Station News

The Connecticut Agricultural Experiment Station
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The mission of The Connecticut Agricultural Experiment Station is to develop, advance, and disseminate scientific knowledge, improve agricultural productivity and environmental quality, protect plants, and enhance human health and well-being through research for the benefit of Connecticut residents and the nation. Seeking solutions across a variety of disciplines for the benefit of urban, suburban, and rural communities, Station scientists remain committed to "Putting Science to Work for Society", a motto as relevant today as it was at our founding in 1875.

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

JASON C. WHITE, PH.D. along with **SARA NASON, PH.D., NUBIA ZUVERZA-MENA, PH.D.,** and **Trung Bui, Ph.D.** participated in a Zoom meeting with collaborators at Yale University and the University of Minnesota for a joint NIEHS grant (March 5 & 26); met by Teams with Convergent Bio scientists to discuss collaborative research (March 6, 7, 18, 19, 21 & 22); participated in the weekly NSF Center for Sustainable Nanotechnology (CSN) all hands call (March 6 & 20); along with **YI WANG, PH.D.** met by Zoom with Prof. Baoshan Xing to discuss a collaborative grant 27proposal (March 6); met by Zoom with Prof. Soledad Peresin of Auburn University to discuss a collaborative grant proposal (March 7); participated in the monthly CSN Faculty call (March 8); along with **CHRISTIAN DIMKPA, PH.D., CARLOS TAMEZ, PH.D., NASSIFATOU TITTIKPINA, PH.D., and MEGHAN Cahill** travelled to the FDA LFFM annual meeting in Houston, Texas (March 11-14); hosted the monthly CSN Nanochem-plant working group call (March 12); along with **CHRISTIAN DIMKPA, PH.D.** hosted a Zoom call with collaborators at Johns Hopkins University to discuss progress on a joint USDA nanoscale phosphorus project (March 12 & 19); participated in the NERA Multistate Activities Committee meeting (March 15); participated in the annual Board meeting of the Environment and Human Health, Inc. (EHHI) (March 16); met by Zoom with an undergraduate student of Purdue University to discuss sustainable agriculture (March 19); along with **CHAOYI DENG, PH.D.** met with Prof. Rebecca Klaper of the University of Wisconsin Milwaukee and students to discuss collaborative research (March 19); met with Ana Fidantsef of the UConn Technology Commercialization Office to discuss joint projects and IP (March 20); along with **CHRISTIAN DIMKPA, PH.D.** met with representatives the nano-enabled agriculture company DG International (March 20); met by Teams with staff of DCP Drug Control to discuss the adult use cannabis testing program (March 21); met with collaborators in Italy and India to discuss the upcoming International Phytotechnologies Conference in Calicut India (March 25); spoke by Zoom with Prof. Jorge Gardea-Torresdey of the University of Texas El Paso to discuss collaborative research (March 25); spoke by Zoom with Prof. Om Parkash Dhankher of the University of Massachusetts to discuss collaborative research (March 25); spoke with senior administrators at UConn on how to align CAES and UConn research programs (March 25); met with Prof. Vasilis Vasiliou of Yale University and Prof. Philip Demokritou of Rutgers University to discuss a joint grant proposal on plastics (March 26); met by Zoom with collaborators at Columbia University to discuss a joint Closer to Zero USDA research project (March 26); along with **CHRISTIAN DIMKPA, PH.D., YI WANG, PH.D. and Mila Pavlicevic, Ph.D.,** met with a prospective Yale Conservation Scholar that could spend the summer at CAES (March 27-28); gave a Director's update at the Experiment Station Associates meeting (March 28), and, along with **CHRISTIAN DIMKPA, PH.D., Terri Arsenault, And Richard Cecarelli,** spoke by Teams with UConn Extension and others about industrial hemp growth this summer (March 28).

PUBLICATIONS:

1. Ahmed, T., Noman, M., Ma, C., **White, J. C.**, Wang, Q., and Li, B. (2024). Quantum dots: A novel class of materials to manage plant diseases. *Trends Plant Sci*. DOI: 10.1016/j.tplants.2024.02.006

Abstract: Plant diseases caused by microbial pathogens significantly reduce agriculture

productivity and worsen food insecurity. Recently, Qiu et al. revealed that polyethyleneimine (PEI)-coated MXene quantum dots (QDs) improve tolerance in cotton seedlings against Verticillium wilt disease by maintaining oxidative system homeostasis. This finding shows how customized QDs can be used to enhance crop disease resistance.

2. Hanna, E., Astete, C. E., Price, T., **Tamez, C.**, Mendez, O., Garcia, G., Fannyuy, K., **White, J. C.**, and Sabliov, C. M. (2024). Antifungal efficacy of nanodelivered azoxystrobin against *Rhizoctonia solani* in soybean (*Glycine max*). *ACS Agric. Sci. Technol*. *4*(3), 330–336. DOI: 10.1021/acsagscitech.3c00469

Abstract: Zein nanoparticles (ZNP) (189.4 ± 2.0 nm, 25.7 ± 0.9 mV) and lignin nanoparticles (LNP) (173.6 ± 0.9 nm, -56.5 ± 2.8 mV) with loaded azoxystrobin (AZO) (5.2 ± 0.8 wt% and 5.5 ± 0.7 wt%, respectively) were designed as antifungal delivery systems for seed treatments. Both particles followed pseudo-first-order kinetics for AZO release at 25°C, with AZO releasing faster from ZNP. AZO-entrapped ZNP treatments produced the greatest yield (41.15 bushels), followed by empty LNP (40.35 bushels) for inoculated samples; these findings were comparable to yields achieved with the commercial AZO formulation, Dynasty®. The stand per row feet for inoculated plants appeared highest for Dynasty®, AZO-entrapped ZNP, and AZO-entrapped LNP treatments (3.90, 3.74, and 2.53, respectively). All treatments, excluding empty ZNP, resulted in a statistically significant increase in yield and stand per row feet compared to the non-treated plants. ZNPs and LNPs developed herein for AZO delivery can be used as an alternative and sustainable solution for the delivery of other agrochemicals.

3. Chen, F., Du, H., Liu, Y., Wang, C., **White, J. C.**, Wang, Z., and Xing, B. (2024). Nitrogen-doped carbon dots facilitate CRISPR/Cas for reducing antibiotic resistance genes in soil. *J. Agric. Food Chem*. *72*, 3397−3405. DOI: 10.1021/acs.jafc.3c08558

Abstract: he continued acquisition and propagation of antibiotic resistance genes (ARGs) in the environment confound efforts to manage the global rise in antibiotic resistance. Here, CRISPR-Cas9/sgRNAs carried by nitrogen-doped carbon dots (NCDs) were developed to precisely target multi-"high-risk" ARGs (tet, cat, and aph(3′)-Ia) commonly detected in the environment. NCDs facilitated the delivery of Cas9/sgRNAs to Escherichia coli (E. coli) without cytotoxicity, achieving sustained elimination of target ARGs. The elimination was optimized using different weight ratios of NCDs and Cas9 protein (1:1, 1:20, and 1:40), and Cas9/multi sgRNAs were designed to achieve multi-cleavage of ARGs in either a single strain or mixed populations. Importantly, NCDs successfully facilitated Cas9/multi sgRNAs for resensitization of antibiotic-resistant bacteria in soil (approaching 50%), whereas Cas9/multi sgRNAs alone were inactivated in the complex environment. This work highlights the potential of a fast and precise strategy to minimize the reservoir of antibiotic resistance in agricultural system.

