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., met by Zoom with collaborators at the University of Birmingham to finalize a joint grant submission (February 2); gave a presentation titled "Nanometrology for Food, Agriculture, and the Environment: Nano-enabled Agriculture" for the National Nanotechnology Initiative Nanometrology Webinar Series: Nanometrology for Food, Agriculture, and the Environment (February 2); met by Teams with Convergent Bio to discuss an NSF SBIR grant submission (February 5, 21, & 28); 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 (February 6); met by Zoom with Christopher Connors, Ph.D. of the UConn Technology Commercialization Office to discuss CAES patent and IP policies (February 6); met by Zoom with Professor Saion Sinha of the University of New Haven to discuss collaborative research (February 6); met with Joseph Doktorski of ABSciex to discuss laboratory instrumentation (February 7); participated in the weekly NSF Center for Sustainable Nanotechnology (CSN) all hands call (February 7 & 21); met by Teams with Representative Bryan Lanoue of the CT State Legislature to discuss the PFAS Farm Soil Testing Program (February 8); participated in the monthly CSN Faculty call (February 9); traveled to the New Jersey Institute of Technology to meet with collaborators and give a seminar titled "Nano-enabled agriculture: A path to global food security in a changing climate" (February 12); hosted the monthly CSN Nanochem-plant working group call (February 13); participated in a Zoom call with collaborators at the University of Texas El Paso and the University of Rhode Island to discuss progress on a joint USDA grant (February 13); met by Zoom with Rebecca Klaper, Ph.D. of the University of Wisconsin Milwaukee to discuss collaborative research (February 14); met by Zoom with Greg Lowry, Ph.D. of Carnegie Mellon University to discuss a joint grant proposal (February 14); gave a presentation titled "The Chemistry of Nanoparticle-Plant Interactions…and Nano-enabled Agriculture" at the weekly CSN meeting (February 14); participated in Farmland Preservation Advisory Board meeting (February 15); 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 (February 20); along with **YI WANG, PH.D.**, and **WASHINGTON DA SILVA, PH.D.**, met with collaborators at the University of Aukland in New Zealand to discuss collaborative research (February 20); met by Zoom with scientists at Convergent Bio and OCP to discuss collaborative research (February 22); along with **NUBIA ZUVERZA-MENA, PH.D., Mandeep Kaur, Ph.D.,** and **Trung Bui, Ph.D.**, participated in a monthly group meeting with collaborators at Rutgers University and the New Jersey Institute of Technology (NJIT) and discussed joint research on micro-nanoplastics in agricultural soils (February 26); gave a podcast for the Mosaic company's podcast series (February 27); met by Zoom with Hongda Chen, Ph.D., of USDA NIFA and Cristina Sabliov, Ph.D., of LSU to discuss a special issue of the Journal of Nanoparticle Research (February 27); traveled to the University of Minnesota for the Ph.D. Defense of Tana O'Keefe and to meet with staff at Land o' Lakes regarding collaborative research (February 28).

PUBLICATIONS:

1. **Vaidya, S., Deng, C., Wang, Y., Zuverza-Mena, N., Dimkpa, C.**, and **White, J. C.** (2024). Nanotechnology in agriculture: A solution to global food insecurity in a changing climate? *NanoImpact.* 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.

2. **Cahill, M., Arsenault, T., Bui, T., Zuverza-Mena, N., Bharadwaj, A., Prapayotin-Riveros, K., White, J. C.**, and **Dimkpa, C.** (2024). Copper stimulation of tetrahydrocannabinol (THC) and cannabidiol (CBD) production in hemp (*Cannabis sativa* L.) is copper-type, dose, and cultivar-dependent. J. *Agric. Food Chem. 72*(13), 6921–6930. DOI: 10.1021/acs.jafc.3c07819

Abstract: Copper (Cu) is an element widely used as pesticide for the control of plant diseases. Cu is also known to influence a range of plant secondary metabolisms. However, nothing is known as to 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 harvest 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 by 19.9 and 33.6 % for CBD. These nano-specific 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 NPs doses, and harvest times would clarify the significance and broader implications of the findings.

3. Sun, X., Yang, R., Ji, J., Zhu, Z., **White, J. C.**, and Shen, Y. (2024). An evaluation of microplastic contamination in the marine waters and species in the coastal region of the South Yellow Sea, China. *J. Haz. Mat*. *469*. DOI: 10.1016/j.jhazmat.2024.134018

Abstract: Microplastics (MPs) contamination of marine environments poses a significant ecological risk, although impacts on species' realized niche spaces remain unclear. The current study investigates MPs distribution across pelagic habitats, benthic sediments, and key biota in the South Yellow Sea, China. Samples were collected via trawling across estuarine transects, and tissues were digested to extract MPs. Density gradient separations and vacuum-filtrations prepared particle extracts for ATR-FTIR and Micro-Raman spectroscopic characterization. Sampling along industrialized river transects reveals ubiquitous plastic particle presence, with concentrations ranging from 0 to 51.68 item/L seawater. Contamination levels reach their peak at station estuaries before dispersing offshore, indicating significant waste stream inputs. Importantly, MPs detected in demersal and pelagic fish species, as well as in bivalves, confirm exposure across trophic niches. Gastrointestinal tract and gill concentrations reached 0.6 items/g fresh tissue, reflecting significant biological uptake and in vivo retention. The greatest population of organisms occurred adjacent to polluted areas. Overall, distribution of MPs from polluted rivers to coastal food webs was evident, suggesting potential negative impacts on key ecological functions in this system. These findings underscore the need to develop upstream mitigation efforts so as to minimize MPs contamination in areas where nearshore and offshore niches intersect.

