STUDENT RESEARCH JOURNAL
JORDAN COLLEGE

Research Newsletter, Vol. 1, Issue 1 Spring 2016

Message From The Editorial Team

This is the inaugural issue of the Jordan College Student Research Journal. The idea of initiating such a journal was conceived during the preparation of a USDA Non Land Grand Colleges of Agriculture (NLGCA) proposal. The objective of this proposal was to promote undergraduate research in agricultural sciences by providing opportunities for experiential learning and a pathway to graduate studies. The goal of this journal is to showcase the undergraduate and graduate student research in the Jordan College at California State University, Fresno and share news of student activities and success stemming from their research projects.

At present, the editorial team consists of members who are a part of the proposal submitted to the USDA-NLGCA; however, we invite interested faculty and students (graduate or undergraduate) from all departments in the Jordan College to serve on the editorial team. We wish to see a broader representation on the editorial team from the next issue. We plan on publishing this journal in electronic format with two volumes a year (Fall and Spring). Contributions from students in the form of abstracts or full-length articles are most welcome.

The journal will continue to grow and improve over time as we get more feedback, so we welcome comments, suggestions, and of course contributions in the form of articles, abstracts, or research news. We hope this is a worthwhile venture.

RESEARCH GRANT NEWS

The current members of the Editorial Team were successful in getting a proposal titled 'Promoting undergraduate research in agriculture: Opportunities for experiential learning and a pathway to graduate studies' funded by the USDA-NLGCA grant funding program.

The total amount funded is $150,000 that will support eight undergraduate students in 2016 and 2017 for approximately three months. The students will intern with researchers from the University of California, USDA-ARS, Fresno State, or other research institutions. Funds will also be available to these students to attend and present their research results at a professional society conference. The call for applications for these internships was announced in January 2016. The following students on page 2 were selected for the 2016 cohort:

IN THIS ISSUE

We wish this first cohort all the best for a productive experience!!!

Katie Asai, Plant Science

Katie will be working with Dr. Jeffrey Mitchell, Department of Plant Science, University of California, Davis. She will be working on soil and water conserving cropping systems.

Jessie Brazil, Plant Science

Jessie will be working with Dr. Margaret Ellis, Department of Plant Science, Fresno State. Her area of interest is forest pathology.

Mark Castanon Plant Science

Mark will be working with Dr. Andreas Westphal, Department of Nematology, University of California, Riverside. His area of interest is nematode control in perennial crops.

Carolyn Chase, Food Science

Carolyn will be working with Dr. John Bushoven, Department of Plant Science, Fresno State. Her area of interest is in minimizing food waste.

Crystal Espindola, Biology/Plant Science

Crystal will be working with Dr. Jacob Wenger, Department of Plant Science, Fresno State. Her area of interest is in conservation of pollinators.

Alexis Jackson, Plant Science

Alexis will be working with Dr. Themis Michailides, Department of Plant Pathology, University of California, Davis. Her area of interest is tree fruit pathology.

Michael Serrato, Plant Science

Michael will be working with Dr. Kent Daane, Department of Environmental Science, Policy, and Management, University of California, Berkeley. His area of interest is in studying insect ecology in vineyards.

May Yang, Plant Science

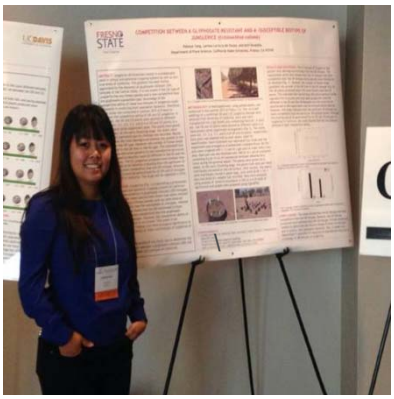
May will be working with Dr. Kent Daane, Department of Environmental Science, Policy, and Management, U.C. Berkeley. Her area of interest is insect-weed interactions.

