASC Update

March 2016

Workshop on "Water Management Strategies for Perennial Crops with Limited and Impaired Water Supplies"

Contact: Jim Ayars

James.Ayars@ars.usda.gov, (559) 596-2875

The USDA-ARS in cooperation with the University of California Division of Agriculture and Natural Resources (UC ANR) and the Agricultural Research Organization of the Israeli Ministry of Agriculture sponsored the workshop "Water Management Strategies for Perennial Crops with Limited and Impaired Water Supplies" which was held at the Modesto Convention Centre on 12-13 January 2016 with approximately 220 attendees. The workshop was initiated with an offer from Israeli scientists to the USDA-ARS Office of International Research Programs to share their water management experiences during drought and periods of limited water with the farmers in California. Australian, USDA-ARS, and University of California scientists and extension agents provided their experiences along with the Israeli scientists. The meeting had a central theme of improving irrigation water management practices that was followed by breakout sessions that looked at water management practices on specific commodities, e.g., grapes, nuts, and subtropical crops. The last session of the day in each breakout session was a grower panel that allowed farmers to discuss their individual practices and challenges. The UC ANR videotaped all the sessions, which are available at http://www.droughtmgt.com/#!presentations-and-documents/niui7. With the emphasis on using reclaimed wastewater for irrigation in California, the Israeli experience of 30 years of use was of particular interest and relevance. The potential for using desalinized water for irrigation was also explored, and plant nutrition issues were identified with this approach. A major theme throughout the workshop was the need to improve basic water management through maintenance, design, and operation of irrigation systems and improved irrigation scheduling. The meeting also allowed for extended periods of discussion between the US and international partners.

New Scientist

Dr. Claire Heinitz is the new curator of the germplasm collections at the National Arid Land Plant Genetic Resources Unit (NALPGRU). In addition to working with the NALPGRU staff to continue to coordinate the maintenance of our collection of industrial crops and regeneration of crops from other National Plant Germplasm System sites, Dr. Heinitz is looking forward to building a research program within the unit. NALPGRU has a valuable collection of plants that are well suited for drought and salt stress work, and Dr. Heinitz plans to collaborate with other researchers here at the Center and beyond on this aspect of the collections. Dr. Heinitz recently finished her Ph.D. at UC Davis, working with Dr. Andy Walker on grapevine genetics. Her project involved the collection, maintenance and characterization of wild grape species from the southwest U.S., with emphasis on the salt tolerance capabilities of the collection and on the large-scale genetic diversity of the different populations. The Walker lab will be using this germplasm in the future for breeding salt and drought tolerant grape rootstocks. Dr. Heinitz received her undergraduate degree at the University of Arizona where she worked in a guayule and lesquerella breeding lab. This was where she first got excited about plant breeding and genetic diversity, and also where she learned to love the less charismatic industrial crops. **Claire.Henitz@ars.usda.gov, 559-596-2980**


Research Updates


Postharvest fumigation of California table grapes with ozone to control Western black widow spider (Araneae: Theridiidae)

Authors: S. Walse, J. Tebbets, J. Leesch

Submitted to: Journal of Economic Entomology

Western black widow spiders (BWS) are a pest of concern to fresh table grape packers and shippers from California. We report results from studies that examined the potential to control BWS with postharvest ozone fumigation. Results indicate that ozone fumigation can be used to control BWS and that the treatment does not result in quality damage to berries. Importantly, this research identifies a tool that the California table grape industry can use to simultaneously control decay as well as insect pests in fruit destined for export, which is often the most valuable of the season.

Contact: Spencer Walse, Spencer.Walse@ars.usda.gov, (559) 596-2750

'Valley Pearl' table grape

Author: C. Ledbetter

Submitted to: HortScience

Table grapes are an important commodity in California agriculture, representing nearly 120,000 bearing acres in 2015. Over 100 million boxes are harvested annually in the industry, with shipment generally beginning in May and extending through the end of November. Consumers appreciate having a diverse selection of high quality table grapes throughout the ripening season. Development of new table grape cultivars is an important objective in the ARS fruit breeding program in Parlier, CA. Valley Pearl is the newest table grape cultivar bred and evaluated by ARS scientists. The new cultivar was released for propagation due to its overall productivity and naturally large berry size. Its spur fruitfulness lends itself well to mechanical pre-pruning, and larger berries can be produced with the application of a single gibberellic acid spray at berry set. Table grape growers will appreciate the ease with which Valley Pearl can be produced.