4. Arsenault, T. L., **Prapayotin-Riveros, K.**, **Ammirata, M. A.**, **White, J. C.**, and **Dimkpa, C. O.** (2024). Compliance testing of hemp (*Cannabis sativa* L.) cultivars for total Delta-9 THC and total CBD using gas chromatography with flame ionization detection. *Plants*, *13*(4), 519. DOI: 10.3390/plants13040519

Abstract: The United States Agriculture Improvement Act passed in December of 2018 legalized the growing of Cannabis sativa containing not more than 0.3% total Delta-9 tetra-

hydrocannabinol (THC) in the country. While Cannabis sativa has been cultivated for hundreds of years, the illegal status of the plant in the United States, and elsewhere has hindered the development of plant cultivars meeting this legal definition. To assess sampling strategies and conformance to the THC limit, 14 cultivars of hemp were grown and tested using gas chromatography with flame ionization detection for total delta-9 THC and total cannabidiol (CBD) during 2020, 2021 and 2022. Each year, samples of fresh plant material were collected from each cultivar weekly, beginning in mid-August and ending in late October, to examine the rate of increase of THC and CBD for different cultivars and select individual plants. The sampling demonstrated that both CBD and THC increase rapidly over a 1-2-week time frame with maximum concentrations around late September to early October. Testing of individual plants on the same day for select cultivars showed that while the ratio of CBD to THC remains constant during the growing season the individual plants are highly variable in concentration. Variability within and between hemp cultivars is useful to instruct field sampling strategies and to assess risk of crop embargoes to growers.

ANALYTICAL CHEMISTRY

MILICA PAVLICEVIC, PH.D. participated with **ROBERT MARRA, PH.D.** and **KELSEY FISHER, PH.D.** at CT Ag Day at the Capitol in Hartford, CT (March 12). During the month, she also participated, together with **JASON WHITE, PH.D., CHRISTIAN DIMKPA, PH.D.** and **NUBIA ZURVEZA-MENA, PH.D.** in three meetings with collaborators on three ongoing project and meeting with a prospective intern from the Yale Conservation Scholar program.

TERRI ARSENAULT, MEGHAN CAHILL, CARLOS TAMEZ, PH.D., NASSIFATOU TITTIKPINA, PH.D. attended the Laboratory Flexible Funding Model (LFFM) CAP Grantee Meeting in Houston, TX (March 12-16): **TERRI ARSENAULT** presented a poster on "Melamine adulteration of human food and animal feed", she was the veteran panelist for the round table discussion of "LFFM experiences for FERN labs – vets vs NKTOB".; **CARLOS TAMEZ, PH.D.** presented a poster on "Investigation of beverage adulteration with ethylene glycol".

PUBLICATIONS:

1. **Cahill, M.S., Arsenault, T., Bui, T.H., Zuverza-Mena, N., Bharadwaj, A., Prapayotin-Riveros, K., Dimkpa, C.O.** (2024). Copper stimulation of tetrahydrocannabinol (THC) and cannabidiol (CBD) production in hemp (Cannabis sativa L.) is copper-type, dose, and cultivar-dependent. In press, *Journal of Agricultural and Food Chemistry*. DOI: 10.1021/acs.jafc.3c07819

Abstract: Copper (Cu) is an element widely used as a pesticide for the control of plant diseases. Cu is also known to influence a range of plant secondary metabolisms. However, it is not known whether Cu influences the levels of the major metabolites in hemp (*Cannabis sativa* L.), tetrahydrocannabinol (THC) and cannabidiol (CBD). This study investigated the impact of Cu on the levels of these cannabinoids in two hemp cultivars, Wife and Merlot, under field conditions, as a function of harvest time (August–September), Cu type (nano, bulk, or ionic), and dose (50, 100, and 500 ppm). In Wife, Cu caused significant temporal increases in THC and CBD production during plant growth, reaching increases of 33% and 31% for THC and 51% and 16.5% for CBD by harvests 3 and 4, respectively. CuO nanoparticles at 50 and 100 ppm significantly increased THC and CBD levels, compared to the control, respectively, by 18% and 27% for THC and 19.9% and 33.6% for CBD. These nanospecific increases coincided with significantly more Cu in the inflorescences (buds) than in the control and bulk CuO treatments. Contrarily, no temporal induction of the cannabinoids by Cu was noticed in Merlot, suggesting a cultivar-specific response to Cu. However, overall, in Merlot, Cu ions, but not particulate Cu, induced THC and CBD levels by 27% and 36%, respectively, compared to

the control. Collectively, our findings provide information with contrasting implications in the production of these cannabinoids, where, dependent on the cultivar, metabolite levels may rise above the 0.3% regulatory threshold for THC but to a more profitable level for CBD. Further investigations with a wider range of hemp cultivars, CuO nanoparticle (NP) doses, and harvest times would clarify the significance and broader implications of the findings.

2. Vaidya, S., **Deng, C.**, **Wang, Y.**, **Zuverza-Mena, N.**, **Dimkpa, C. O.**, and **White, J. C.** (2024). Nanotechnology in agriculture: A solution to global food insecurity in a changing climate? *NanoImpact, 34,* 2452-0748. DOI: 10.1016/j.impact.2024.100502

Abstract: Although the Green Revolution dramatically increased food production, it led to non- sustainable conventional agricultural practices, with productivity in general declining over the last few decades. Maintaining food security with a world population exceeding 9 billion in 2050, a changing climate, and declining arable land will be exceptionally challenging. In fact, nothing short of a revolution in how we grow, distribute, store, and consume food is needed. In the last ten years, the field of nanotoxicology in plant systems has largely transitioned to one of sustainable nano-enabled applications, with recent discoveries on the use of this advanced technology in agriculture showing tremendous promise. The range of applications is quite extensive, including direct application of nanoscale nutrients for improved plant health, nutrient biofortification, increased photosynthetic output, and greater rates of nitrogen fixation. Other applications include nano-facilitated delivery of both fertilizers and pesticides; nano-enabled delivery of genetic material for gene silencing against viral pathogens and insect pests; and nanoscale sensors to support precision agriculture. Recent efforts have demonstrated that nanoscale strategies increase tolerance to both abiotic and biotic stressors, offering realistic potential to generate climate resilient crops. Considering the efficiency of nanoscale materials, there is a need to make their production more economical, alongside efficient use of incumbent resources such as water and energy. The hallmark of many of these approaches involves much greater impact with far less input of material. However, demonstrations of efficacy at field scale are still insufficient in the literature, and a thorough understanding of mechanisms of action is both necessary and often not evident. Although nanotechnology holds great promise for combating global food insecurity, there are far more ways to do this poorly than safely and effectively. This review summarizes recent work in this space, calling out existing knowledge gaps and suggesting strategies to alleviate those concerns to advance the field of sustainable nano-enabled agriculture.

ENTOMOLOGY

GOUDARZ MOLAEI, PH.D. met with Dr. James Shepherd, MD, PhD, Associate Professor, Yale School of Medicine, to discuss the CAES Tick and Tick-borne Disease Surveillance Program and potential collaborative projects (March 7); met virtually with the CDC scientists and CT DPH officials to discuss a collaborative project on Alpha gal syndrome (aka red meat allergy), a medical condition associated with the lone star tick bite (March 7 & 26); met with the CT DPH officials to discuss the CDC ELC funding for the CAES (March 11); was interviewed by the NBC News on tick and tick-borne diseases activity (March 11); met virtually with Sagnik Basuray, Ph.D., Associate Professor, Chemical & Materials Engineering, New Jersey Institute of Technology, to discuss a collaborative grant proposal for the Department of Defense (March 12); met virtually with Dr. Paul Wolujewicz, an Assistant Professor of Biomedical science, Quinnipiac University, to discuss a joint project and grant application on tick-borne diseases (March 12); met virtually with the CDC Cross-CoE group to discuss personal protection projects against tick bites (March 14); as a member of the Stakeholders Advisory Committee attended the monthly meeting of the New England Center of Excellence in Vector-Borne Diseases (NEWVEC) and discussed the projects' updates and progress (March 18); organized a symposium and workshop on tick and tick-borne diseases in Connecticut, and presented a talk, "Pleading for a Cross-Disciplinary Conversation: Range Expansion of Native and Invasive Ticks and Ensuing Public and Veterinary Health Challenges" (March 22); and presented an invited talk: "New Threats and Old Enemies: Vector-Host-Pathogen Interactions and the Emergence and Expansion of Arboviruses" to the University of New Haven, and met with faculty of Department of Biology and Environmental Science and Shaily Menon, Ph.D., Dean and Vice Provost for Interdisciplinary Initiatives, College of Arts & Sciences, to discuss collaboration and student training at the CAES (March 25).