STUDENT RESEARCH ACTIVITIES NEWS

California Weed Science Society Annual Meeting

L-R: Jorge Angeles, Elizabeth Mosqueda, Sarah Parry and Ryan Cox

Undergraduate (Ryan Cox, Sarah Parry, and Pahoua Yang) and graduate students (Jorge Angeles, Elizabeth Mosqueda, and Katrina Steinhauer) from the Department of Plant Science presented oral talks and posters at the California Weed Science Society Annual Meeting held in Sacramento from January 13-15, 2016. In the oral presentation competition, Ryan Cox and Jorge Angeles placed 1st and 2nd, respectively, while Elizabeth Mosqueda and Sarah Parry tied for 3rd place. Students from Fresno State were the only ones competing in the oral competition while students from University of California, Davis; University of California, Berkeley; Cal Poly State University, San Luis Obispo; Fresno Pacific University, Fresno; and California State University, Fresno competed in the poster section. Pahoua Yang placed 3rd in the poster competition.



Pahoua Yang

California Plant and Soil Annual Meeting

Undergraduate (Ryan Cox, Francisco Llamas, Sarah Parry, Julie Pedraza, Omar Robles, Yue Wu, and Pahoua Yang) and graduate students (Jorge Angeles, Jacob Burtis, Giuliano Galdi, Elizabeth Mosqueda, Josue Samano Monroy, Eeva Sharma, Katrina Steinhauer, and Touyee Thao) from the Department of Plant Science presented posters at the Agronomy Society of America California Chapter Plant and Soil Conference held in Visalia on February 2 –3, 2016. Sarah Parry and Ryan Cox placed 1st and 2nd, respectively in the undergraduate poster competition while Touyee Thao, Giuliano Galdi, and Elizabeth Mosqueda placed 1st, 2nd, and 3rd in the graduate section.

L-R: Sarah Parry and Touyee Thao, first place winners in the undergraduate and graduate category poster competition, respectively.

Weed Science Society of America Annual Meeting

Graduate student Elizabeth Mosqueda presented a talk titled 'Automated Lettuce Thinners: Can They Also Contribute to Weed Control?' at the Weed Science Society of America Annual meeting held from February 8-11, 2016 in San Juan, Puerto Rico. Other students who were co-authors on various posters presented at this meeting included Ryan Cox, Sarah Parry, Julie Pedraza, Larissa Larocca de Souza, and Mala To.

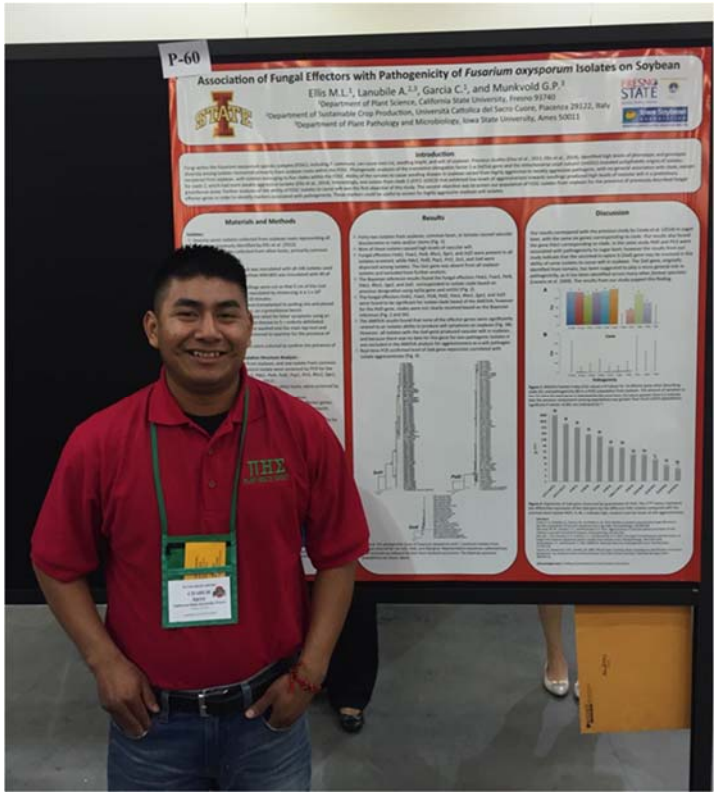
American Society of Agricultural and Biological Engineering CA NV Section Meeting

Frank Baggiolini, an undergraduate student from the Department of Industrial Technology, presented his poster on 'Implementation of cultural practices and technology to reduce air emissions' at the American Society of Agricultural and Biological Engineering held in Tulare on the sidelines of the World Agricultural Expo on February 11, 2016. Frank was placed 3rd in the undergraduate poster competition.