4. Hafeez, R., Guo, J., Ahmed T., Razab, M., Jiang, H., Shahid, M, Ibrahim, E., Yang, Y., Wang, J., Yand, C., An, Q., **White, J. C.**, and Li, B. (2024). Bio-formulated chitosan nanoparticles enhance disease resistance against rice blast by physiomorphic, transcriptional, and microbiome modulation of rice (*Oryza sativa* L.). *Carbo. Polym*. *334*. DOI: 10.1016/j.carbpol.2024.122023

Abstract: Rice blast disease (RBD) caused by *Magnaporthe oryzae*, threaten food security by cutting agricultural output. Nano agrochemicals are now perceived as sustainable, cost-effective alternatives to traditional pesticides. This study investigated bioformulation of moringa chitosan nanoparticles (M-CsNPs) and their mechanisms for suppressing RBD while minimizing toxic effects on the microenvironment.

plant health. Furthermore, M-CsNPs improved photosynthesis, gas exchange, and the nutritional profile of diseased rice plants. RNA-seq analysis highlighted upregulated defense-related genes in treated rice plants. Metagenomic study showcased reshaping of the rice microbiome, reducing *Magnaporthe* abundance by 93.5%. Both healthy and diseased rice plants showed increased microbial diversity, particularly favoring specific beneficial species *Thiobacillus*, *Nitrospira*, *Nocardioides*, and *Sphingomicrobium* in the rhizosphere and Azonexus, Agarivorans, and Bradyrhizobium in the phyllosphere. This comprehensive study unravels the diverse mechanisms by which M-CsNPs interact with plants and pathogens, curbing *M. oryzae* damage, promoting plant growth, and modulating the rice microbiome. It underscores the significant potential for effective plant disease management

5. Dai, Y., Yuan, H., Cao, X., Liu, Y., Xu, Z., Jiang, Z., **White, J. C.**, Zhao, J., Wang, Z., and Xing, B. (2024). La_2O_3 Nanoparticles can cause cracking of tomato fruit through genetic reconstruction. *ACS Nano*, *18*(10), 7379–7390. DOI: 10.1021/acsnano.3c09083

Abstract: In this study, cracking mechanisms of tomato (Solanum lycopersicum) fruit skin in response to La_2O_3 nanoparticles (NPs) were investigated. Tomato plants were exposed to La_2O_3 NPs at 0-9 mg/L for 90 days under field conditions. Higher concentrations of La_2O_3 NPs (3 and 9 mg/L) increased obvious cracking of the fruit skin by 17.9% and 25.0%, respectively. After exposure to 3 mg/L La_2O_3 NPs, decreased thickness of cuticle and cell wall, and lower wax crystallization patterns of tomato fruit skin were observed. Biomechanical properties (e.g., firmness and stiffness) of fruit skin were decreased by 34.7% and 25.9%, respectively. RNA-sequencing revealed that cuticle biosynthesis related genes were significantly down-regulated, which contributed to the lower thickness of cuticle, and genes regulating pectin remodeling were responsible for the thinner cell wall. Additionally, genes related to water and abscisic acid homeostasis were significantly upregulated, causing the increases of water and soluble solid content of fruit by 0.8% and 40.46%, respectively, and an enhancement of fruit inner pressure. Therefore, the thinner fruit cuticle and cell wall combined with the higher inner pressure caused the fruit cracking. The findings of this study increase our understanding of the impacts of nanomaterials on important agricultural crops, including the structural reconstruction of fruit skin contributing to NPs-induced cracking at the molecular level.

Jason C. White, Ph.D., and colleagues at the University of Minnesota

ANALYTICAL CHEMISTRY

CHRISTIAN DIMKPA, PH.D., gave a presentation titled "A Unique Blend of Regulatory and Research Efforts Towards Food and Environmental Safety" to the Plant Science and Landscape Architecture Department of the University of Connecticut (30 attendees) (February 16).

TERRI ARSENAULT attended the annual meeting for the multi-state Hatch grant for industrial hemp (S1084) in Raleigh North Carolina (February 15). The hatch grant remains focused on fiber and grain hemp. The meeting included a tour of the the University of North Carolina Wilson College of Textiles which demonstrated every process of turning raw materials into consumer products such as socks and fabric.

RAJA MUTHURAMALINGAM, PH.D., participated in a hybrid format invited talk and presented a lecture on Nanotechnology in Agriculture and Plant Disease Management at the MAHER Institute in Chennai, India (40 attendees) (February 16).

NEW STAFF:

Milica Pavlicevic, Ph.D., joined the Analytical Chemistry Department as a Post-doctoral Scientist on December 8, 2023. She obtained her MS degree in Biochemistry and PhD in Food technology. She worked as a lecturer and postdoctoral researcher in Serbia, Kuwait, China and Italy. She was a visiting researcher at CAES from October 2021 to May 2022 and this stay resulted in two publications. Her current focus is on the synthesis of "green" micronutrient nanoparticles from plant waste and evaluating their effect on plant's photosynthesis rate, immunity, nutritive properties and growth.

Raja Muthuramalingam, Ph.D., joined the Analytical Chemistry Department in February 2024. Raja earned his PhD in Biotechnology with a specialization in virus nanotechnology from the University of Madras in India in 2018. Following this, he was consecutively awarded two years of institute postdoctoral fellowships at the prestigious Indian Institutes of Technology (IIT) in Ropar and Delhi. During these fellowships, he conducted research in microfluidics, biosensing, and electrochemistry. In 2021, Raja received a two-year Individ-

ual National postdoctoral fellowship from the Ministry of Science and Technology, Government of India, to pursue research in nanobiosensors. The following year, in mid-2022, he seized the opportunity and joined the **da Silva** Laboratory in the Department of Plant Pathology and Ecology at CAES as a Post-doctoral Scientist. His work there was funded by USDA-NIFA and focused on nanotechnology-assisted management of plant virus diseases. During his tenure at CAES, Raja played a pivotal role in inventing two nanoformulations containing RNA active ingredients, which effectively managed plant viruses in infected plants. These technologies are currently undergoing provisional patent conversion. Raja transitioned to the Department of Analytical Chemistry within CAES where he continues his tenure as a Post-doctoral Scientist under the supervision of **NUBIA ZUVERZA-MENA, PH.D**. Presently, his research focuses on the development of nanoscale multi-nutrients aimed at enhancing the photosynthesis of salad greens under specific light conditions, alongside implementing a biofortification strategy. After April 2024, he may assume a new post-doc tenure in an FDA-funded program overseen by **JASON C. WHITE, PH.D.**, and **CHRISTIAN DIMKPA, PH.D**.

Raja Muthuramalingam, Ph.D., lecture on Nanotechnology in Agriculture and Plant Disease Management at the MAHER Institute in Chennai, India (February 16).

PUBLICATIONS:

1. 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 (Basel)*, *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 tetrahydrocannabinol (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 that meet this legal definition. To assess sampling strategies, and conformance to the THC limit, 14 cultivars of hemp were grown and tested by 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 in 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 (about 16% and 0.6%, respectively) around late September to early October. The testing of individual plants on the same day for select cultivars showed that while the

ratio of CBD to THC remains constant (about 20:1 in compliant hemp) during the growing season, the individual plants are highly variable in concentration. Whereas previous studies have shown cultivar-dependent variability in THC production, this study demonstrated a novel plant-to-plant variability in the levels of THC within the same hemp cultivar. Understanding variability within and between hemp cultivars is useful to determine field sampling strategies and to assess the risk of crop embargoes to growers by compliance regulators.