PHILIP ARMSTRONG, PH.D. gave a guest lecture titled "Emergence of West Nile and Eastern Equine Encephalitis Virus in Connecticut' to undergraduate students at Central Connecticut State University (March 1); gave a talk titled "Jamestown Virus Comes into View: Understanding the Threat from an Underrecognized Virus" at the Annual American Mosquito Control Meeting held in Dallas, Texas (March 6), gave a talk titled "Arbovirus Risk in CT: EEE, WNV, and JCV" at the Vector-Borne Disease Symposium and Workshop held at CAES New Haven campus (March 22).

ANGELA BRANSFIELD participated in a CAES DEI meeting (March 7); participated via Zoom in Yale University's Biosafety Committee meeting (March 21); and attended the CAES Symposium & Workshop on Vector-borne Diseases (March 22).

HANY DWECK, PH.D. participated in a Zoom meeting with Todd Ugine, Ph.D., of Cornell University to discuss a project on the identification of chemoreceptor genes in spotted lanternfly (March 18); participated in a Zoom meeting with Richard Fandino, Ph.D., of Cornell University to help in establishing CRISPR injection in spotted wing Drosophila (March 19); gave a talk on "The emergence of a pest fly: mechanisms of ecological niche adaptation" at Yale University (March 21); gave a seminar on "Smelling with the mouthpart in spotted lanternfly" in the cellular and molecular seminars, Royal Society publishing (March 26).

KELSEY E. FISHER, **PH.D.** met with the Pollinator Advisory Committee and submitted a written testimony related to "SB No 190: An Act Concerning the use of Neonico-

tinoids" (March 8); virtually attended CT Coalition for Pesticide Reform's conference about reducing the use of neonicotinoids in CT (March 11); attended and presented "Is SLF a Forest Pest" at the Forest Health Monitoring Workshop (March 12); met with ~20 CT dairy producers about corn insect pest management in the northwest (March 19) and northeast (March 21) regions of CT; presented a table about monarch butterfly conservation at Ag Day at the Capital in Hartford, CT (March 20); attended the Grape Grower Symposium (March 26); presented "Temporal and spatial trends in continental-scale monarch butterfly dispersal" during Wesleyan University's environmental science Departmental seminar (35 attendees) (March 28).

ANDREA GLORIA-SORIA, PH.D. gave the talk "Addressing vector control challenges using a population genetics approach" at the Vector-Borne Symposium hosted by the Connecticut Agricultural Experiment Station (110 attendees) (March 22); gave the lecture "Vector Population Genetics and Control", as part of the Thursday Afternoon Southern Connecticut State University Graduate Seminar Series in Vector Control (4 attendees) (March 28).

MEGAN LINSKE, PH.D. participated in a Northeast Section of the Wildlife Society (NETWS) Executive Committee meeting as Past President and Workshop Chairperson (March 1); participated in a meeting with collaborators from Genesis Labs, Inc. and North Carolina State University to discuss blacklegged tick repellency trials and the upcoming field season (March 5 & 19); participated in a meeting for Ms. Sandra M. Zapata-Ramirez's master's thesis proposal as a member of her graduate committee (March 8); participated in a meeting with Dr. Ezio Ferroglio (University of Turin, Italy) to discuss potential collaborations (March 13); participated in a meeting to discuss the Wildlife Society Leadership Institute 2024 applications as co-chair of the Leadership Institute committee (March 14); presented a lecture titled "Advances in Integrated Tick Management Strategies" at the annual Vector Day Symposium and Workshop hosted by CAES (March 22); interviewed by outdoor writer Ed Ricciuti on recently published article "Evaluation of landscaping and vegetation management to suppress host-seeking *Ixodes scapularis* (Ixodida: Ixodidae) nymphs on residential properties in Connecticut, USA" which was prominently featured in: CT Examiner, Stamford Advocate, CT Insider, MSN, CT Post, and The Weather Channel (March 28).

GALE RIDGE, PH.D. presented a talk on bed bugs and their management to the Hartford schools (52 attendees) (March 6); interviewed by Ed Stannard from the Hartford Courant about the spotted lanternfly, *Lycorma delicatula* (March 13); interviewed by Harlan Levy (reporter) about spring arthropods, particularly exotic ticks and ground nesting bees (March 14); presented a talk on jumping worms at the 4-H Education Center, Auerfarm in Bloomfield (20 attendees), (March 18); presented a talk about jumping worms to the Colchester Garden Club (45 attendees) (March 25); and was interviewed by Ed Stannard of the Harford Courant about self-protection from ticks (March 27).

CLAIRE RUTLEDGE, PH.D. presented a talk titled 'Southern Pine Beetle and the Fate of Pitch Pine' to the Forest Health Workshop, Jones Auditorium, New Haven, CT (75 attendees) (March 12), was an examiner for the oral portion of the Arborist Licensing Exam (3 attendees) (March 13), presented a talk titled 'Spotted Lanternfly ' to the Connecticut Farm Winery Education Symposium, Jones Auditorium, New Haven, CT (55 attendees) (Match 26), and presented the talk 'Biosurveillance: Using a native wasp to catch an invasive beetle' to the Master Gardeners' class on live-stream (70 attendees) (March 31).

JOHN SHEPARD presented "Mosquito & Arbovirus Surveillance" (March 7) and "Mosquito Control and Prevention of Mosquito-Borne Disease" (March 21) for the course, BIO 561 -

Special Topics Seminar, at Southern Connecticut State University; co-organized, with **GOUDARZ MOLAEI, PH.D.** and **NOELLE KAHLIL**, a Vector-borne Disease Symposium & Workshop and presented the talks "Surveillance for Mosquito-borne Viruses in Connecticut: Reporting of Results" and "Identification of Key Mosquito Species in Connecticut" (March 22).

VICTORIA SMITH, PH.D. completed a virtual course sponsored by the US EPA Center for Integrated Pest Management titled "Protecting Boxwoods Against Blight and The Box Tree Moth" (March 5); was interviewed by students of the Mill River Park Collaborative about spotted lanternfly (March 7); organized and moderated the annual Forest Health Monitoring Workshop, including participants from CAES, DEEP, USDA-APHIS-Plant Protection and Quarantine, and other stakeholders, held in the Jones Auditorium (presentations are posted here: Forest Health Monitoring Workshop 2024 (ct.gov) (March 12); attended the 2024 Connecticut Farm Winery Education Symposium, sponsored by the CT Dept. of Agriculture, CAES, and the CT Farm Wineries, held in the Jones Auditorium (March 26); completed Authorized Certifying Official recertification, sponsored by USDA-APHIS-Plant Protection and Quarantine Export Services (March 26); completed Re-Export Training, sponsored by USDA-APHIS-Plant Protection and Quarantine Export Services (March 27).

KIRBY C. STAFFORD III, PH.D. (Emeritus) participated in a meeting of the Pollinator Advisory Committee (March 5).