American Phytopathological Society Annual Meeting

Fresno State's Plant Pathology Assistant Professor Dr. Margaret Ellis and USDA-ARS Research Plant Pathologist Dr. Christopher Wallis attended the American Phytopathological Society annual meeting in Pasadena, CA on August 1-5, 2015 with a group of Fresno State Plant Health Society students that included Omar Carrillo, Crystal Espindola, Noemi Fonseca-Espinoza, Charlie Garcia, Angel Lozano, Megen Morales, Sarah Parry, Julie Pedraza, Andres Rubio and Robert Ullo.

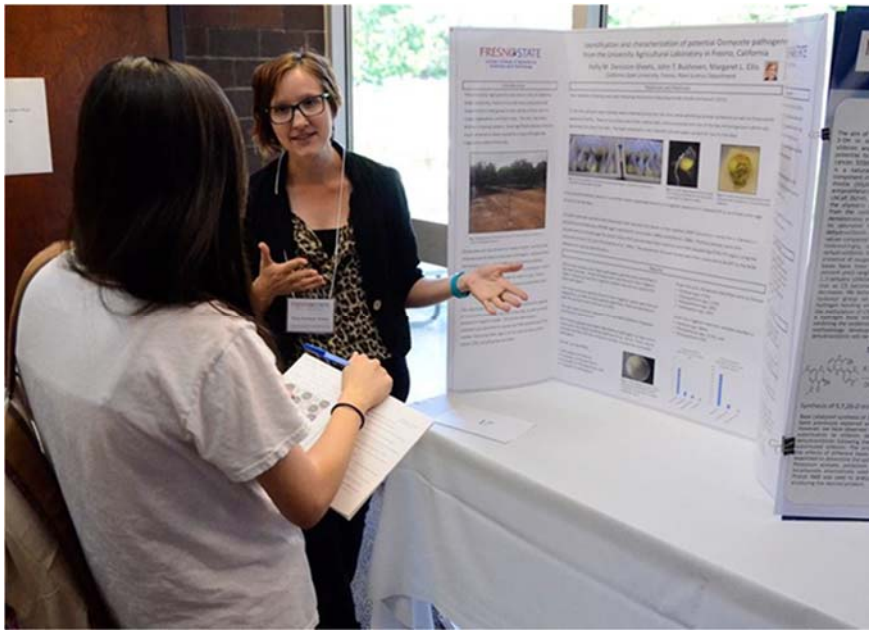
American Phytopathological Society Annual Meeting



Under the guidance of Dr. Margaret Ellis, Charlie Garcia, an undergraduate, was co-author on a presentation describing their research examining the association of fungal effectors with pathogenicity of *Fusarium oxysporum* isolates on soybean. Garcia helped with DNA alignments of sequenced fungal effector genes and prepared phylogenetic trees for each of the fugal effector genes to examine DNA variability among *F. oxysporum* isolates collected from soybean. The abstract for this presentation was presented at the American Phytopathological Society annual meeting in Pasadena, CA on August 1-5, 2015. More recently, Garcia was a co-author on the publication resulting from this work that has recently been accepted in the journal *Phytopathology*, the premier research journal for plant pathology research.

Central California Research Symposium

Holly Deniston-Sheets, an undergraduate student from the Department of Plant Science, presented her first poster on 'Identification and characterization of potential oomycete pathogens from the University Agricultural Laboratory in Fresno, CA' at the Central California Research Symposium held in Fresno, California on April 20, 2016. Holly's poster presentation received an honorable mention award for the undergraduate poster competition. Her mentor is Dr. Margaret Ellis.



Entomological Society of America Annual Meeting

Julie Pedraza, was the first undergraduate student from the Department of Plant Science, to present a poster on 'Glassy-winged sharpshooter oviposition effects on foliar grapevine and red-tipped photinia terpenoid levels' at the Entomological Society of America (ESA) held in Minneapolis, Minnesota on November 15-18, 2015. She worked in collaboration with her mentors, Plant Pathologist, Dr. Christopher Wallis, and Entomologist, Dr. Rodrigo Kruger, from the USDA Agricultural Research Service.in Parlier, California.