ENTOMOLOGY

GOUDARZ MOLAEI, PH.D., attended the CDC Vector Week annual meeting and discussed several research and projects and surveillance programs with the CDC authorities (February 6–8); attended the CDC Tickbite Prevention Working Group to discuss tick-bite prevention projects across the U.S. (February 16); discussed with the CDC scientist the potential of a joint project on Powassan virus (February 16); attended the annual meeting of the Virginia Mosquito Control Association and presented an invited talk, "Eco-Epidemiology of Eastern Equine Encephalitis virus and Novel Approaches to Study Vector-Host-Pathogen Interactions" (February 20–21); attended the monthly meeting of the New England Center of Excellence in Vector-Borne Diseases (NEWVEC) and discussed the projects' updates and progress (February 26); and was interviewed by the CT Insider: "Warmer, wetter seasons in CT are fostering more disease-carrying pests like ticks and mosquitoes" (February 26).

PHILIP ARMSTRONG, PH.D., attended the CDC Vector Week annual meeting (February 6–8).

TIA M. BLEVINS attended a virtual training session about the SANC program, offered by the National Plant Board. SANC stands for Systems Approach to Nursery Certification, and it is a voluntary state-managed nursery certification program (February 22); attended the 8th Annual Spotted Lanternfly Summit, hosted virtually by the National Plant Board and Cornell University. Topics included updates on biological control, detection, and monitoring of spotted lanternfly (February 28–29).

ANGELA BRANSFIELD participated via Zoom in Yale University's Biosafety Committee meeting (February 15).

HANY DWECK, PH.D., gave a presentation at the USDA spotted lanternfly (SLF) research virtual discussion (January 24); participated in a Zoom meeting with Miriam Cooperband, Ph.D. (MRP-APHIS) to discuss projects related to SLF neuroethology (January 23); and participated in a Zoom meeting with Miriam Cooperband, Ph.D. (MRP-APHIS), Xingeng Wang (REE-ARS), and Hannah Broadley (MRP-APHIS) to discuss projects related to SLF-parasitoids interactions (February 2).

KELSEY E. FISHER, PH.D., presented "Conservation and restoration recommendations that align with monarch butterfly behavior and biological needs" at University of Connecticut's Plant Science and Landscape Architecture departmental seminar (February 9); presented "Using the stable isotope of nitrogen as a long-term marking strategy to estimate natural dispersal capacity of spotted lanternfly" for Earthplace's Environmental Learning Series in Westport, CT with **CLAIRE RUTLEDGE, PH.D.**, (February 15); presented "Conservation and restoration recommendations that align with monarch butterfly behavior and biological needs" at Western Connecticut State University's biology departmental seminar (February 22); presented "Conservation and restoration recommendations that align with monarch butterfly behavior and biological needs" at Stonehill College's biology departmental seminar (February 23).

ANDREA GLORIA-SORIA, PH.D., is hosting the internship of Jack Brophy, a senior-year biology student at Albertus Magnus, to provide him with hands-on experience in molecular biology techniques and apply them to the study of mosquito vectors.

NOELLE KHALIL attended the CCSU Biology Internship and Career Fair and presented a short talk on research and tick testing services at the CAES Tick and Tick-borne Pathogen Surveillance Program (Tick Testing Laboratory) (February 5).

MEGAN LINSKE, PH.D., participated in a meeting with members of the Northeast Regional Center of Excellence in Vector-Borne Diseases (NEVBD) and Training and Evaluation Center (TEC) to discuss the evaluation of novel tick management strategies (February 1); participated in a Northeast Section of the Wildlife Society (NETWS) Executive Committee meeting (February 2); participated in the Annual Vector Week Conference hosted by the Centers for Disease Control and Prevention Division of Vector-Borne Diseases (CDC DVBD) in Fort Collins, CO (February 6–8); participated in a call with staff from the CDC DVBD on progress made on a funded integrated tick management project (February 21); participated in a meeting with Paul Turner, Ph.D., (Yale) to discuss potential research collaborations (February 21); participated in a NEVBD-TEC Leadership Committee meeting (February 27); and participated in a meeting with Vanessa Ezenwa, Ph.D., (Yale) to discuss potential research collaborations (February 28).

GALE RIDGE, PH.D., was interviewed by Edward Stannard reporter with the Hartford Courant about Asian jumping worms (February 1). A subsequent article was published on February 11, titled, "Scary, invasive and destructive worms are in CT."

JOHN SHEPARD presented "Mosquito Biology, Ecology, and Behavior" (February 8) for the course, BIO 561 - Special Topics Seminar, at Southern Connecticut State University. Participated in an Executive Board meeting of the Northeastern Mosquito Control Association (via Zoom, February 27).

VICTORIA SMITH, PH.D., participated in the 8th annual Spotted Lanternfly Symposium, sponsored by Cornell University and Penn State University, held virtually via Zoom (February 28–29).

PUBLICATIONS:

1. Mashlawi, A. M., Alqahtani, H., Abuelmaali, S. A., **Gloria-Soria, A.**, Saingamsook, J., Kaddumukasa, M., Ghzwani, A. H., Abdulhaq, A. A., Al-Mekhlafi, H. M., and Walton, C. (2024). Microsatellite-based analysis reveals *Aedes aegypti* populations in the Kingdom of Saudi Arabia result from colonization by both the ancestral African and the global domestic forms. *Evolutionary Applications*, *17*(2), DOI: 10.1111/eva.13661

Abstract: The *Aedes aegypti* (Linnaeus, 1762) mosquito is the main vector of dengue, chikungunya and Zika and is well established today all over the world. The species comprises two forms: the ancestral form found throughout Africa and a global domestic form that spread to the rest of the tropics and subtropics. In Saudi Arabia, *A. aegypti* has been known in the southwest since 1956, and previous genetic studies clustered *A. aegypti* from Saudi Arabia with the global domestic form. The purpose of this study was to assess the genetic structure of *A. aegypti* in Saudi Arabia and determine their geographic origin. Genetic data for 17 microsatellites were collected for *A. aegypti* ranging from the southwestern highlands of Saudi Arabia on the border of Yemen to the north-west in Madinah region as well as from Thailand and Uganda populations (as representatives of the ancestral African and global domestic forms, respectively). The low but significant level of genetic structuring in Saudi Arabia was consistent with long-distance dispersal capability possibly through road connectivity and hu-

man activities, that is, passive dispersal. There are two main genetic groupings in Saudi Arabia, one of which clusters with the Ugandan population and the other with the Thailand population with many Saudi Arabian individuals having mixed ancestry. The hypothesis of genetic admixture of the ancestral African and global domestic forms in Saudi Arabia was supported by approximate Bayesian computational analyses. The extent of admixture varied across Saudi Arabia. African ancestry was highest in the highland area of the Jazan region followed by the lowland Jazan and Sahil regions. Conversely, the western (Makkah, Jeddah and Madinah) and Najran populations corresponded to the global domesticated form. Given potential differences between the forms in transmission capability, ecology and behaviour, the findings here should be taken into account in vector control efforts in Saudi Arabia.

