

# Station News

The Connecticut Agricultural Experiment Station  
Volume 13 Issue 4 | April 2023



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

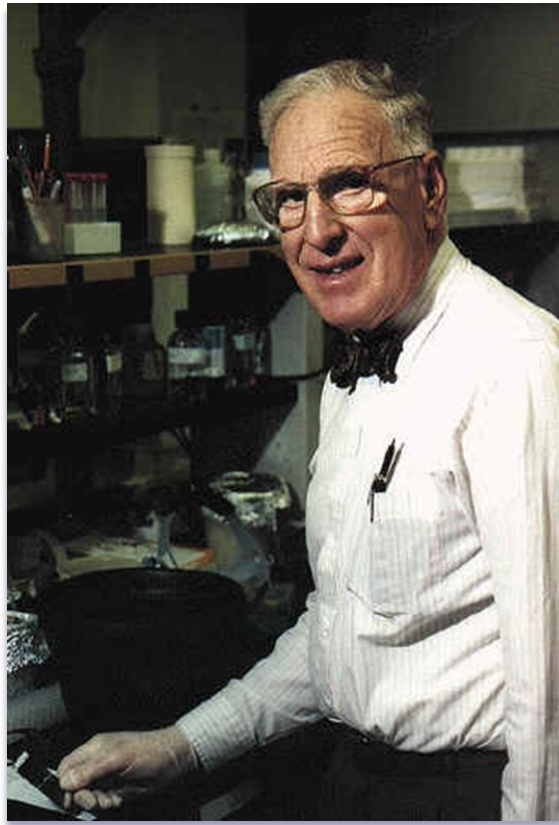
The Connecticut Agricultural Experiment Station

*Putting Science to Work for Society since 1875*

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**DR. ISRAEL ZELITCH REMEMBRANCE**



Known as “Zuni”, Yiddish for “Sonny”, to all he knew, he passed away on March 23, 2023 in Haverill, MA after contracting COVID-19.

Born in Winfield, PA in 1924, Zuni received his bachelor’s degree in Agricultural and Biological Chemistry from Pennsylvania State University in 1947 and his Ph.D. in Biochemistry from the University of Wisconsin in 1951. After completion of postdoctoral studies at NYU he became an assistant scientist at The Connecticut Agricultural Experiment Station in 1952. Zuni rose quickly through the ranks becoming Head of the Department of Biochemistry in 1963 and later Head of the Department of Biochemistry and Genetics in 1980. He was named Samuel W. Johnson Distinguished Scientist in 1974. Even after retiring in 1994 Zuni continued laboratory work and remained actively engaged in the activities of the Experiment Station.

Zuni’s research interests centered on photosynthesis in higher plants, specifically presumptive “wasteful” processes in carbon biochemistry that limit productivity. He worked on the forefront of a fast-moving and contentious field first developing in the 1950’s involving a substantial internal O<sub>2</sub>-dependent, CO<sub>2</sub>-releasing process operating in opposition to concurrent photosynthetic CO<sub>2</sub>-uptake in leaves utilizing the C<sub>3</sub> pathway of carbon metabolism typical of most crop species. Zuni’s seminal contribution was the demonstration that the substrate for this dissipative process coined “photorespiration” is an early and ubiquitous product of photosynthesis, glycolic acid. Two additional examples define his impact on science. First, his passion to exploit basic science to improve agricultural productivity led Zuni next on a visionary, yet elusive, quest to suppress photorespiration using genetics.

Second, he valued a hands-on approach to science. Despite nearing retirement, he pursued a sabbatical at Yale where he learned molecular biological techniques. This effort resulted in generation of O<sub>2</sub>-resistant tobacco plants that possessed elevated levels of the enzyme catalase. Later, after retirement, he extended his early work to show that glycolic acid catabolism is essential to the survival of the naturally O<sub>2</sub>-resistant crop species *Zea mays*. This finding, published in *Plant Physiology* in 2009, sparked a revival in photorespiration research. Zuni's contributions to science did not end at the lab bench.