STUDENT ABSTRACTS

(*undergraduate student; **graduate student)

Effects of duration of weed-free periods in organic lettuce production

Sarah Parry*, Ryan Cox*, Larissa Larocca*, S. Kaan Kurtural, and Anil Shrestha
California State University, Fresno, CA.

Weed management accounts for a substantial portion of farm budgets in organic lettuce production. Knowledge of the duration the lettuce crop has to be kept weed-free without compromising yield or quality may result in unnecessary weeding costs. Studies were conducted in 2014 and 2015 to determine the effect of the duration of weed-free period on crop yield and quality of transplanted organic Romaine lettuce. The crop was grown for 8 weeks, with 8 different weed-free periods [0 (no weed control), 1, 2, 3, 4, 5, 6, 7 (weed-free entire 8 weeks)]. The plots were hand weeded. All standard organic production practices were followed. Data were collected on total and marketable yield, hand weeding costs, weed density, weed biomass, crop quality rating at harvest, and phenolic composition. Results showed that the critical weed-free duration for lettuce yield and quality was up to four weeks after transplant. However, total stand counts, disease incidence, and phenolic composition of the leaves were not affected by the duration of weed-free period. The major weed species in the plots depended on the season. Weed biomass data also showed that there was not much benefit in controlling weeds beyond four weeks after lettuce transplant. Therefore, it can be concluded that a weed-free duration of four weeks after transplanting will be sufficient to produce quality Romaine lettuce in organic cropping systems with optimum yields and weed control costs.

Presented at the American Society of Agronomy/Crop Science Society of America/Soil Science Society of America Annual Meeting, November 6-9, 2015, Minneapolis, MN.

Effect of shade and soil moisture level on the efficacy of selected postemergence herbicides in control of junglerice (*Echinochloa colona*).

Ryan Cox*, Larissa Larocca de Souza*, Mala To* and Anil Shrestha
Department of Plant Science, California State University, Fresno, CA 93740

Junglerice (*Echinichloa colona*) is a problematic weed in annual and perennial cropping systems of California. Further, the discovery of glyphosate-resistant (GR) populations of junglerice in the Central Valley has aggravated the problem. Two alternatives that have been identified in perennial cropping systems are sethoxydim and glufosinate, both of which are postemergence herbicides. However, the performance of these herbicides can be influenced by environmental conditions such as light intensity and soil moisture. Junglerice, in orchards, are usually growing under shaded conditions. Further, increasing incidents of drought in the Central Valley are promoting regulated deficit irrigation (RDI) of crops. The combination of drought and RDI can create soil moisture stress conditions. Both shade and soil moisture deficiency can reduce the efficacy of these herbicides on plants that are growing under stressful conditions.

A study was conducted in Fresno, CA in summer 2015 to evaluate the effect of light intensity and soil moisture levels on the efficacy of sethoxydim, glufosinate, and glyphosate on potted junglerice plants. Four to 6-leaf stage junglerice plants were grown in 3" size plastic pots containing field soil. Three levels of shade (70% shade, 50% shade, and 0% shade) were imposed using shade cloth of various transparency and three soil moisture regimes (100% , 50%, and 25% of field capacity) were imposed using the gravimetric method. The plants were treated with label rates of the selected herbicides between the second leaf and the first tiller stage. An untreated control was also included. Shade was simulated by using shade cloth of various transparencies. The experimental design was a split-split-split plot with shade as the main effect, soil moisture as the sub-effect, and herbicide type as the sub-sub effect. Mortality and other biomass of these plants were evaluated every 7 days after treatment. Data were analyzed using analysis of variance procedures in SAS at a significance level of 0.05.