KIMBERLY STONER, PH.D. (Emeritus) participated in a Pollinator Advisory Committee Meeting (March 5); presented the talk, "Why Do We Use So Much Pesticide?" to the Durham Garden Club, with 20 attendees at the Durham Public Library (March 18); presented a workshop, "Use Your Voice and Vote to Advocate for What You Want" at the CT NOFA Winter Conference at Eastern CT State University with 10 attendees (March 23), and presented a workshop "The Green Amendment" by Zoom in the NOFA Interstate symposium (March 30).

TRACY ZARRILLO participated in a virtual meeting of the New England Pollinator Partnership (March 14).

NEW STAFF:

Breahna Gillespie, Ph.D. is thrilled to have joined the Department of Entomology on April 1, 2024 as the Magnarelli Postdoctoral Research Scientist. She earned her Ph. D in Ecology at University of California, Davis. Her previous research focused on ecological monitoring of primary production of vegetation through hydrological cycles. Through her work at CAES, she will leverage her previous experience to focus on bumblebee nesting, foraging, and siblingship in a spectrum of urban environments.

PUBLICATIONS:

1. Armstrong, P. M., **Anderson, J. F.,** Sharma, R., Misencik, M. J., **Bransfield, A., Vossbrinck, C. R.**, and **Brackney, D. E.** (2024). Field isolation and laboratory vector-host studies of Brazoran virus (*Peribunyaviridae*: *Orthobunyavirus*) from Florida. *Am. J. Trop. Med. Hyg.* DOI: 10.4269/ajtmh.23-0799

Abstract: Brazoran virus was first isolated from *Culex* mosquitoes in Texas in 2012, yet little is known about this virus. We report the isolation of this virus from *Culex erraticus* from southern Florida during 2016. The Florida strain had a nucleotide identity of 96.3% (S segment), 99.1% (M segment), and 95.8% (L segment) to the Texas isolate. *Culex quinquefasciatus* and *Aedes aegypti* colonies were subsequently fed virus blood meals to determine their vector competence for Brazoran virus. *Culex quinquefasciatus* was susceptible to midgut infection, but few mosquitoes developed disseminated infections. *Aedes aegypti* supported disseminated infection, but virus transmission could not be demonstrated. Suckling mice became infected by intradermal inoculation without visible disease signs. The virus was detected in multiple mouse tissues but rarely infected the brain. This study documents the first isolation of Brazoran virus outside of Texas. Although this virus infected *Ae. aegypti* and *Cx. quinquefasciatus* in laboratory trials, their vector competence could not be demonstrated, suggesting they are unlikely vectors of Brazoran virus.

2. Dweck, H. K. M., **Rutledge, C. C.** (2024). The subapical labial sensory organ in spotted lanternfly. *Open Biology 14*: 230438. DOI: 10.1098/rsob.230438

Abstract: Deciphering how spotted lanternfly (SLF), an invasive polyphagous planthopper in North America, engages with its environment is a pressing issue with fundamental biological significance and economic importance. This interaction primarily depends on olfaction. However, the cellular basis of olfaction in SLF remains elusive. Here we investigate the neuronal and functional organization of the subapical labial sensory organ using scanning electron microscopy and electrophysiological recordings. This organ is believed to supply planthoppers with crucial sensory information that influences their subsequent feeding behaviour. We find in SLF that this organ comprises two identical placoid sensilla, each housing two distinct neurons. The A neuron displays a remarkable sensitivity to changes in airflow speed. Importantly, the same neuron also exhibits robust excitatory responses exclusively to three aldehydes out of a diverse pool of 85 tested odorants and inhibitory responses to 62 other odorants. By contrast, the B neuron solely serves as an olfactory detector, showing strong excitatory responses to 17 odorants and inhibitory responses to only three. The results provide a potential cellular basis for the behavioural responses of SLF to its ecologically relevant stimuli. Our study also identifies new odorants that may be useful for managing this serious pest.

3. Dweck H. K. M., and Carlson J. R. (2024). Base Recording: A technique for analyzing responses of taste neurons in *Drosophila*. *Journal of Visualized Experiments*. DOI: 10.3791/66665

Abstract: Insects taste the external world through taste hairs, or sensilla, that have pores at their tips. When a sensillum comes into contact with a potential food source, compounds from the food source enter through the pore and activate neurons within. For over 50 years, these responses have been recorded using a technique called tip recording. However, this method has major limitations, including the inability to measure neural activity before or after stimulus

contact and the requirement for tastants to be soluble in aqueous solutions. We describe here a technique that we call base recording, which overcomes these limitations. Base recording allows the measurement of taste neuron activity before, during, and after the stimulus. Thus, it allows extensive analysis of OFF responses that occur after a taste stimulus. It can be used to study hydrophobic compounds such as long-chain pheromones that have very low solubility in water. In summary, base recording offers the advantages of single-sensillum electrophysiology as a means of measuring neuronal activity - high spatial and temporal resolution, without the need for genetic tools - and overcomes key limitations of the traditional tip recording technique.

ENVIRONMENTAL SCIENCE AND FORESTRY

SCOTT WILLIAMS, PH.D. serving as Executive Treasurer, participated in a meeting of the Executive Committee of the Northeast Section of The Wildlife Society (March 1); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (March 5); participated in a Zoom call with staff from CDC Division of Vector-Borne Diseases, University of Massachusetts, University of Rhode Island, Penn State University, State of Massachusetts, MaineHealth, Michigan State University, Texas A&M University, Tufts University, and Genesis Laboratories about tick management strategies involving white-tailed deer (March 6); attended the morning session of the Forest Health Workshop in Jones Auditorium (March 12); participated in the Tick IPM Working Group Monthly Webinar (March 13); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (March 19); hosted the biannual meeting of the CAES Animal Care and Use Committee (March 20); Gave invited lecture titled "Overabundant white-tailed deer as dispersers of exotic plant seeds" for the Avon, CT Public Library seminar series (21 attendees) (March 21); attended the annual Vector-Borne Disease Symposium and Workshop at Jones Auditorium (March 22); as the Northeast Section Representative, participated in a Zoom call for members of the Professional Certification Review Board of The Wildlife Society (March 26).

JOSEPH P. BARSKY attended the Society of American Foresters-Yankee Division Annual Meeting in Sturbridge, MA (March 1); spoke on "2023 Acorn Mast Survey Results" during the annual Forest Health Monitoring Workshop at CAES (65 attendees) (March 12); participated, as chair-elect, in the New England Society of American Foresters Board of Directors Annual Business Meeting (March 27); presented a research poster on the 2023 Connecticut Acorn Mast Survey Results during the New England Society of American Foresters Winter Meeting in Burlington, VT (March 26-29).

GREGORY BUGBEE gave a talk titled "Lake Wononpakook: 2023 Aquatic Plant Survey and Management Options" to the Lake Wononpakook Association at the Salisbury Town Hall (30 attendees) (March 16); with **Riley Doherty** and **Summer Stebbins** staffed the CAES Office of Aquatic Invasive Species table at the Connecticut Fishing and Outdoor Show at Mohegan Sun (March 24); with **Riley Doherty** gave an Invasive Aquatic Plant Workshop to Bridgeport Academy middle school students in the Trout Unlimited Program at the Beardsley Park Zoo (20 attendees) (March 26).

RILEY DOHERTY attended the ESRI Developer Summit in Palm Springs, CA (March 11-15); participated in the monthly Connecticut Federation of Lakes Board of Directors meeting representing CAES's Office of Aquatic Invasive Species (March 20).

JEREMIAH FOLEY, IV, PH.D. gave invited presentation titled "Ripples of Invasion: Understanding the Spread and Impact of Aquatic Invasive Plants" to The Bruce Museum in Greenwich, CT (30 attendees) (March 3); participated in the National Forum on Biological Control in Annapolis, MD (March 11- 14).