Among Zuni's numerous honors are Fellowships from the Guggenheim Foundation and The American Academy of Arts and Sciences. Zuni served on the Executive Committee of the American Society of Plant Physiologists (1973-1976) and as President of the Society over 1977-78. He was named Fulbright Distinguished Professor in 1981 and was an adjunct professor at Yale University. Zuni published his work in premier journals such as *Science*, *The Journal of Biological Chemistry*, and *Plant Physiology*. An important literary contribution was his book *Photosynthesis, Photorespiration, and Plant Productivity* published in 1971. This was required reading for newcomers to the field at the time and is still highly regarded.

As a person, Zuni was unfailingly gentlemanly and good humored. Some found him a bit irascible, but this was really just tough-mindedness. He always defended his views with evidence, logic, vigor, and patience. His persistent optimism made him a great leader for his department. Setbacks did not slow him down and he was skillful in conveying this attitude to others. His insistence on scholarship was an inspiration to everyone in the department. Zuni was a credit to science and the Experiment Station.

*Richard B. Peterson and Neil Schultes*



**DR. JASON C. WHITE** visited North Carolina State University and presented a seminar titled “Nanotechnology-enabled agriculture: A path to global food security?” to the NSF Center for Science and Technologies for Phosphorus Sustainability (STEPS) (March 1-3); along with **DR. CHRISTIAN DIMKPA** met with a Ph.D. student in the Materials, Energy, and Nanoengineering (MSN) Department at the Mohammed VI Polytechnic University (UM6P) in Morocco to discuss a possible research visit to The CAES (March 6); gave an interview by Zoom to a reporter doing a story on toxic metals in food for *Undark* magazine (March 6); participated in the monthly Center for Sustainable Nanotechnology (CSN) Plant-Biosurfaces Zoom call (March 6); along with **DR. SARA THOMAS, DR. SARA NASSON,** and **DR. NUBIA ZUVERZA-MENA** participated in a Zoom meeting with collaborators at Yale University and the University of Minnesota to discuss our joint NIEHS grant on PFAS phytoremediation (March 7); along **DR. YI WANG** and **DR. WASHINGTON DA SILVA** met by Zoom with colleagues at the University of Auckland in New Zealand to discuss collaborative research focused on nanoscale management options for grape pathogens (March 7 and 29); along with **DR. QUAN ZENG** met with colleagues in Italy to discuss collaborative research focused on nanoscale management of fire blight (March 8); participated in the weekly CSN all hands Zoom call (March 8, 22, and 29); spoke by Zoom with Ed Weinberg, P.E. of ESSRE Consulting to discuss research on nutrient recovery from water and agricultural run-off (March 9); participated in a Zoom meeting with USDA officials to trouble shoot website reporting issues (March 9); participated in the bi-weekly CSN Faculty meeting (March 9 and 23); participated in a Zoom call with collaborators at Rutgers University to discuss a new project on micro-nanoplastics (March 10); along with **DR. CHAOYI DENG** met by Zoom with collaborators at the University of Minnesota to discuss a joint publication in *Trends in Chemistry* (March 10); along with **DR. CHRISTIAN DIMKPA** and **DR. NASSIFATOU TITTIKPIN** met by Zoom with collaborators at Rutgers University to discuss a joint research on nanoparticles related to wildfires (March 10); spoke with a representative of Nutrien regarding nanoscale fertilizers (March 13); along with **DR. CHRISTIAN DIMKPA,** and **DR. SHITAL VAIDYA** hosted a Zoom call with collaborators at Johns Hopkins University to discuss progress on a joint USDA nanoscale phosphorus project (March 14); hosted the monthly CSN Nanochem-Plant working group call (March 14); attended the Northeastern Regional Association of State Agricultural Experiment Station Directors (NERA) Spring meeting in Washington DC (March 15-16); participated in the biweekly Teams call for the organizing committee of the 2023 International Phytotechnologies Conference (March 17); along with **DR. YI WANG** hosted a Zoom call with collaborators at the University of Massachusetts Amherst to discuss progress on a joint USDA nanoscale sulfur project (March 17); participated in a Zoom call with collaborators at Auburn University and Johns Hopkins University to discuss preparation of a joint publication (March 17); participated in a Zoom call with collaborators at Rutgers University to discuss an application to the USDA SAS program (March 20); along with **DR. CHAOYI DENG, DR. CHRISTIAN DIMKPA** and **DR. NEIL SCHULTES** participated in a Zoom call with colleagues at the University of Central Florida to discuss experiments to measure leaf surface pH (March 20); along with **DR. YI WANG** spoke with representatives from Stanses LLC about their nanoscale sulfur product (March 21); participated in a webinar titled “PFAS: Breaking down the future of forever chemicals in