Results indicated that mortality of the plants was affected differentially by light intensity, moisture level, and herbicide type. There was a significant interaction between light intensity and soil moisture level. Therefore, data were analyzed separately for each shade level. Interactions occurred between moisture level and herbicide type under shade but not under full sun. Glufosinate provided 100% control of the junglerice plants at all light and moisture levels. Sethoxydim provided 70 to 100% control of the plants under full sun. Although all the plants were controlled at 100% FC with sethoxydim under 50 and 70% shade, mortality of the plants was reduced to 20 to 50% at 50% FC. Similarly, the efficacy of glyphosate was also affected by shade and moisture levels. The efficacy of glyphosate was generally greater under shade than under full sun conditions and mortality was greater at 100% and 75% FC than at 50% FC. Among the herbicides compared, glufosinate was the best treatment under all levels of shade and moisture conditions. Control of junglerice with sethoxydim was lower under shaded and low moisture conditions, whereas control with glyphosate was better under shaded conditions at 100% and 75% FC moisture conditions. Therefore, both shade and soil moisture conditions should be taken into consideration when selecting postemergence herbicides for control of junglerice.
Funding source: California Specialty Crops Block Grant, CSU ARI, Provost's Undergraduate Research Award.

Presented at the California Weed Science Society Annual Meeting, January 13-15, 2016, Sacramento, CA.

Testing the efficacy of bio-insecticides to control *Lygus* bugs (Hemiptera: Miridae) in alfalfa seed production.

Francisco Llamas-Gonzales[1*], Bruce Roberts[1], Antonino Cusumano[2], and Jorge M. González[1]
[1]Department of Plant Science, California State University, Fresno, CA, USA
[2]Department of Agricultural and Forest Science, Universita' degli Studi di Palermo, Italy

Seed production of alfalfa can be affected by damage from piercing sucking insects being Lygus bugs the pest of major concern for alfalfa seed growers. Considerable effort has been made to find insecticides that effectively control *Lygus* populations. The aim of our research was to test two biological pesticides (MBI-203, MBI-206) unregistered in seed alfalfa against two registered synthetic pesticides (Sivanto 200SL, and Beleaf 50 SG) for control of *Lygus* on Alfalfa seed production. A field trial was conducted on the College Farm at California State University, Fresno. The two biological pesticides (MBI-206, at .5 and 1 gal/Ac, MBI-203 at 2 lb/Ac) and the two commonly used synthetic pesticides (Beleaf 50 SG at 2.8 oz/Ac; Sivanto 200SL at 2 lb/Ac) were tested in a randomized block design with four replications. Sampling of *Lygus* populations were done for each block (and replications) prior to application then 5 and 10 days post application, and one day prior to the second application, plus 3 and 12 days post application. Analysis comparing populations of other piercing insects, predators and parasitoids were also done. Our preliminary assessments indicate that the experimental pesticides (MBI-206 at both rates) and Sivanto 200SL had the best effects in diminishing *Lygus* populations. Effects on other pests and on natural enemies will be presented.
This project was supported by the California Seed Alfalfa Research Board.

Presented at the California Plant and Soil Conference, February 2-3, 2016, Visalia, CA.

Glassy-winged sharpshooter oviposition effects on foliar grapevine and red-tipped photinia terpenoid levels

[1]Julie Pedraza*, [2]Christopher M. Wallis, [2]Rodrigo Krugner
[1]Department of Plant Science, California State University, Fresno, CA
[2]USDA-ARS San Joaquin Agricultural Sciences Center, Parlier, CA

The glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis* (Germar) (Hemiptera: Cicadellidae), is an important vector of *Xylella fastidiosa*, the bacterium that causes Pierce's disease of grapevine and is a threat to grape production throughout the United States. Female GWSS deposit egg masses beneath the epidermis layer on the abaxial side of leaves of many host plants. Host plants respond to GWSS oviposition by releasing volatile chemicals that attract mymarid parasitoids (Hymenoptera: Mymaridae) to GWSS egg masses thus interrupting reproduction of the pest. Previously, greater concentrations of two terpenoids were emitted from GWSS-infested leaves of grapevine compared to non-infested leaves. This study examined terpenoid concentrations present within leaves of GWSS egg-infested grapevines and red-tipped photinia and compared with levels present in non-infested plants. This was done to directly observe the accumulation of terpenoid compounds within tissues prior to emission from each of these host plants, and to discover differences between grapevine and photinia defense responses. Since in previous studies parasitoids were more responsive to GWSS infested red-tipped photinia leaves than grapevines leaves, findings should determine which particular compounds or blend of compounds unique to photinia allow it to better defend itself than grapevine against GWSS.