SUSANNA KERIÖ, D.SC. presented a talk "Sooty Bark Disease - Should We Worry?" at the Connecticut Forest Health Monitoring Workshop (65 attendees) (March 12); administered exams to arborist candidates for the Connecticut Tree Protection Examining Board (March 13); met with Jane Harris from the Middletown Urban Tree Commission to plan research on my-

corrhizal inoculations on urban trees (March 26); with **Faisal Qaseem, Ph.D.**, met Chandi Witharana, Ph.D. at the University of Connecticut to discuss collaboration on spatial analysis of urban tree research (March 27); participated in the Connecticut Urban Forest Council Meeting as Executive Board Member (March 28); met with Maria Schreiner at Ansonia Nature Center to plan research on mycorrhizal inoculations on urban trees (March 28).

JACKIE LAREAU presented research poster titled "Introducing an environmental microbiome to axenic *Aedes aegypti* mosquitoes documents bacterial responses to a bloodmeal" at the Pioneer Valley Microbiology Symposium hosted at the University of Massachusetts, Amherst (March 2).

SARA NASON, PH.D. participated in meetings for the Best Practices for Non-Targeted Analysis working group (March 4, 14, 19, & 25); participated in the CT PFAS testing Laboratory Capacity and Capability discussion group meeting (March 12); spoke with a reporter from The Atlantic about PFAS phytoremediation research (March 18).

ITAMAR SHABTAI, PH.D. held a kickoff meeting with program managers at Foundation for Food and Agriculture Research to discuss activities under the New Innovator Award (March 8); met with **BLAIRE STEVEN, PH.D.** and **NUBIA ZUVERZA-MENA, PH.D.** and a collaborator from University of Missouri to discuss a grant proposal to NASA (March 12); attended a Zoom meeting with **BLAIRE STEVEN, PH.D.** and UConn collaborators to plan a proposal for the Long Island Sound Study Research Grant Program (March 18); discussed a research proposal to DOE's Environmental Molecular Sciences Laboratory (EMSL) Large Scale Projects program with Staff Scientists (March 25-27); met with EMSL Staff Scientist to discuss an ongoing Exploratory Project (March 27).

SUMMER STEBBINS with **RILEY DOHERTY** gave a GIS workshop to a group of Sound School high school students to teach them how to utilize free ArcGIS online tools for their environmental justice project (15 students) (March 6).

BLAIRE STEVEN, PH.D. presented talk titled "Expanding the metabolic repertoire of the host: The role of bacterial insecticide degradation in mosquito resistance" at the Pioneer Valley Microbiology Symposium, University of Massachusetts Amherst (30 scientists and 100 students in attendance) (March 2).

ELISABETH WARD, PH.D. participated in the Yankee Division Society of American Foresters Annual Meeting in Sturbridge, MA (March 1); met with Danica Doroski (State Urban Forester, CT DEEP) and Annie Mixswell (Tree Warden, City of New Haven) to discuss urban forest management options for Beech Leaf Disease (March 6); participated in an initial interview for a candidate for the Spatial Modeling of Vector-Borne Diseases position (March 8); presented a talk titled "Competition between regenerating oaks and invasive plants in irregular shelterwood harvests: The role of forest soils" at the annual CAES Forest Health Monitoring Workshop (65 attendees) (March 12); attended the Harvard Forest Research Symposium in Petersham, MA (March 19); met with Jeremy Clark (CT DEEP Forestry Division), Dr. Mark Ashton (Yale), and Connor Hogan (McLean Game Refuge) to select sites to study understory plant dynamics and tree regeneration following overstory ash mortality from Emerald Ash Borer (March 20-22); attended the Northeast-Midwest State Foresters Alliance Forest Health Committee meeting in Bangor, ME as the Connecticut Forest Health Program Leader and presented Connecticut Forest Health updates (35 attendees) (March 25-28).

JEFFREY WARD, PH.D., (Emeritus) spoke on "Slash walls influence on forest regeneration" at the 27th Forest Health Monitoring Workshop in New Haven (60 attendees) (March 12); spoke on "Influence of deer browse on stump sprouting success" at the 2024 Society of American Foresters annual meeting in Burlington, VT (70 attendees) (March 28): was awarded certificate as a Fellow of the Society of American Foresters at the 2024 Society of American Foresters Awards banquet in Burlington, VT (March 28).

LEIGH WHITTINGHILL, PH.D. participated in a CT DoAg grant review panel (March 6-7); participated in two site reviews for the State Agricultural Science and Technology Education Consulting Committee (March 12-13); gave a virtual webinar at the CT NOFS winter conference titled "Determining fertilizer needs for small scale production" (March 20); was coauthor on a presentation: M. M. Lekhon Alam, Randall Etheridge, Lee R. Skabelund, Leigh Whittinghill, Carol Massarra, Jaeyoung Ha, Ariane Peralta, Michael G. Behm. "A green roof system to support urban cooling and flood-related disaster management in Eastern North Carolina, USA" Council of Educators in Landscape Architecture 2024 annual conference, St. Louis Missouri (March 20-23); participated in the quarterly meeting of the CT Council on Soil and Water Conservation (March 21); gave a report on CAES activities to the State ASTE Consulting Committee (March 21); met with Frontiers in Sustainable Food System staff about a special research topic collection on green roof agriculture (March 27).

YINGXUE (CHARLIE) YU, PH.D. met with application scientists from Agilent to discuss about capabilities of Agilent 8700 LDIR (March 11); attended Malvern training on Zetasizer Ultra and NanoSight Pro (March12–13); organized a training session for postdocs on Zetasizer Ultra and NanoSight Pro (March 19).

GRANTS AWARDED:

1. ELISABETH WARD, PH.D. received $93,178 of core funding from the USDA Forest Service Cooperative Forest Health Protection Program and became the new Connecticut Forest Health Program Director—a position that was previously held by Victoria Smith, Ph.D, in the Department of Entomology. The purpose of the Cooperative Forest Health Protection Program is to facilitate the surveying and monitoring of forest health conditions to protect forests and trees on non-Federal public and private lands from insects, diseases, and invasive plants. The core Forest Health Protection funding received through the USDA Forest Service will therefore support cross-departmental work on the monitoring and management of pests, pathogens, diseases, and other forest health concerns at CAES.

PUBLICATIONS:

1. Liu, F., **Pignatello, J. J.**, Sun, R., and Guan, X. (2024). A comprehensive review of novel adsorbents for per- and polyfluoroalkyl substances in water. *ACS Environmental Science & Technology: Water*. DOI: 10.1021/acsestwater.3c00569

Abstract: Recent literature has seen a significant surge in studies focusing on new adsorbent materials for per- and polyfluoroalkyl substances (PFAS), a class of contaminants found in natural waters worldwide that pose a considerable threat to human and environmental health. Despite growing interest, the fundamental mechanisms of PFAS adsorption on these materials are not fully understood, thus hindering the progress of developing effective solutions for PFAS removal. This review aims to bridge that knowledge gap by offering a critical appraisal of recent innovations in adsorbent materials specifically designed for treating PFAS. Strategies

aimed at enhancing nanopore capacity or introducing anion-exchange capabilities in adsorption materials, have shown promise. Innovative materials such as carbon nanotubes, graphene, and graphene oxide, are evaluated. Modified clay-based and silica-based adsorbents have demonstrated efficacy in removing PFAS, driven by the hydrophobic effect, Coulombic interactions, and electrostatic interactions. Polymers, ranging from natural types to synthetic variants have shown promise in PFAS removal across a wide pH range. We discuss mechanisms including F–F interactions, ion-pair adsorption, and ion exchange for chemically and thermally modified adsorbents, and provide a general guideline for the design of PFAS adsorbents. This review offers a holistic view of the advances related to PFAS adsorbent materials.