Contact: Craig Ledbetter, Craig.Ledbetter@ars.usda.gov, (559) 596-2817

'Goshen Gold': A late-season Apricot for fresh and dry product markets

Author: C. Ledbetter

Submitted to: HortScience

Apricot is generally the first stone fruit to appear at markets in late spring and the first to leave markets after all cultivars have completed maturity. California orchards provide 90% of the apricot grown domestically to the fresh and processing markets. High quality cultivars suitable for cultivation in the hot San Joaquin Valley are demanded by apricot producers for specific marketing windows. ARS researchers in Parlier, CA, have been breeding apricots since the 1950s and have recently developed a late-season cultivar that extends the apricot maturity window approximately 10 days beyond the current latest maturing cultivar. Named Goshen Gold, the new cultivar provides producers with a self-fruitful tree that is both vigorous and productive, and can be marketed fresh as well as cut and dried to a high-color premium product. When dried, Goshen Gold has a dry ratio just under 4.0, and dry product retains color significantly better than cultivar Patterson, the predominant apricot used as drying stock in California. Availability of this new late-ripening apricot for propagation and production will provide another high quality cultivar alternative for growers and may encourage further consumer sales.

Contact: Craig Ledbetter, Craig.Ledbetter@ars.usda.gov, (559) 596-2817

Rootstock effects on almond leaf scorch disease incidence and severity

Authors: R. Krugner, C. Ledbetter

Submitted to: Plant Disease

Almond leaf scorch disease (ALSD) is caused by the bacterium *Xylella fastidiosa*, which is transmitted by sharpshooters and spittlebugs. The vast majority of the 380,000 ha of almond orchards in California is located in the San Joaquin Valley, where significant heterogeneity of disease incidence and severity exists among regions and cultivars affected by ALSD. Although cultivar selection and planting location partially describe the hetero-

geneity in ALSD intensity during the history of almond production in California, a clear alternative has not been proposed. A five-year field study was conducted to evaluate effects of duration and exclusion of *X. fastidiosa* infections on young almond tree performance and their links to tree vigor. 'Nemaguard', 'Okinawa', 'Nonpareil', and Y119 were used as rootstocks for almond scion 'Sonora'. Symptoms of leaf scorching, reduced growth, and *X. fastidiosa* infection persisted throughout the study on all trees grafted on 'Nonpareil' rootstock, whereas remission of leaf scorching symptoms and elimination of the pathogen occurred in only 30% of the *X. fastidiosa*-inoculated trees on 'Okinawa' and Y119 rootstocks. 'Nemaguard' promoted complete pathogen elimination and remission of leaf scorching symptoms. Results indicate that a *X. fastidiosa*-resistant trait in the rootstock can be valuable for maintaining low incidence of ALSD in California.

Contact: Rodrigo Krugner,

Rodrigo.Krugner@ars.usda.gov, (559) 596-2887

Mucor rot – An emerging postharvest disease of mandarin fruit caused by *Mucor piriformis* and other *Mucor* spp. In California

Authors: S. Saito, T.J. Michailides, C. Xiao

Submitted to: Plant Disease

In recent years, an emerging, undescribed postharvest fruit rot disease was observed on mandarin fruit after extended storage in California. In 2015, we collected decayed mandarin fruit from three citrus packinghouses in the Central Valley of California and identified this disease as Mucor rot caused by *Mucor* spp. Percentage of Mucor rot in the total decayed fruit varied greatly among 15 grower lots sampled, ranging from 0 to 93.1% with an average of 36.3%. In total, 197 isolates of *Mucor* spp. were obtained from decayed mandarin fruit and identified based on DNA fingerprinting and morphological characteristics. Of the 197 isolates, 182 (92.4%) were identified as *M. piriformis*, seven (3.6%) were *M. circinelloides* (six *M. circinelloides* f. *lusitanicus* and one *M. circinelloides* f. *circinelloides*), four (2%) were *M. racemosus*, three (1.5%) were *M. hiemalis*, and one (0.5%) was *M. mucedo*. All five *Mucor* spp. caused decay on mandarin fruit inoculated with the fungi, and the lesion size caused by *M. piriformis* was significantly larger than those caused by other species at both 5 and 20°C. Our results indicated that Mucor rot in mandarins in California is caused by a *Mucor* species complex consisting of *M. piriformis*, *M. circinelloides*, *M. racemosus*, *M. hiemalis*, and *M. mucedo*, with *M. piriformis* being the dominant and most virulent species. Previously, *M. racemosus* was reported on citrus. This is the first report of Mucor rot in citrus caused by *M. piriformis*, *M. circinelloides*, *M. hiemalis*, and *M. mucedo*.