2. Linske, M. A., and **Williams, S. C.** (2024). Evaluation of landscaping and vegetation management to suppress host-seeking *Ixodes scapularis* (Ixodida: Ixodidae) nymphs on residential properties in Connecticut, USA. *Environmental Entomology, 53*(2), 268–276. DOI: 10.1093/ee/nvae007

Abstract: Ticks and tick-borne diseases are of increasing concern across the United States, particularly in the Northeast. *Ixodes scapularis* Say (Ixodida: Ixodidae) remains the primary vector for the Lyme disease spirochete, *Borrelia burgdorferi* (Johnson, Schmid, Hyde, Steigerwalt, and Brenner). Prior studies established that *I. scapularis* can be found in greatest abundance in the 1-m forested ecotone surrounding the lawn edge in residential backyards. Our study was conducted on 42 properties in Guilford, CT, and sought to expand upon this premise by determining which key habitat features were associated with increased densities of host-seeking *I. scapularis* nymphs. We quantified nymphal abundances in 19 different habitat types that were posited to influence densities. We determined that nymphal *I. scapularis* densities were greatest in forested areas closest to lawn edges with leaf litter or understory vegetation present, as well as short lawns adjacent to woodland edges. Additionally, we determined that there were no significant declines in nymphal *I. scapularis* density where leaf litter was removed, lawns were left unmowed, or woodchip barriers were installed. Bird feeders and woodpiles were not associated with increased nymphal *I. scapularis* densities. However, areas adjacent to stone walls did have nearly 3 times the density of *I. scapularis* nymphs present compared with habitats without stone walls. The culmination of the results from this study can be utilized to create more targeted acaricide applications rather than broadcast spraying, as well as increase homeowner awareness for areas with heightened risk for exposure to nymphal *I. scapularis*, which are deemed the most epidemiologically important species and stage for pathogen transfer to humans.

ENVIRONMENTAL SCIENCE AND FORESTRY

SCOTT WILLIAMS, PH.D., participated in a Zoom call with collaborators involved with the Northeast Vector-Borne Disease Training and Evaluation Center on a rodent-targeted vaccine against Borrelia burgdorferi field study (February 1); as Executive Treasurer, participated in a meeting of the Northeast Section of the Wildlife Society (February 2); attended Vector Week hosted by the Division of Vector-Borne Diseases of the Centers for Disease Control and Prevention in Ft. Collins, CO (February 5-8); participated in a meeting with collaborators from Columbia University and MaineHealth (February 15); coordinated a job shadow undergraduate visitor from Bates College (February 21); participated in a collaborative meeting with Paul Turner, Ph.D., and Benjamin Chan, Ph.D., of the Center for Phage Research and Therapy at Yale Medical School regarding spring tick sampling efforts (February 21); participated in a Zoom call with staff from the CDC Division of Vector-Borne Diseases on progress made on a funded integrated tick management project (February 21); participated in a Zoom meeting of the Centers for Disease Control and Prevention-funded Teaching & Evaluation Center leadership members (February 27); participated in a Zoom call on potential collaborative research opportunities with Vanessa Ezenwa, Ph.D., of Yale University School of Medicine on parasitizing and infection in wild mammals (February 28); participated in a Zoom call with collaborators from Columbia University regarding ongoing integrated tick management research (February 29).

JOSEPH P. BARSKY organized and moderated the Annual Meeting for the Connecticut Chapter of the Society of American Foresters at the Connecticut Forest and Park Association Headquarters in Rockfall, CT (February 8); participated in the Annual Meeting of the Granite State Division of the Society of American Foresters at the Grappone Conference Center in Concord, NH (February 9); participated in an online steering committee meeting of the New England Society of American Foresters Board of Directors (February 12).

GREGORY BUGBEE with **SUMMER STEBBINS** gave an invasive aquatic plant workshop as part of the Three Rivers Community College Environmental Issues Seminar (25 attendees) (February 21); with **RILEY DOHERTY** gave a presentation titled “Pachaug Pond - Aquatic Vegetation Survey 2023” to the Pachaug Pond Weed Control Association at the Griswold Town Hall (30 attendees) (February 28).

JEREMIAH FOLEY, IV, PH.D., held a meeting with Nathan Harms, Ph.D., and Ben Sperry, Ph.D., from the US Army Corps of Engineers to discuss the potential establishment of insect biological control agents for Hydrilla in the Northeast (February 16); participated in a collaborative meeting with Kelly Aho, Ph.D., from Michigan State University to establish the objectives for a RAPID NSF proposal to leverage an ecosystem-scale herbicide application to investigate feedbacks between aquatic invasive plants and greenhouse gas emissions (February 21); participated in a collaborative meeting with Catherine Awwad, President and CEO of Northwest Regional Workforce Investment Board, to organize an aquatic invasive species workshop to train seasonal employees of the Department of Energy and Environmental Protection (February 27).

SUSANNA KERIÖ, D.SC., participated in a meeting with CT DEEP to develop a webpage on the impacts of salt on water ecosystems (February 1); gave a keynote talk titled "Urban Tree Health - Management Challenges and Research Opportunities" at the CT Society of

American Foresters meeting (40 participants) (February 8); met with Fairfield Garden Club to discuss CAES chestnut field trials established in Fairfield (February 9); met with Dr. Somidh Saha at Karslruhe Institute of Technology to discuss research collaboration on urban trees (February 12); met with City of New Haven Tree System Coordinator Annie Mixsell to discuss collaboration on forest health diagnostics (February 22); met with Dr. Rebekah Stein at Quinnipiac University to discuss research collaboration on urban trees (February 22); met with Dr. Danica Doroski at DEEP and Dr. Jill Wegrzyn at UConn to discuss collaboration on a book chapter on Norway maple (February 26); co-organized the Connecticut Urban Forest Council Conference 2024 and organized an exhibit on tree health at the conference (February 29).