PLANT PATHOLOGY AND ECOLOGY

LINDSAY TRIPLETT, PH.D. hosted discussions with Jamie Smith at the Department of Agriculture and the group of Jana Milucka at the Max Plank Institute-Bremen to discuss potential shared initiatives in workforce development and symbiosis, respectively (5 attendees) (March 13)

WASHINGTON DA SILVA, PH.D. visited the startup company 12-15 Molecular Diagnostics Inc. to discuss potential collaboration on a project to develop accessible and efficient plant virus test technologies (March 13); organized the 2024 Connecticut Farm and Winery Education Symposium held at Jones Auditorium at CAES and presented the seminar "Gathered from the Vine: Grapevine Viruses in Connecticut"; da Silva Lab members presented posters during the symposium (Rania El-Tanbouly, Ph.D. and the graduate students, Jarlan Silva, Maria Helena Diogenes, and Talison da Costa) (60 attendees) (March 26).

YONGHAO LI, PH.D. presented "Common Perennial Diseases" to the Spring Glen Garden Club member in Hamden (13 attendees) (March 11); presented "Common Diseases of Pines" at the Forest Health Monitoring Workshop in New Haven (65 attendees) (March 12); presented "Organic and Biological Control of Plant Diseases" at the CT NOFA's Winter Conference via Zoom (25 attendees) (March 21).

ROBERT MARRA, PH.D. participated in the annual meeting of the Northeast Division of the American Phytopathological Society in Ithaca, NY (65 Attendees) (March 6-8); presented "Beech Leaf Disease: Research Advances for 2023" at the Forest Health Monitoring Workshop in New Haven (65 attendees) (March 12); served as examiner for the CT Arborist Certification oral exam (March 13); joined Kelsey Fisher and Milica Pavlicevic in staffing a table for "Ag Day" at the State Capitol in Hartford, where he presented information on beech leaf disease (March 20); presented a workshop at the annual meeting of the Connecticut Land Conservation Council at Wesleyan University, Middletown, CT, titled "Controlling Beach Leaf Disease on Land Trust Properties: A Landscape-scale Effort to Protect and Preserve Beech Genetic Diversity (75 attendees) (March 23).

FELICIA MILLETT presented "Disease Updates from 2023" at the Northeast Division Meeting of the American Phytopathological Society in Ithaca, NY (65 Attendees) (March 6-8); presented "Collecting Samples for Detection of Bacterial Leaf Scorch" at the Forest Health Monitoring Workshop in New Haven (65 attendees) (March 12); presented "Pruning Woody Plants in the Landscape" to the Chester Garden Club in Chester, CT (22 Attendees) (March 12); reported on 2023 Accomplishments and the 2024 Plan of Work of the Proficiency Committee at the NPDN Cross Committee Meeting (47 Attendees) (March 13); presented "Growing Annuals from Seed" to the Burlington Garden Club in Burlington, CT (16 Attendees) (March 14); attended the workshop, "Production and Validation of Diagnostic Assay Controls" (March 15); attended the "ELISA Proficiency Preparation Workshop" at the USDA Plant Pathogen Confirmatory Diagnostics Laboratory (PPCDL) in Laurel, MD (March 19-20); presented "Pruning Woody Plants in the Landscape" to the Orchard Valley Garden Club in Southington, CT (36 attendees) (March 26); and participated in the NPDN Proficiency Committee Meeting (5 attendees) (March 28).

NEIL SCHULTES, PH.D. gave a seminar titled "Fire blight: the scourge of apple produc-

tion" to undergraduate biology and chemistry students at Quinnipiac University (25 attendees) (March 5).

QUAN ZENG, PH.D. met UConn Protected Agriculture faculty search candidates Qinglu Ying, Ph.D. (Vineland Research Center, Canada) and Nicole Waterland (West Virginia University) (March 4 and 7, respectively), presented two talks "New insights on the biology of fire blight bacteria" and "Fire blight prevention and suppression strategies" to apple growers at the Maine Apple Grower Association Meeting (65 attendees) (March 19) , hosted Dr. Vikki Robinson from University of Connecticut, Department of Molecular and Cell Biology for a lunch seminar and discussed research collaborations and student mentoring (March 20).

PUBLICATIONS:

1. Borges, D., **da Silva, W.**, and Ambrosio, M. M. (2024). Alternative management strategies reduced the incidence and severity of root rot of melon. *Caatinga*, *37*. DOI: 10.1590/1983-21252024v3712099rc

Abstract: Melon (*Cucumis melo* L.) is one of the most economically important fruit crops in the Northeastern region of Brazil, nearly all production is exported to European countries. Because of the indiscriminate use of monoculture, the incidence of soilborne pathogens in melon fields is on the rise, resulting in increasing losses in fruit production. The objective of this study was to investigate if the incorporation of different vegetable materials (*Crotalaria juncea* L. and *Pennisetum glaucum* L.) in the soil, combined with polyethylene mulch, and the application of commercial products (Compost-Aid® + Soil-Set®) can efficiently control soilborne pathogens in melon fields. Two greenhouse experiments were identically set up using soil naturally infested with various phytopathogenic fungi, including *Fusarium* spp. and *Macrophomina* spp. The experimental design was completely randomized, with seven treatments and seven replications. The pathogens' occurrence, disease incidence, and severity were evaluated, as well as fruit quality indicators (weight, firmness, and Brix Degree). Two treatments showed great potential for decreasing disease incidence, severity, and the occurrence of pathogens. One of the treatments had pearl millet (*Pennisetum glaucum*) incorporated into the soil that was covered with polyethylene mulch. The other treatment was when crotalaria was incorporated into the soil and covered with polyethylene mulch. Commercial products (Compost-Aid® and Soil-Set®) were applied in high temperatures and lower humidity, in both treatments. Plants submitted to these treatments also yielded fruits with higher weight and Brix Degree than the control treatment.

2. Laisk, A., **Peterson, R. B.**, and Oja, V. (2024). Excitation transfer and quenching in photosystem II, enlightened by carotenoid triplet state in leaves. *Photosynthesis Research*, 1-14. DOI: 10.1007/s11120-024-01086-6

Abstract: Accumulation of carotenoid (Car) triplet states was investigated by singlet–triplet annihilation, measured as chlorophyll (Chl) fluorescence quenching in sunflower and lettuce leaves. The leaves were illuminated by Xe flashes of 4 μs length at half-height and 525–565 or 410–490 nm spectral band, maximum intensity 2 mol quanta m− 2 s− 1, flash photon dose up to 10 μmol m− 2 or 4–10 PSII excitations. Superimposed upon the non-photochemically unquenched F md state, fluorescence was strongly quenched near the flash maximum (minimum yield F e), but returned to the F md level after 30–50 μs. The fraction of PSII containing a 3 Car in equilibrium with singlet excitation was calculated as T e=(F md—F e)/F md. Light dependence of T e was a rectangular hyperbola, whose initial slope and plateau were determined

by the quantum yields of triplet formation and annihilation and by the triplet lifetime. The intrinsic lifetime was 9 µs, but it was strongly shortened by the presence of O 2. The triplet yield was 0.66 without nonphotochemical quenching (NPQ) but approached zero when NP-Quenched fluorescence approached 0.2 F md. The results show that in the F md state a light-adapted charge-separated PSII L state is formed (Sipka et al., The Plant Cell 33: 1286–1302, 2021) in which Pheo− P680+ radical pair formation is hindered, and excitation is terminated in the antenna by 3 Car formation. The results confirm that there is no excitonic connectivity between PSII units. In the PSII L state each PSII is individually turned into the NPQ state, where excess excitation is quenched in the antenna without 3 Car formation.