Contact: Chang-Lin Xiao, Chang-Lin.xiao@ars.usda.gov, (559) 596-2721

Fungicide resistance profiling in *Botrytis cinerea* populations from blueberries in California and Washington and their impact on control of gray mold

Authors: S. Saito, T. Michailides, C. Xiao

Submitted to: Plant Disease

Gray mold caused by the fungus *Botrytis cinerea* is a major postharvest disease of blueberries grown in the Central Valley of California and western Washington State. Control of gray mold has largely relied on the use of fungicides, but fungicide resistance in *B. cinerea* can result in the failure of disease control. In this study, we examined sensitivities to boscalid, cyprodinil, fenhexamid, fludioxonil, and pyraclostrobin, representing five different fungicide classes, in 249 and 106 isolates of *B. cinerea* recovered from decayed blueberry fruit in CA and WA, respectively. In CA and WA, respectively, 66 and 49% of the isolates were resistant to boscalid; 20 and 29% were moderately resistant to cyprodinil; 29 and 29% were resistant to fenhexamid; and 66 and 55% were resistant to pyraclostrobin. All isolates from CA were sensitive to fludioxonil, while 70% of the isolates from WA showed reduced sensitivity to fludioxonil. In CA, 26 and 30% of the isolates were resistant to two and three classes of fungicides, respectively. In WA, 31, 14, 16, and 9% of the isolates were resistant to two, three, four, and five classes of fungicides, respectively. On detached blueberry fruit inoculated with 11 isolates exhibiting different fungicide-resistant phenotypes, most fungicides failed to control gray mold on fruit inoculated with respective resistant phenotypes, but the mixture of cyprodinil and fludioxonil was effective against all fungicide-resistant phenotypes tested. Our findings would be useful in designing and implementing fungicide resistance management spray programs for control of gray mold in blueberry.

Contact: Chang-Lin Xiao, Chang-Lin.xiao@ars.usda.gov, (559) 596-2722

Effects of '*Candidatus* Liberibacter solanacearum' infections on potato (*Solanum tuberosum* L.) tuber physiology when kept at different temperatures

Authors: C. Wallis, A. Rashed, F. Workneh, L. Paetzold, C. Rush

Submitted to: Physiological and Molecular Plant Pathology

Current efforts to minimize processor losses due to zebra chip disease of potato (ZC), caused by infections of '*Candidatus* Liberibacter solanacearum', involve visual inspection of symptoms in freshly-cut potatoes. Symptomatic lots are rejected prior to storage. However, late-season Lso-infections could result in the acceptance of Lso -positive but asymptomatic tubers that may develop ZC symptoms in storage. This study examined development of ZC symptoms, Lso titers, and associated shifts in tuber chemistry in late-season Lso-infected tubers held at 3°C, 6° C, or 9°C. Although changes in Lso titers were variable, symptoms were observed to be consistently greater in tubers kept at 3°C versus 6°C or 9°C. ZC-associated compounds were greater in Lso-infected tubers kept at 3°C compared to those stored at higher temperatures. These results confirmed ZC symptoms may develop in Lso-positive tubers that were asymptomatic at harvest. Based on these findings, PCR-detection of Lso presence should be made on potentially infected tubers prior to acceptance. Furthermore, any tubers suspected of being Lso-positive should be held at temperatures greater than 3°C to limit ZC symptom development.

Contact: Chris Wallis, Christopher.Wallis@ars.usda.gov, (559) 596-2805

Influence of salinity and boron on germination, seedling growth and transplanting mortality of guayule: a combined growth chamber and greenhouse study

Authors: Z. Hui, G. Banuelos

Submitted to: Industrial Crops and Products

Guayule, a native plant in the southwestern United States and northern Mexico, has been exploited as a source of natural rubber for commercial production. Due to guayule's commercial value and its drought tolerance, guayule has been developed and considered as an alternative crop for arid and semiarid areas of the southwestern United States, north central Mexico, and the west side of Central California. One drawback in establishing guayule is that there are oftentimes problems with seed germination when it is direct seeded under different soil quality conditions. If this plant is to be considered as an alternative crop for the westside of California, it must be able to grow in poor quality soils. Our results showed that increased salinity inhibited both germination and seedling growth of six guayule lines tested. In contrast, boron (B) positively influenced (to varied degrees) germination and growth of specific guayule lines (AZ-1, 2, and 4) and had no significant negative influence on the other three lines. The combination of 5 mg B/L and salinity of 5 dS/m (deciSiemens/meter) increased both germination percentages and rates and seedling vigor of some lines. There was no effect on germination percentages for most guayule lines (except for AZ-3) grown in saline B-laden (EC [electrical conductivity] of 10 dS/m, 10 mg B/L) and control (EC of 2.3 dS/m, 0.12 mg B/L) soils under greenhouse conditions. AZ-4 showed even a greater germination percentage in saline B-laden soil than in control soil. AZ-1 and AZ-6 showed greater germination percentages and rates than the other lines, although greater mortality percentage was observed when these AZ-1 and AZ-6 seedlings were transplanted into saline B-laden soils. Our results from both growth chamber and greenhouse experiments indicate that many of the tested guayule lines can successfully germinate in typical but moderate saline B-laden soils present in the West side of central California. Consequently, guayule may be a new crop to consider for planting in this region of California.