SARA NASON, PH.D., participated in committee meetings for the Best Practices for Non-Targeted Analysis working group (February 5, 8, 15); presented at the Best Practices for Non-Targeted Analysis monthly webinar, titled "Working with stakeholders to determine high impact research directions for non-targeted analysis" (55 attendees) (February 20).

ITAMAR SHABTAI, PH.D., met with the Staff Scientist at the Environmental Molecular Sciences Laboratory to discuss a proposal for the Large Scale Program (February 5); attended a Zoom meeting with members of the Soil Health Plan Subcommittee of the CT Council on Soil and Water Conservation (February 7); met with a colleague from University of Idaho to discuss data collection for an ongoing shared project (February 21); held a Zoom call with colleagues from CAES and UConn to plan a proposal for the Long Island Sound Study Research Grant Program (February 21).

ELISABETH WARD, PH.D., participated in the monthly partners meeting for the Master Woodland Managers program and provided feedback on participant woodland surveys (February 6); participated in the Connecticut Council on Soil and Water Conservation Soil Health Committee Soil Action Plan meeting (February 7); participated in the monthly State Coordinators meeting for the Forest Ecosystem Monitoring Cooperative (February 8); participated in the Connecticut Society of American Foresters meeting (February 8); presented an invited guest lecture in Plant Ecology at Connecticut College titled "Factors promoting understory plant invasions following forest disturbances" (10 participants) (February 21); participated in the Connecticut Cooperative Agricultural Pest Survey meeting (February 21); and participated in the initial interviews for three candidates for the Spatial Modeling of Vector-Borne Diseases position (February 13, 27, & 29).

JEFFREY WARD, PH.D., (Emeritus) attended the annual meeting of Connecticut Chapter - Society of American Foresters in Middlefield (February 8); participated in a meeting of the Great Mountain Forest Trustees in Norfolk (February 17); participated in a CT DEEP Forest Practices Advisory Board meeting (February 28).

LEIGH WHITTINGHILL, PH.D., hosted a first year Bates College student for a job shadowing experience (February 21).

YINGXUE (CHARLIE) YU, PH.D., met with scientists from King County (Washington State) to discuss about PFAS regulatory works (February 13); attended the Vadose Zone Journal Editorial Board Meeting for Associate Editor training (February 22); visited Dr. Baoshan Xing at University of Massachusetts Amherst and discussed future collaborative efforts (February 23).

GRANTS AWARDED:

ELISABETH WARD, PH.D. received two awards from the Forest Ecosystem Monitoring Cooperative at the University of Vermont for $40,756 to support regional forest health monitoring and to serve as the Connecticut State Coordinator for the Cooperative in 2024.

OTHER DEPARTMENTAL NEWS:

GREGORY BUGBEE, **JEREMIAH FOLEY, IV, PH.D.**, **SUMMER STEBBINS**, and **RILEY DOHERTY** of the Office of Aquatic Invasive Species were recently highlighted in a CAES podcast episode which can be viewed here: https://youtu.be/L4jrtBn_0-U

PUBLICATIONS:

1. Foley, J. R. IV, Stebbins, S. E., Doherty, R., Tippery, N. P., and **Bugbee, G. J.** (2024). *Hydrilla verticillata* subsp. *lithuanica*: discovery and establishment outside of the Connecticut River. *Invasive Plant Science and Management*. DOI: 10.1017/inp.2024.4

Abstract: Hydrilla [*Hydrilla verticillata* (L.f.) Royle], an invasive aquatic weed, has had a rich introduction history into the United States with multiple subspecies being introduced since the 1960s. The most recent occurred prior to 2016, when northern hydrilla (*Hydrilla verticillata* subsp. *lithuanica*) was discovered in the Connecticut River. By 2021, following a three-year survey from Agawam, MA to the Long Island Sound by the Connecticut Agricultural Experiment Station Office of Aquatic Invasive Species, *H. verticillata* subsp. *lithuanica* was found in over 113 km of the river, occupying 344 hectares. Since this survey, there has been concern that *H. verticillata* subsp. *lithuanica* would spread to nearby waterbodies and have a significant negative impact. Here we report the first documented spread and establishment of *H. verticillata* subsp. *lithuanica* from the Connecticut River to five waterbodies in Connecticut and one in Massachusetts. Of the total eight sites where *H. verticillata* observations were made, 75% (n=6) were confirmed to be *H. verticillata* subsp. *lithuanica* and 25% (n=2) to be wandering hydrilla (*Hydrilla verticillata* subsp. *peregrina*). Except for one site, all six locations infested with *H. verticillata* subsp. *lithuanica* provide watercraft access through public or private boat ramps. The authors also postulate on the mechanisms facilitating the spread and establishment of this subspecies.

2. Bylaska, E. J., Tratnyek, P. G., Torralba-Sanchez, T. L., Edwards, K. C., Dixon, D. A., **Pignatello, J. J.**, and Xu, W. (2022). Computational predictions of the hydrolysis of 2,4,6-Trinitrotoluene (TNT) and 2,4-Dinitroanisole (DNAN). *The Journal of Physical Chemistry A, 126* (48), 9059-9075. DOI: 10.1021/acs.jpca.2c06014

Abstract: Hydrolysis is a common transformation reaction that can affect the environmental fate of many organic compounds. In this study, three proposed mechanisms of alkaline hydrolysis of 2,4,6-trinitrotoluene (TNT) and 2,4-dinitroaniline (DNAN) were investigated with plane-wave density functional theory (DFT) combined with ab initio and classical molecular dynamics (AIMD/MM) free energy simulations, Gaussian basis set DFT calculations, and correlated molecular orbital theory calculations. Most of the computations in this study were carried out using the Arrows web-based tools. For each mechanism, Meisenheimer complex formation, nucleophilic aromatic substitution, and proton abstraction reaction energies and activation barriers were calculated for the reaction at each relevant site. For TNT, it was found that the most kinetically favorable first hydrolysis steps involve Meisenheimer complex for-

mation by attachment of OH− at the C1 and C3 arene carbons and proton abstraction from the methyl group. The nucleophilic aromatic substitution reactions at the C2 and C4 arene carbons were found to be thermodynamically favorable. However, the calculated activation barriers were slightly lower than in previous studies, but still found to be $\Delta G‡ \approx 18$ kcal/mol using PBE0 AIMD/MM free energy simulations, suggesting that the reactions are not kinetically significant. For DNAN, the barriers of nucleophilic aromatic substitution were even greater ($\Delta G‡ > 29$ kcal/mol PBE0 AIMD/MM). The most favorable hydrolysis reaction for DNAN was found to be a two-step process in which the hydroxyl first attacks the C1 carbon to form a Meisenheimer complex at the C1 arene carbon C1−(OCH3)OH−, and subsequently, the methoxy anion (−OCH3) at the C1 arene carbon dissociates and the proton shuttles from the C1−OH to the dissociated methoxy group, resulting in methanol and an aryloxy anion.