3. Hassani, M. A., Cui, Z., **LaReau, J.**, **Huntley, R. B.**, **Steven, B.**, and **Zeng, Q. (**2024). Inter-species interactions between two bacterial flower commensals and a floral pathogen reduce disease incidence and alter pathogen activity. *mBio*, *15*, e00213-24. DOI: 10.1128/mbio.00213-24

Abstract: Flowers are colonized by a diverse community of microorganisms that can alter plant health and interact with floral pathogens. Erwinia amylovora is a flower-inhabiting bacterium and a pathogen that infects different plant species, including Malus × domestica (apple). Previously, we showed that the co-inoculation of two bacterial strains, members of the genera Pseudomonas and Pantoea, isolated from apple flowers, reduced disease incidence caused by this floral pathogen. Here, we decipher the ecological interactions between the two flower-associated bacteria and E. amylovora in field experimentation and in vitro co-cultures. The two flower commensal strains did not competitively exclude E. amylovora from the stigma habitat, as both bacteria and the pathogen co-existed on the stigma of apple flowers and in vitro. This suggests that plant protection might be mediated by other mechanisms than competitive niche exclusion. Using a synthetic stigma exudation medium, ternary co-culture of the bacterial strains led to a substantial alteration of gene expression in both the pathogen and the two microbiota members. Importantly, the gene expression profiles for the ternary co-culture were not just additive from binary co-cultures, suggesting that some functions only emerged in multipartite co-culture. Additionally, the ternary co-culture of the strains resulted in a stronger acidification of the growth milieu than mono- or binary co-cultures, pointing to another emergent property of co-inoculation. Our study emphasizes the critical role of emergent properties mediated by inter-species interactions within the plant holobiont and their potential impact on plant health and pathogen behavior.

VALLEY LABORATORY

JATINDER S. AULAKH, PH.D. attended the annual meeting of the Connecticut Christmas Tree Growers Association in Middletown, CT (80 attendees) (March 2); and presented a talk titled "Postemergence weed control and crop safety of Frequency and Mission Herbicides"; and gave a talk at the Connecticut Tobacco Growers Meeting in Somers, CT titled "Herbicide Resistant Weeds and Tobacco Weed Management Review" (90 attendees) (March 6); and published an article in the Real Tree Line Magazine titled "Tips for Spring and Summer Weed Management in Christmas Trees" (March 10); and reviewed a manuscript titled "Response of Tahitian bridal veil (*Gibasis pellucida*) and small-leaf spiderwort (Tradescantia fluminensis) to postemergence herbicides under greenhouse conditions" for the Invasive Plant Science and Management Journal (March, 27).

CAROLE CHEAH, PH.D. presented on climate change impacts shaping HWA biological control strategies in Connecticut at the Forest Health Workshop, CAES New Haven (65 attendees) (March 12); scouted for HWA on New Hartford Land Trust properties with a land trust steward (March 25); gave an evening talk on Hemlock Woolly Adelgid and the biological control programs supported by the National Wild and Scenic River Program at the Simsbury Library (40 attendees) (March 27);

RICHARD COWLES, PH.D. presented "The physiology of needle retention," and "Root aphid management," at the CT Christmas Tree Growers' Association annual meeting in Middletown, CT (60 attendees) (March 2).

JAMES LAMONDIA, PH.D (Emeritus) spoke about tobacco breeding and progress in resistance development at the CAES Tobacco Research meeting held in Somers (90 attendees) (March 6); and participated in Agriculture Day at the Capital, speaking about the 2023 Century Farm Award recognizing Horton Farms (100 attendees) (March 20).

NATHANIEL WESTRICK, PH.D. spoke at the Tobacco Research Meeting in Sommers, CT to introduce himself to the growers as the new plant pathologist at the Valley Laboratory and discuss emerging pathogen concerns for tobacco in Connecticut (90 attendees) (March 6); travelled to Davis, CA to review research proposals for the Pierce's Disease & Glassy-winged Sharpshooter Board as a part of a larger initiative to control major insect, bacterial, and viral pests/pathogens of grapevine (7 attendees) (March 18). gave a seminar titled "The Present (and Future) of Fungal Grapevine Diseases in Connecticut" at the 2024 Connecticut Farm Winery Education Symposium (50 attendees) (March 26).

PUBLICATIONS:

1. Li, H., Peng, B.-Y., Xie, J.-Y., Bai, Y.-Q., **Li, D.-W.**, and Zhu, L.-H. (2024). *Pestalotiopsis jiangsuensis* sp. nov. causing needle blight on *Pinus massoniana* in China. *J. Fungi*, *10*, 230. DOI: 10.3390/jof10030230

Abstract: *Pinus massoniana* Lamb. is an important, common afforestation and timber tree species in China. Species of *Pestalotiopsis* are well-known pathogens of needle blight. In this study, the five representative strains were isolated from needle blight from needles of *Pi. massoniana* in Nanjing, Jiangsu, China. Based on multi-locus phylogenetic analyses of the three genomic loci (ITS, TEF1, and TUB2), in conjunction with morphological characteristics, a new species, namely *Pestalotiopsis jiangsuensis* sp. nov., was described and reported. Pathogenicity tests revealed that the five representative strains of the species de-

scribed above were pathogenic to *Pi. massoniana*. The study revealed the diversity of pathogenic species of needle blight on *Pi. massoniana*. This is the first report of needle blight caused by *P. jiangsuensis* on *Pi. massoniana* in China and worldwide. This provides useful information for future research on management strategies of this disease.

2. Fan, K., Qi, Y.-K., Fu, L., Li, L., Liu, X.-H., Qu, J.-L., **Li, D.-W.**, Dong, A.-X., Peng, Y.-J., and Wang, Q.-H. (2024). Identification and fungicide screening of fungal species associated with walnut anthracnose in Shaanxi and Liaoning Provinces, China. *Plant Disease*, *108*(3), 599-607. DOI: 10.1094/PDIS-05-23-0967-RE

Abstract: Walnut is cultivated around the world for its precious woody nut and edible oil. Recently, walnut infected by *Colletotrichum* spp. resulted in a great yield and quality loss. In August and September 2014, walnut fruits with anthracnose were sampled from two commercial orchards in Shaanxi and Liaoning provinces, and five representative isolates were used in this study. To identify the pathogen properly, four genes per region (internal transcribed spacer, glyceraldehyde-3-phosphate dehydrogenase, actin, and chitin synthase) were sequenced and used in phylogenetic studies. Based on multilocus phylogenetic analysis, five isolates clustered with *Colletotrichum fioriniae*, including its ex-type, with 100% bootstrap support. The results of multilocus phylogenetic analyses, morphology, and pathogenicity confirmed that *C. fioriniae* was one of the walnut anthracnose pathogens in China. All 13 fungicides tested inhibited mycelial growth and spore germination. Flusilazole, fluazinam, prochloraz, and pyraclostrobin showed the strongest suppressive effects on the mycelial growth than the others, the average EC_{50} values ranged from 0.09 to 0.40 μg/ml, and there was not any significant difference ($P < 0.05$). Pyraclostrobin, thiram, and azoxystrobin were the most effective fungicides on spore germination ($P < 0.05$), and the EC_{50} values ranged from 0.01 to 0.44 μg/ml. Pyraclostrobin, azoxystrobin, fluazinam, flusilazole, mancozeb, thiram, and prochloraz exhibited a good control effect on walnut anthracnose caused by *C. fioriniae*, and preventive activities were greater than curative activities. Pyraclostrobin at 250 a.i. μg/ml and fluazinam at 500 a.i. μg/ml provided the highest preventive and curative efficacy, and the values ranged from 81.3 to 82.2% and from 72.9 to 73.6%, respectively. As a consequence, mancozeb and thiram could be used at the preinfection stage, and pyraclostrobin, azoxystrobin, flusilazole, fluazinam, and prochloraz could be used at the early stage for effective prevention and control of walnut anthracnose caused by *C. fioriniae*. The results will provide more significant instructions for controlling the disease effectively in northern China.