Presented at the Entomological Society of America Annual Meeting, November 6-9, 2015, Minneapolis, MN.

Evaluating Crop Water Requirement for Sugarbeet under Drip Irrigation

Touyee Thao**, F. Cassel S., D. Goorahoo, J. Ayars, and S. Ashkan

Important changes in irrigation management and crop production have occurred over the past decade throughout the state of California. In the Central Valley, many growers have transitioned from low-value crops produced under flood irrigation to higher value crops grown with low-volume irrigation systems, including drip. More recently, this trend has also been observed for row crops, such as sugarbeets, a relatively salt-toleant crop, and has been mostly attributed to the current drought that has severely affected the availability of water resources in the region. Overall, water conservation has become a top priority in California and has required producers to adopt management practices that optimize irrigation and water use efficiency. One approach to conserve water consists in optimizing irrigation scheduling through the development of new crop water requirement (CWR) estimates that better reflect the current agricultural and irrigation management practices. The most accurate and precise method to determine CWR involves the use weighing lysimeters to derive evapotranspiration (ET) and crop coefficient (Kc) estimates. Thus, the objectives of our study were to develop ET and Kc estimates for sugarbeets (*Beta vulgaris*) grown under drip irrigation using the lysimeter facility available at the University of California Westside Research and Extension Center. Results from our 2014-2015 lysimeter study, conducted on a clay loam soil, suggested that peak ET for sugarbeet was around 8 mm/day, while midseason K_c was 1.25. This K_c value was close to that reported in FAO-56. A strong correlation was also observed between crop Kc and fractional ground cover (F_c), with an $r^2 = 0.90$.

Presented at the California Plant and Soil Conference, February 2-3, 2016, Visalia, CA.

Automated Lettuce Thinners: Can They Also Contribute to Weed Control?

Elizabeth Mosqueda[1], Richard Smith[2], Anil **Shrestha[1]. [1]California State University, Fresno, California, USA.
[2]University of California Cooperative Extension, Monterey County, California, USA.

Direct-seeded lettuce cultivation is very labor intensive, specifically for the thinning and weeding process. During the past few years, lettuce growers in California have been facing labor shortages making it much more difficult to grow this crop. In recent years, automated lettuce thinners have been introduced in California. These implements are expected to supplement or replace manual-thinning and weeding. However, the efficacy of the machines in these operations has not been assessed. Therefore, a study was conducted in 2014 and 2015 in California to compare the efficacy of these machines with manual lettuce thinning and weeding. Parameters measured were number of lettuce plants including doubles (two closely spaced plants) and number of weeds in the crop row, before and after the thinning process; and plant spacing within a row after thinning. Time taken for the initial thinning process and the double/weed removal process was recorded. Results showed that lettuce thinning was completed in about one-third of the time with the automated system compared to the manual system. However, the automated system left more doubles than the manual system; but the time required for their removal was similar between the two systems. Within-row plant spacing was also similar between the two systems. The automated system was as efficient as the manual system in weed removal. The major weed species in the experiment were shepherd's purse (*Capsella bursa-pastoris*), hairy nightshade (*Solanum physalifolium*), burning nettle (*Urtica urens*), common groundsel (*Senecio vulgaris*), and annual grasses, and there was no difference between the two systems in the removal of these species. Therefore, automated thinners seem to have good potential to supplement or replace several manual operations in direct-seeded lettuce in California.

Presented at the Weed Science Society of America Annual Meeting, February 8-11, 2016, San Juan, Puerto Rico.

Implementation of Cultural Practices and Technology to Reduce Air Emissions

Frank Baggiolini* and Balaji Sethuramasamyraja. California State University, Fresno, California, USA.