3. Chen, Z., and **Pignatello, J. J.** (2024). Analytical methods for selectively determining hydrogen peroxide, peroxymonosulfate and peroxydisulfate in their binary mixtures. *Water Research, 253*, 121256. DOI: 10.1016/j.watres.2024.121256

Abstract: Hydrogen peroxide (H_2O_2), peroxymonosulfate (PMS), and peroxydisulfate (PDS) are key bulk oxidants in many advanced oxidation processes (AOPs) for treating chemically contaminated water. In some systems these peroxides may coexist in solution either through intentional co-addition or inadvertent formation of one (especially H_2O_2) due to reaction chemistry. While many analytical methods to determine these peroxides individually have been established, mutual interference among the peroxides in such methods has seldom been evaluated, and new methods or variants of established methods to selectively determine peroxides in binary mixtures are lacking. We re-examined five established colorimetric methods—the Permanganate, Titanium Oxalate (Ti-oxalate), Iodide, N.N-diethyl-p-phenylenediamine (DPD), and 2,20-azino-bis(3-ethylbenzothiazoline-6-sulfonate (ABTS) methods—for mutual interference among peroxides and devised variants of these methods for selectively quantifying one in the presence of another. Hydrogen peroxide can be selectively determined by the Permanganate method at short reaction time; by the Ti-oxalate method; by the DPD method with added peroxidase (POD); or by the ABTS method with added POD. PMS can be selectively determined by the Iodide method; by the DPD or ABTS methods with added iodide ion as catalyst; or by the DPD method with added catalase (CAT) (with co-existing H_2O_2 but not PDS). The DPD method can be used to determine PDS without interference by H_2O_2, and—provided the sample is pretreated with L-histidine—without interference by PMS. The recommended methods were successfully applied to binary peroxide mixtures in complex waters, including a tap water and a synthetic water. Overall, the new selective methods will assist mechanistic investigation of AOPs based on these peroxides and support efforts to apply them commercially.

4. Yang, J., **Pignatello, J.**, Yang, C., Yang, Y., **Wang, Z.**, Wang, R., Zhang, K., Wang, C., Dang, Z., Zhao, Q., et al. (2024). New insight into the activation mechanism of peroxymonosulfate by N,O-doped carbonaceous materials: Active sites, intermediates, and pathways. *Applied Catalysis B: Environment and Energy, 347.* DOI: 10.1016/j.apcatb.2024.123793

Abstract: Persulfates activation by N,O-doped carbonaceous materials is an emerging advanced oxidation process for removing organic pollutants from water. However, the specific activation mechanisms including active sites, intermediates, and pathways are unknown. We prepared a N,O-doped carbocatalyst (NOGM) as model material to unveil the activation mech-

anism. Reaction occurred on the surface. After ruling out oxyl radicals, singlet oxygen, persistent free radicals, and through-surface direct electron transfer, a two-electron (nucleophilic-electrophilic) reaction involving short-lived bound PMS species or PMS-transformed surface groups was found to be the most likely pathway. Pre-contact of NOGM with PMS generates bound -OO- groups and causes major transformations of surface functionality identified in unprecedented detail. Activation pathways are proposed. This study goes far in providing a strategy for designing new carbonaceous materials with high efficiency for activating peroxides.

PLANT PATHOLOGY AND ECOLOGY

LINDSAY TRIPLETT, PH.D., represented CAES at the February meeting of the State Commission on Human Rights and Opportunities, where they voted to approve the 2021-2023 Affirmative Action plan (36 attendees) (February 14); and presented a lecture titled "A furious cannonNADe: nucleotide signaling in plant defense" at the Yale Botany Seminar Series (19 attendees) (February 19).

WASHINGTON DA SILVA, PH.D., participated, as the scientific member, in the CT Farm Wine Development Council Meeting via Zoom (10 attendees) (February 8), co-chaired via Google Meets a Masters thesis defense committee for Daniela Assunção, a masters student from the Department of Crop Sciences at the Universidade Federal Rural do Semi-arido (UFERSA) in Brazil (11 attendees) (February 21).

YONGHAO LI, PH.D., participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (11 attendees) (February 14); presented a lecture "Diseases of Trees" for the Connecticut Tree Protective Association Arboriculture 101 Courses in New Haven (37 attendees) (February 15); presented "Bonsai Tree Disease Management" to the Bonsai Society of Greater Hartford in West Hartford (10 attendees) (February 20)

FELICIA MILLETT has taken on the position of Chair of the NPDN Proficiency Committee; participated in the NEPDN monthly meeting (18 people) (February 8); presented "Native Plant Gardening" to the Harwinton Garden Club in Harwinton (32 attendees) (February 8); presented "Growing Mountain Laurels in Connecticut" to the Down to Earth Garden Club in South Windsor (30 attendees) (February 14); staffed the CAES booth with **ROSE HISKES** at the Connecticut Grounds Keepers Association Turf and Landscape Conference in Plantsville, CT (February 20); led the plant disease at the CTPA Arboriculture 101 Tree Conditions Workshop (36 attendees) (February 22); participated in the NPDN Proficiency Committee Meeting (7 attendees) (February 23); and attended the USDA-APHIS PPQ Morphological Fungal Identification Techniques Workshop in Greenbelt, MD (February 27–29).

RAQUEL ROCHA, PH.D., presented a talk titled "Polyamines in fungal cells: an ancestral metabolic pathway with new functions" at the X Brazilian Conference of Mycology in Belo Horizonte City, Brazil (50 attendees) (February 20).