Contact: Gary Banuelos, Gary.Banuelos@ars.usda.gov, (559) 596-2880

Examination of key factors and mitigation methods affecting the processes in nitrous oxide emissions from urea application

Authors: Z. Cai, S. Gao, A. Hendratna, Y. Duan, M. Xu, B. D. Hanson

Submitted to: Soil Science Society of America Journal

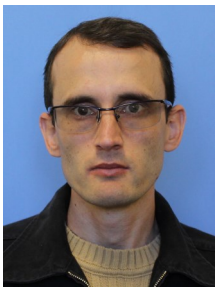
Agricultural soil is a significant source of nitrous oxide (N_2O) emissions contributing to global warming, and mitigation strategies depend on better understanding of the environmental factors and processes affecting its production. This study examined the dynamics of both N_2O emission and N transformation processes from urea application by conducting a series of laboratory soil incubation experi-

ments under varying conditions of application rate, soil moisture, temperature, incorporation of biochar, and the use of nitrogen transformation inhibitors (fertilizer stabilizers). Soil water content was found to be the most important environmental factor impacting N_2O emissions. Much higher emissions and total gaseous N loss were found in soil above water holding capacity (WHC) than those below. This research also revealed that nitrite (NO_2^-) was highly correlated with N_2O emission but within two distinct water content ranges (above or below WHC). Biochar and the inhibitors reduced total N_2O emissions >70% and the inhibitors also significantly reduced total gaseous N loss. The research information can be used to guide development of practices for effective N management and minimizing losses.

Contact: Suduan Gao, Suduan.Gao@ars.usda.gov, (559) 596-2870

Visiting Scientists

Dr. Yogita Maheshwari started at the SJVASC on 6 November 2015 as a visiting scholar in the laboratory of Dr. Ray Yokomi to conduct research on Citrus tristeza virus (CTV). She will examine the molecular biology of mild and severe strains of CTV and develop infectious cDNA clones of CTV. Yogita received her Ph.D. in Biotechnology from the Jaipur National University in Rajasthan, India. She is a molecular virologist and has worked as a Research Associate in the Indian Agricultural Research Institute in New Delhi conducting research on genome characterization of Tobacco mosaic virus, recombinant coat protein and antibody gene expression of Papaya ringspot virus, construction of single chain variable fragment (scFv) for diagnosis of Groundnut bud necrosis virus, and development of a lateral flow immunoassay for diagnosis of Large cardamom chirke virus.



Edmar Tuelher is a Ph.D. student in Entomology at the Federal University of Viçosa (UFV), Brazil. He will be a visiting scientist at SJVASC under the supervision of Dr. Elaine Backus from January through November 2016. Edmar received his B.S. in Agronomy (2004) and his M.S. in Entomology (2006) at UFV. For his Master's thesis, Edmar studied sublethal effects of non-conventional insecticides used by organic coffee growers against a phytophagous mite, *Oligonychus ilicis*. After graduating, Edmar joined the Brazilian Agricultural Research Corp. and spent the next four years in a project (conducted at the Embrapa Maize and Sorghum Unit) to achieve large scale production of the baculovirus *Spodoptera frugiperda* Multiple Nucleopolyhedrovirus (SfMNPV) for control of fall armyworm. After that, Edmar worked for one year at DuPont/Pioneer Seeds Division as a research assistant in the Trait Characterization and Development Department, where he was responsible for testing transgenic events for insect resistance. Edmar next worked at the Embrapa Rice and Bean Unit on a project to characterize resistance genes of the common bean (*Phaseolus vulgaris*) to the fungus *Colletotrichum lindemuthianum*. Later, as a fellow of the Agriculture and Livestock Research Enterprise of Minas Gerais, Edmar contributed to a project for ecological control of mites in coffee and pepper. Edmar returned to UFV to begin his Ph.D. graduate studies in 2013. His Ph.D. research is focused on sublethal effects of target and non-target insecticides on the brown stink bug, *Euschistus heros*, a major pest of Brazilian soybean. The effects under investigation are: insect survival, mating behavior, fecundity, fertility, and longevity after insecticide exposure, as well as feeding behavior and locomotory response after exposure on treated surfaces. During Edmar's visit to Parlier, he will perform research on the feeding behavior and cause of damage of Brown Marmorated Stink Bug on grape berries and receive advanced training in electropenetrography (EPG), the electronic method of observing, measuring, and understanding hemipteran feeding behavior, for application to his Ph.D. research and future studies of important pentatomid pests in Brazilian soybean.

Subscribe to the SJVASC Update or read past Updates at:

http://www.ars.usda.gov/News/News.htm?modecode=20-34-05-00

To unsubscribe, send e-mail to: Marlene.Jensen@ars.usda.gov