Best management practices for orchard farming operations to reduce unnecessary air pollution emissions is not only an evolving science but also an art much in need. Making choices that can aid to the reduction of particulate airborne emissions helps the overall crop health and integrated pest management plans. Additionally, changes in practices by farmers can help the state comply with federal air pollution requirements, although it is not mandated by law, the voluntary reduction of particulate matter can enhance the image of farming. In this study, the sources of emissions from an orchard farming operations are identified for particulate emission reduction. The variable inputs and outputs of land management, crop management and mechanized implementation were of primary influence in emissions. Research involved in-field observation of equipment working in the orchards to study the visual effects of dust particle movement. Ranches were selected for various soil types with similar equipment used at each site during different times of the growing season. Ranches were located in Fresno, Kings, Tulare, Madera and Merced counties to further study variability in cultural practices. The analysis lead to two basic areas of operation; Orchard development and Harvesting. The practical changes to developing the floors and berms through simple implements helps to maintain the necessary characteristics needed for when trees reach maturity and harvest starts. The harvesting operation proves to be an area of needed future mechanized product development and hence a practical design has been documented as part of this study considering the expected quality, speed of harvest and minimal mechanical disruption of soil particles.

Presented at the 2015 American Society of Agricultural and Biological Engineering CA NV Section Meeting, Tulare, CA.

Whole-Canopy Gas Exchange of Merlot Grapevine is Affected by Interaction of Crop Load and Irrigation

Andrew L. Beebe** and S. Kaan Kurtural
California State University, Fresno

Growers in the San Joaquin Valley of California are mechanizing vineyard operations. However, the ubiquitous California sprawl trellis (CS) and the procumbent habit of cultivars make this a challenge. This experiment was undertaken to investigate the effects of trellis conversion and applied water amounts on vegetative compensation, yield components, whole canopy photosynthesis, and phenolic composition of fruit and wine of Merlot/Freedom grapevine. The following factors, crop load systems, and applied water amounts were arranged factorially in a randomized complete block. Crop load systems included a spur-pruned CS trellis (HP), a cane-pruned CS trellis (CP), and a mechanically pruned single high-wire trellis (SHMP). Applied water amounts were sustained deficit irrigation (SDI), where vines were maintained at a midday leaf water potential (Ψ) of -1.2 MPa and were irrigated to 0.8 of crop evapotranspiration (ETc) from budbreak until harvest, and regulated deficit irrigation (RDI) that received 0.8 of ET_c from budbreak to fruit set, whereafter 0.5 ETc was replaced to maintain (Ψ) at -1.4 MPa until veraison, but not thereafter. The leaf layer of HP was 18 and 11% higher than that of SHMP and CP, respectively. The yields of HP and CP were 28 and 22% lower than that of SHMP. The phenolic compounds measured included anthocyanins, proanthocyanidins, flavonols, flavan-3-ols, and nonflavanoid compounds. A precocious and earlier exposed leaf area was produced by SHMP. Although CP displayed a greater whole canopy photosynthetic rate, when calculated on a leaf area basis, SHMP displayed the greatest leaf assimilation rate. Applied water amounts did not affect canopy architecture or yield efficiency. This project provides applied information about the optimum crop load management and deficit irrigation strategies for maintaining or increasing yield and phenolic composition during the transition between manual and mechanically managed vineyards in the hot climate. Funding Support: American Vineyard Foundation

Presented at the 66th American Society of Enology and Viticulture National Conference, Portland, OR.

Identification and characterization of potential oomycete pathogens from the University Agricultural Laboratory in Fresno, CA

Holly Deniston-Sheets*, John Bushoven, and Margaret L Ellis
California State University, Fresno, CA

Oomycota are a class of fungal-like organisms that include several devastating plant pathogens. Many genera attack agricultural crops, and mobile spores known as zoospores can be disseminated via irrigation water. The objectives of this study were to characterize the species of oomycetes present in agricultural fields and irrigation reservoirs at the California State University, Fresno Farm Laboratory and to determine probable source pathways from the irrigation reservoirs for pathogen dissemination. Two methods of baiting the pathogens were used. In the first, soil and water samples were collected in fields and returned to the lab. Pear or cucumber was then used as bait, since oomycetes are one of the few organisms that can penetrate their intact skin. The baits were left in the sample for two to five days. In the second method, pears and cucumbers were suspended in cheesecloth in irrigation reservoirs for five days. For both baiting methods, symptomatic plant tissue was excised and plated on an oomycete selective medium. Positive samples were identified using morphology and DNA sequencing. Of 56 total isolates, four plant pathogenic genera were identified in the field samples. Three of these were also found in the irrigation water, indicating that the irrigation system may act as a source of infectious disease.