PUBLICATIONS:

1. Thangalvelu, R.M., and **da Silva, W. L.** (2024). Innovative stain-free technique for high-resolution imaging of virus particles via standard transmission electron microscopy. *Heliyon, 10(*4), e26172. DOI: 10.1016/j.heliyon.2024.e26172

Abstract: This research presents a groundbreaking approach in virus-related research, addressing challenges in electron microscopy (EM). This imaging technique has been crucial in exploring virus structures; however, traditional methods involve complex sample preparations and the risk of contamination. Herein, we introduce an approach that overcomes these obstacles, enabling high-resolution virus imaging without toxic staining procedures. Focusing on Begomovirus particles, an economically significant plant virus genus, our images confirm their non-enveloped structure and their twin icosahedral symmetry. Our methods involve sample collection, purification, and crystallization, followed by transmission electron microscopy - selected area electron diffraction (TEM-SAED) analysis. Notably, this study achieves 2D

and 3D virus imaging through standard TEM, providing a new avenue for virus structure analysis and advancing virus-related research. Remarkable high image quality stemmed from the crystallization process, offering exciting possibilities for improving virus research and diagnosis while eliminating staining limitations.

2. Rezzonico, F., Emeriewen, O.F., **Zeng, Q.**, Peil, A., Smits, T. H. M., and Sundin, G. W. (2024). Burning questions for fire blight research: I. Genomics and evolution of *Erwinia amylovora* and analyses of host-pathogen interactions. *Journal of Plant Pathology*. DOI: 10.1007/s42161-023-01581-0

Abstract: Fire blight, caused by the bacterial pathogen *Erwinia amylovora*, continues to be a devastating disease affecting commercial apple and pear plantings in almost all areas of the world, with recent incursions into Korea and China. During the past two decades, significant gains in knowledge of *E. amylovora* and fire blight disease have been achieved, in topic areas such as genetic and genomic diversity, host-pathogen interactions, host resistance, and disease management. As we look forward to the next two decades and beyond of fire blight research, we summarize the current research knowledge in topics focused on *E. amylovora* pathogen and population biology and propose research questions that we hope can guide the field forward to gain the necessary understanding that will lead to sustainable management of this disease.

3. Grünwald, N. J., Altendorf, K., Bock, C., Chang, J.H., De Souza, A.A., Del Ponte, E., Du Toit, L., Dorrance, A., Dung, J., Gent, D., Goss, E., Lowe-Power, T., Madden, L., Martin, F., McDowell, J., Moyer, M., Naegele, R. P., Potnis, N., Quesada-Ocampo, L. M., Sundin, G., Thiessen, L., Vinatzer, B. A., and **Zeng, Q.** (2024). Ensuring reproducibility in plant pathology. *Phytopathology.* DOI: 10.1094/PHYTO-12-23-0483-IA

Abstract: The landscape of scientific publishing is experiencing a transformative shift towards open access (OA), a paradigm that mandates the availability of research outputs such as data, code, materials, and publications. OA provides increased reproducibility and allows for reuse of these resources. This article provides guidance for best publishing practices of scientific research, data, and associated resources, including code, in APS journals. Key areas such as diagnostic assays, experimental design, data sharing, and code deposition are explored in detail. This guidance is in line with those observed by other leading journals. We hope the information assembled in this paper will raise awareness of best practices and enable greater appraisal of the true effects of biological phenomena in plant pathology.

4. Li, Y. (2024). Edema. *CAES Fact Sheet*. https://portal.ct.gov/-/media/CAES/DOCUMENTS/Publications/Fact_Sheets/Plant_Pathology_and_Ecology/Edema.pdf.

5. Li, Y. (2024). Black Root Rot of Ornamentals. *CAES Fact Sheet*. https://portal.ct.gov/-/media/CAES/DOCUMENTS/Publications/Fact_Sheets/Plant_Pathology_and_Ecology/Black-Root-Rot-of-Ornamentals.pdf.

6. Li, Y., **Dugas, K.**, and **Millett, F.** (2024). Seed Germination and Purity Analysis 2022. *CAES Technical Bulletin 34.* https://portal.ct.gov/-/media/CAES/DOCUMENTS/Publications/Technical_Bulletins/TB34.pdf.

7. Freitas, C. D., Costa, J. H., Germano, T. A., **Rocha, R. O.**, Ramos, M. V., and Bezerra, L. P. (2024). Class III plant peroxidases: From classification to physiological functions. *International Journal of Biological Macromolecules*. DOI: 10.1016/j.ijbiomac.2024.130306

Abstract: Peroxidases (EC 1.11.1.7) are involved in a wide range of physiological processes, hence their broad distribution across biological systems. These proteins can be classified as haem or non-haem enzymes. According to the RedOxiBase database, haem peroxidases are approximately 84 % of all known peroxidase enzymes. Class III plant peroxidases are haem-enzymes that share similar three-dimensional structures and a common catalytic mechanism for hydrogen peroxide degradation. They exist as large multigene families and are involved in metabolizing Reactive Oxygen Species (ROS), hormone synthesis and decomposition, fruit growth, defense, and cell wall synthesis and maintenance. As a result, plant peroxidases gained attention in research and became one of the most extensively studied groups of enzymes. This review provides an update on the database, classification, phylogeny, mechanism of action, structure, and physiological functions of class III plant peroxidases.

OTHER DEPARTMENTAL NEWS:

Over 20 CAES staff enjoyed a potluck lunch to celebrate the Lunar New Year on February 9, featuring delicious noodles, dumplings, salads, and many other homemade treats! The Dragons in attendance included **KITTY PRAPAYOTIN-RIVEROS** and **JAMIE CANTONI**, who got to take home paper dragon decorations.

Left: **Quan Zeng** and **Kitty Prapayotin-Riveros** celebrate the Lunar New Year potluck with festive attire. Photobombing by **Chaoyi Deng**. Right: Scientists work together to solve the assembly of paper dragons.

On February 8 we celebrated **Joseph Liquori's** (Agricultural Research Technician) birthday. Fruit styling and mini "greenhouse" cake topper crafted by **Regan Huntley, Raquel Rocha**, and members of the da Silva lab.

VALLEY LABORATORY

RICHARD COWLES, PH.D. presented "The invasion continues," to the Helena Nursery workshop, Ledyard, CT (100 participants) (February 7). He discussed "Climate change and effects on plants, insects, and diseases," to the Manchester Garden Club (18 participants) (Febrary 12). He talked about "Aphids," to the Great Lakes Christmas Tree Growers via Zoom, hosted by Michigan State University (100 participants); discussed "Exotic invasives," to the CT Groundskeepers' Association, Milldale, CT (650 participants) (February 20); lectured on "Failures of neonicotinoids in turf," to the Atlantic Golf and Turf seminar, Turners Falls, MA, (80 participants) (February 21).