water” (March 21); visited Princeton University and gave a lecture titled “Nanotechnology-Enabled Agriculture: A path to global food security?” (March 23); hosted the quarterly CAES Safety Committee meeting (March 24); participated in a Zoom call as part of The International Network For Researching, Advancing, and Assessing Materials for Environmental Sustainability (INFRAMES) (March 24); along with **DR. NUBIA ZUVERZA-MENA** participated in a Zoom call with collaborators from Texas A & M University, the University of Arkansas, the University of California Irvine, and Houston Christian University to discuss a joint grant proposal (March 24); attended the American Chemical Society Spring 2023 Conference in Indianapolis IN and gave a presentation titled “Nanobiotechnology-based Strategies for Enhanced Crop Resilience” (March 26-28); along with **DR. SARA NASON, DR. NUBIA ZUVERZA-MENA** and **DR. SARA THOMAS** met by Zoom with a Yale Conservation Scholar that will be working at The CAES this summer (March 31); met by Zoom with a reporter to discuss toxic metal contamination of food (March 31); and met by Zoom with the CSN to prepare for an upcoming NSF site visit (March 31).

### GRANTS AWARDED

1. “Nanoparticulate soil amendments for achieving Closer to Zero via metal(loid) encapsulation,” Adeyemi, A., **White, J. C.**, and Keller, A. Awarded from USDA NIFA AFRI in April 2023 for 4 years, \$728,000.
2. “Crop exposure to micro-nanoplastics and potential impact on human nutrition and health”, Demokritou, P., **White, J. C.**, **Zuverza-Mena, N.**, and Sadik, O. Awarded from USDA NIFA AFRI in April 2023 for 3 years, \$752,000.
3. “Nanoscale manganese and iron micronutrients to increase photosynthesis, crop yield and abiotic stress tolerance”, Hernandez, J.A., **White, J. C.**, Gardea-Torresdey, J.L., **Zuverza-Mena, N.**, Craver, V. Awarded from USDA NIFA AFRI in May 2023 for 4 years. \$750,000.
4. “Calcium phosphate nanocomposites as a precise intelligent fertilizer to increase nutrient use efficiency and crop yield”, Jaisi, D., **White, J. C.**, **Steven, B.**, Iafisco, M. Awarded from USDA NIFA AFRI in May 2023 for 4 years. \$750,000.

### PUBLICATIONS

1. Li, M., Li, G., **White, J. C.**, Haynes, C. L., O’Keefe, T. L., Rui, Y., Ullah, S., Gao, Z., Lynch, I., and Zhang, P. (2023). Nano-enabled strategies to enhance biological nitrogen fixation. *Nature Nano*. In press.

**Abstract:** Increasing the strength of biological nitrogen fixation (BNF) is an effective strategy to enhance food security while simultaneously reducing the carbon and nitrogen footprint of agriculture. Nanotechnology offers several pathways to enhance BNF successfully.

2. Channab, A.-E., El Idrissi, A., Zahouilyac, M., and **White, J. C.** (2023). Starch-based controlled release fertilizers: A review. *Int. J. Biol. Macromol.* In press.

**Abstract:** Starch, as a widely available renewable resource, has the potential to be used in the production of slow-release fertilizers (CRFs) that support sustainable agriculture. These CRFs can be formed by incorporating nutrients through coating or absorption, or by chemically modifying the starch to enhance its ability to carry and interact with nutrients. This review examines the various methods of creating starch-based CRFs, including coating, chemical modification, and grafting with other polymers. In addition, the mechanisms of controlled release in starch-based CRFs are discussed. Overall, the potential benefits of using starch-based CRFs in terms of resource efficiency and environmental protection are highlighted.