Presented at the Central California Research Symposium, April 20, 2016, Fresno, CA.

STUDENT PUBLICATIONS IN PEER-REVIEWED JOURNALS

Ellis, M.L., Lanubile, A., **Garcia, C.***, and Munkvold, G.P. 2016. Association of putative fungal effectors in *Fusarium oxysporum* with wilt symptoms in soybean. Phytopathology. *Accepted.* http://dx.doi.org/10.1094/PHYTO-11-15-0293-R

Paudel, R.**, D. Grantz, H. Vu, and A. Shrestha. 2016. Tolerance of elevated ozone and water stress in a California population of Palmer amaranth (*Amaranthus palmeri* S. Wats.). *Weed Science* 64:276-284.

Pokorny, A.,** J. Smilanick, C. Xiao, J. J. Farrar, and A. Shrestha. 2016. Determination of fungicide resistance in *Botrytis cinerea* from strawberry in the Central Coast Region of California. *Plant Health Progress* 17:30-34.

Dennis, M.**, K. J. Hembree, J. Bushoven, and A. Shrestha. 2016. Growth stage, temperature, and time of year affects the control of glyphosate-resistant and glyphosate-paraquat resistant *Conyza bonariensis* with saflufenacil. *Crop Protection* 81:129-137.

Grantz, D., **R. Paudel****, Vu. H., A. Shrestha, and N. Grulke. 2016. Diel trends in stomatal response to ozone and water: A unique relationship of midday values to growth and allometry in Pima cotton. *Plant Biology* 18(Suppl. 1):37-46.

Cun, G. S.**, P. H. Robinson, and S. E. Benes. 2015. Bioavailability of selenium in 'Jose' tall wheatgrass (*Thinopyrum ponticum* var 'Jose') hay as a substitute for sodium selenite in the diets of dairy cattle. *Science of the Total Environment* 158-159:159-167.

Benes, S. E., P. H. Robinson, and **G. S. Cun****. 2015. Depletion of selenium in blood, liver and muscle from beef heifers previously fed forages containing high levels of selenium. *Science of the Total Environment* 536:603-608.

Sethuramasamyraja, B., **N. Simonian****, and D. Austin. 2015. Development of Unmanned Aerial Vehicle Systems for Terrain Mapping and Geospatial Data Management. *International Journal of Geomatics and Geosciences* Vol 5(3): 404-415

STUDENT RESEARCH OPPORTUNITIES

rGrant has been announced. Details available at: http://www.fresnostate.edu/studentaffairs/asi/funding/rgrants/rgrants-process.html

RESEARCH IN ACTION

Plant Science graduate student Elizabeth Mosqueda, undergraduate student Ryan Cox, helping undergraduate student Sarah Parry harvest her experiment on lettuce (left). Undergraduate exchange student from Brazil Larissa Larocca deSouza helping graduate student Jorge Angeles measure chlorophyll concentration on tomato plants for his thesis research.

Students planting a broccoli experiment in the certified organic plots at the Horticulture Unit.

Plant Science graduate students Touyee Thao (left) setting up instrumentation for his field research and Josue Samano Monroy (right) taking soil samples in his research plots.

Viticulture and Enology graduate student Andrew Beebe explaining his research to participants of Grape Day 2015 (left) and Plant Science graduate student Guiliano Galdi by his alfalfa research plots in Five Points, CA (right).

JORDAN AGRICULTURAL RESEARCH BUILDING

As the flagship university in the top agricultural region in the world, Fresno State is a fitting home for a world-class research center to discover and investigate the most advanced concepts and practices of agriculture, food and natural resources.

The new Jordan Agricultural Research Center at Fresno State fosters collaboration between some of the brightest minds in agriculture, engineering, science and mathematics. The 30,000-square-foot facility is slated for completion in spring 2016, reinventing Fresno State as a leading research institution for decades to come.

It is privately funded by a generous gift to the University and the Jordan College from the Jordan family.

FRESNO STATE

Jordan College of Agricultural Sciences and Technology

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