ROSE HISKES participated in a virtual invasive plant focus group run by UCONN Sustainable Landscape team (Feb. 9), participated in a virtual Connecticut Invasive Plant Working Group (CIPWG) Symposium Planning Committee meeting (Feb 15), with Felicia Millett, staffed at CAES booth at the Connecticut Groundskeepers winter meeting in Southington (Feb. 20), participated in the virtual CAPS meeting (Feb 21), organized, set up and staffed the CIPWG display at the Connecticut Flower Show; mentored Wilton High School sophomore Shriya Natajaran with her science project final report (Feb. 29),

NATHANIEL WESTRICK, PH.D. participated in the North American Strawberry Association (NASGA) Annual Meeting in Hershey, PA (Jan 31 to Feb 2, 2024);presented at the Central Connecticut State University Research and Internship Fair as a representative of the Valley Laboratory (February 5); participated in the quarterly meeting over Zoom of the Boxwood Blight Insight Group, a USDA NIFA funded multistate working group focused on the mitigation of Boxwood Blight throughout the United States (February 21).

GRANTS AWARDED:

CAROLE CHEAH, PH.D. was awarded two 2024 grants from the Farmington River Coordinating Committee for implementation of HWA biocontrol with *Sasajiscymnus tsugae* in the Upper Farmington River watershed ($12,625.50) and by the Lower Farmington Salmon Brook Wild and Scenic Committee ($15,150) for implementation in the Lower Farmington River and Salmon Brook watershed.

PUBLICATIONS:

1. Li, H., Wan, Y., **Li, D.-W.**, and Zhu, L.-H. (2024). *Colletotrichum nanjingense* sp. nov. and *C. gloeosporioides* s.s. causing leaf tip blight on *Jasminum mesnyi* in Nanjing, Jiangsu, China. *Plant Disease. 103* (1) 82-93. DOI: 10.1094/PDIS-04-23-0693-RE

Abstract: *Jasminum mesnyi* Hance is an important medicinal and ornamental plant. This species is native to South Central China and Vietnam and grows primarily in the subtropical biomes. In June 2022, 17 *Colletotrichum* strains were isolated from leaf tip blight on foliage of *J. mesnyi* in Nanjing, Jiangsu, China. Based on morphological characteristics and multilocus phylogenetic analyses of six genomic loci (ITS, *CAL*, *ACT*, *TUB2*, *CHS-1*, and *GAPDH*), a new species, namely, *C. nanjingense*, and a known species, namely, *C. gloeosporioides* s.s., were described and reported. Pathogenicity tests revealed that both species were pathogens causing leaf tip blight on *J. mesnyi*. The results provided necessary information for disease control and enhanced our understanding of the diversity of *Colletotrichum* species in China.

JOURNAL ARTICLES APPROVED FEBRUARY 2024

Ames, M.*, **Westrick, N.*,** Karki, H.S., Hamernik, A., Jansky, S.H., Bethke, P.C., Halterman, D.A.** WiDiPo: A Collection of Wild Diploid Potato for Enhancement of Breeding Germplasm. *Frontiers in Plant Science.*

Averill, A.L., **Eitzer, B. D.**, and Drummond, F.A. Pesticide contamination in native North American crops, Part I. Development of a baseline and comparison of honey bee exposure to residues in lowbush blueberry and cranberry. *Ecotoxicology and Environmental Safety*.

Bolan, S., Hou, D., Mukherjee, S., Zhou, P., Yang, X., **White, J. C., Zuverza-Mena, N.,** Zhang, T., Chen, J., **Xu, Q**., Wei, X., Lyu, S., Lakma, S., Vithanage, M., Rinklebe, J., Wang, H., Siddique, K. H. M., Bolan, N. Titanium – metal of the future or an emerging environmental contaminant? *Environment International*.

Bylaska, E. J., Tratnyek, P. G., Torralba-Sanchez, T., Dixon, D. A., Student, D., **Pignatello, J. J.**, and Xu, W. Hydrolysis of 2,4,6-Trinitrotoluene (TNT) and 2,4-Dinitroaniline (DNAN): AIMD/MM Simulations Implicate Different Mechanisms. *Journal of Physical Chemistry.*

Channab, B.-E., El Idissiab, A., **White, J. C.**, and Zahouily, M. MOF ZIF-8, carboxymethylcellulose and polyvinyl alcohol bio-nanocomposite controlled-release phosphorus fertilizer: Improved P management and tomato growth. *Composites part B: Engineering*.

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

Drummond, F. A., Averill, A. L., and **Eitzer, B. D.** Pesticide contamination in native North American crops, Part II. Comparison of flower, honey bee worker, and native bee residues in lowbush blueberry. *Ecotoxicology and Environmental Safety*.

Li, Z., Jorn, R., Samonte, P. R. V., Mao, J., Sivey, J. D., **Pignatello, J. J.**, and Xu, W. Surface-Catalyzed Hydrolysis by Pyrogenic Carbonaceous Matter and Model Polymers: An Experimental and Computational Study on Functional Group and Nanopores. *Applied Catalysis B: Environmental*.

Liang, J., Rose, N., Brusentsov, I. I., Lukyanchikova, V., Karagodin, D., Feng, Y., Yurchenko, A. A., Sharma, A., Sylla, M., Lutomiah, J., Badolo, A., Aribodor, O., Ayala, D., Gonzalez-Acosta, C., Alto, B. W., Ahmad, N. W., Ney, T. G., Tu, Z., **Gloria-Soria, A**., Black, W. C., Powell, J. R., Sharakhov, I. V., McBride, C. S., and Sharakhova, M. V. Discovery and characterization of chromosomal inversions in the arboviral vector mosquito *Aedes aegypti*. *Nature Ecology and Evolution*.

Liua, F., **Pignatello, J. J.**, Sunc, R., Guana, X.*, Xiao, F.* A Comprehensive Review of Novel Adsorbents for Per- and Polyfluoroalkyl Substances (PFAS) in Water. *ACS ES&T Water*.

Qiao, C.-X., Zhao, R.-W., **Li, D.-W.**, and Ding, X.-L. A new species of *Biscogniauxia* associated with pine needle dieback on *Pinus thunbergii* in China. *MycoKeys*.

Ridge, G., **Dugas, K.**, Lepping, P. et al. Delusional Infestation. *Springer Nature*.

Seenthia, N. I., Bylaska, E. J., **Pignatello, J. J.**, Tratnyek, P. G., Beal, S. A., and Xu, W. Experimental and Computational Study of Pyrogenic Carbonaceous Matter Facilitated Hydrolysis of 2,4-Dinitroanisole (DNAN). *Environmental Science & Technology*.

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