3. Westrick, N. M., Dominguez, E. G., Bondy, M. *et al.* (2024). A single laccase acts as a key component of environmental sensing in a broad host range fungal pathogen. *Commun. Biol. 7*, 348. DOI: 10.1038/s42003-024-06034-7

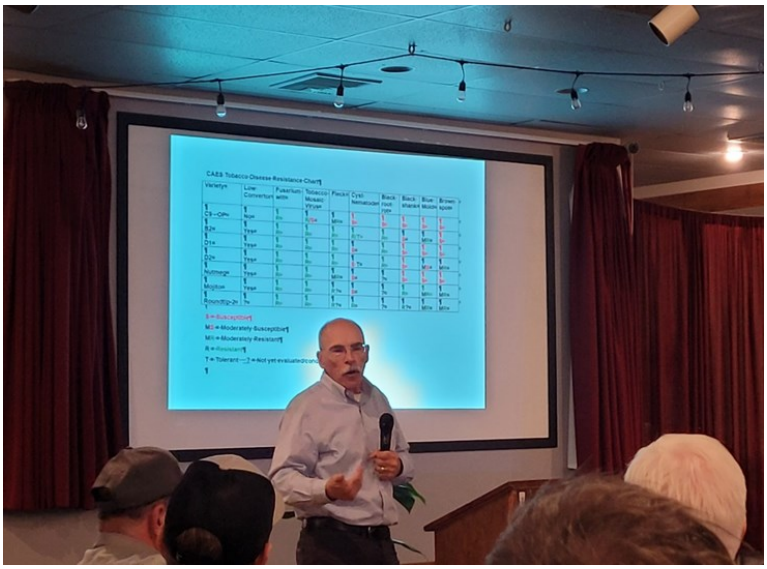
Abstract: Secreted laccases are important enzymes on a broad ecological scale for their role in mediating plant-microbe interactions, but within ascomycete fungi these enzymes have been primarily associated with melanin biosynthesis. In this study, a putatively secreted laccase, Sslac2, was characterized from the broad-host-range plant pathogen *Sclerotinia sclerotiorum*, which is largely unpigmented and is not dependent on melanogenesis for plant infection. Gene knockouts of Sslac2 demonstrate wide ranging developmental phenotypes and are functionally non-pathogenic. These mutants also displayed indiscriminate growth behaviors and enhanced biomass formation, seemingly as a result of their inability to respond to canonical environmental growth cues, a phenomenon further confirmed through chemical stress, physiological, and transcriptomic analyses. Transmission and scanning electron microscopy demonstrate appar-

ent differences in extracellular matrix structure between WT and mutant strains that likely explain the inability of the mutants to respond to their environment. Targeting Sslac2 using host-induced gene silencing significantly improved resistance to *S. sclerotiorum*, suggesting that fungal laccases could be a valuable target of disease control. Collectively, we identified a laccase critical to the development and virulence of the broad-host-range pathogen *S. sclerotiorum* and propose a potentially novel role for fungal laccases in modulating environmental sensing.

OTHER DEPARTMENTAL NEWS:

Ninety people attended the Connecticut Agricultural Experiment Station's annual Tobacco Research Meeting held at Joannas Restaurant in Somers CT on March 6, 2024. **JATINDER AULAKH, PH.D.** spoke about Palmer Amaranth, water hemp and herbicide updates; **NATHAN WESTRICK, PH.D**. introduced himself as the new pathologist at the Valley Laboratory; Srikanth Kodati, Ph.D., the new UConn Extension IPM and Pesticide Coordinator, spoke about pesticide safety; Julie Fine of Farmland Trust spoke about soil health; and **JAMES LAMONDIA, PH.D.** discussed tobacco breeding, and progress in resistance development. Bill Syme spoke about rotating chemical families and label updates for tobacco. **JAMES PRESTE, ETHAN PAINE** and **MICHELLE SALVAS** assisted with much of the behind-the-scenes work for the meeting. The meeting qualified for pesticide applicator re-certification credit in Connecticut and Massachusetts and 52 persons received credit.

James LaMondia, Ph.D., presenting about tobacco breeding and progress in resistance development at the CAES Valley Laboratory.



Participants of the Tobacco Meeting (left).

JOURNAL ARTICLES APPROVED MARCH 2024

Adams, E., Surendran, S. N., Ramasamy, R. Powell, J., and **Gloria-Soria, A.** Exploring the genetic basis of brackish water tolerance in *Aedes aegypti*. *PLOS One.*

Borges, D. F., de Almeida Nogueira, G., de Araújo Cruz, G., de Azevedo e Silva, S. G., **da Silva, W. L.**, and de Queiroz Ambrósio, M. M. Alternative management strategies reduced the incidence and severity of root rot of melon. *Revista Caatinga.*

Cai, Z., Ma, C., Hao, Y., Jia, W., Cao, Y., Wu, H., Xu, X., Han, L., Li, C., Shang, H., Liang, A., **White, J. C.**, and Xing, B. Molecular evidence of nanoceria modulation of ABA and genes containing ABAresponsive cis-elements to promote drought tolerance in rice. *Nature Communications.*

Chen, L., Qiu, T., Zeng, Y., Huang, F., **White, J. C.**, and Fang, L. Micro-nanoplastics pollution poses a potential threat to soil health: Evidence from a hierarchical meta-analysis. *Global Change Biology.*

de Assunção, D. A., Evangelista, L. F. B. da Costa, T. E., dos Santos Silva, J. L., Bento, E. A., da Silva Neto, J. A., **da Silva, W. L.**, de Queiroz Ambrósio, M. M., and Holanda, I. S. A. First report of *Colletotrichum plurivorum* and *Colletotrichum truncatum* causing anthracnose on *Cucumis melo* in Brazil. *Plant Disease.*

Fisher, K. E., Filandro, A., Bradbury, S. P., Wanamaker, A., and Coates, B. Temporal and spatial trends in continental-scale dispersal of the monarch butterfly, *Danaus Plexippus*. *Journal of Environmental Entomology.*

Huo, D., **Westrick, N. M.**, Nelson, A., Kabbage, M., and Koch, P. The role of oxalic acid in *Clarireedia jacksonii* pathogenesis and development on creeping bentgrass. *Phytopathology*

Jiang, X., **White, J. C.**, He, E., Van Gestel, C. A. M., and Qiu, H. Foliar exposure of deuterium stable isotope labeled nanoplastics to lettuce: Quantitative determination of foliar uptake, transport, trophic transfer in a terrestrial food chain. *Environmental Science and Technology.*

McAvoy, T. J., **Foley, J. R. IV,** Barnett, S. D., Mays, R., Dechaine, A. and Salom, S. M. Laboratory assessment of predation and fecundity of *Laricobius* species (Coleoptera: Derodontidae), predators of hemlock woolly adelgid. *Biological Control Science and Technology.*

Muthuramalingam, R., **da Silva, W. L., Zuverza-Mena, N., Dimkpa, C.,** and **White, J. C.** Nano-sized metal oxide fertilizers for sustainable agriculture: balancing benefits, risks, and risk management strategies. *Nanoscale*.

Noman, M., Ijazb, U., Ahmed, T., Hao, Z., Wang, Y., Wang, J., Islam, M. S., Ijaze, A., **White J. C.**, and Wang, J. Nanohybrid-enabled engineering systems for developing eco-stable plants: Current trends, prospects and future challenges. *Biotechnology Advances.*

Zhang, J., **White, J. C.**, Lowry, G. V., He, J., Yu, X., Yan, C., Dong, L., Tao, S., and Wang, X. Advanced enzyme-assembled hydrogels for the remediation of contaminated water. *Nature Water.*

CAES

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