3. Wang, D. and **White, J. C.** (2022). Determining the cost and benefit of nano-enabled agrochemicals. *Nature Food*, 3, 983-984.

**Abstract:** Nano-enabled fertilizers and pesticides can bring new economic benefits to agricultural practices with reduced environmental impacts. Moving forward, nano-enabled agrochemicals should continue to be optimized for greater efficiency.

## ANALYTICAL CHEMISTRY

**MS. TERRI ARSENAULT** spoke at the UConn Cannabis symposium about optimizing testing for cannabinoids. The talk discussed how field sampling and laboratory handling affect the measurement uncertainty associated with test reports. Ongoing research as Lockwood farm has demonstrated that the timing of maturation of the cannabis flower is highly variable between plants and escalates exponentially in a two-week window. In addition, interlaboratory proficiency testing suggests that results between laboratories varies as much as 20% or 30%. Laboratories should be cautious about statements of measurement uncertainty as it applies to the 0.3% Delta-9 THC allowed for Cannabis sativa to be certified as hemp under the federal law. This information is useful to Cannabis growers as they navigate the complex regulatory environment of *Cannabis sativa* (March 16).

**DR. ANUJA BHARADWAJ** and **MR. GREGORY BUGBEE** represented the Station at the Ag Day at the Capitol in Hartford (March 22). They staffed The CAES booth and responded to research and outreach questions about the Station from attendees.

**DR. NASSIFATOU KOKO TITIKPINA** participated with other alumni of the Lindau Meetings of Nobel Laureates (LINO), in the online discussion via Zoom on “Mentoring: Access and Leverage the Power of a Global Community” using the LINO network to establish research collaborations and tackle global issues (March 9); along with **DR. JASON WHITE** and **DR. CHRISTIAN DIMKPA** participated in a Zoom call with collaborators at Rutgers University to discuss a research collaboration on the Analysis of Polycyclic Aromatic Hydrocarbons (PAHs) in black and brown nanoparticles from forest fires and subsequent research ideas (March 10); participated in a Zoom call with Prof. Jason Crawford (Yale University) to discuss research collaboration (March 15); participated, as an invited guest lecturer, in the opening ceremony of the project “Science in the time of War-Digital

Ukraine.” The project is an online lecture project organized by the Institute of Bioorganic Chemistry of the Saarland University (UdS) in Germany, and the Faculty of Chemistry, Ecology and Pharmacy, Lesya Ukranka Volyn National University (VNU) in Ukraine. The project will provide Ukrainian pharmacy students with the opportunity to attend weekly online lectures with a wide variety of scientific topics such as chemistry, biology, biochemistry, nanotechnology, biotechnology, public health, and philosophy of science. The project is funded by the University of Saarland and the German Academic Exchange Service (DAAD) (March 17); participated with other members of the American Society of Pharmacognosy (ASP), in a Zoom webinar held by Prof. Malika Jeffries (Boston University) on “Moving the Needle: How Key Interventions Can Increase Diversity Equity and Inclusion in STEM” organized by the ASP (March 23).

### NEW STUDENTS, STAFF, AND VOLUNTEERS



**Dr. Vinod Goyal** joined the Station as a visiting scientist on March 29, 2023. He obtained his Master's (1998) and Ph.D. (2001) in Plant Physiology from Chaudhary Charan Singh (CCS) Haryana Agricultural University, Hisar. After completing his higher studies, he worked in various capacities and roles in the private sector (Advanta, Bioseed, Privi Life Sciences etc) prior to joining in the Department of Botany and Plant Physiology, CCS Haryana Agricultural

University, Hisar in 2017. He is primarily working in the field of stress physiology. He is associated with All India Coordinated trials on Rapeseed Mustard that includes screening of Brassica genotypes for drought, salinity, high temperature tolerance and developing mitigation strategies by use of growth regulators and microbial consortia. Presently, Dr Goyal is handling several research projects, including serving as principal investigator in Rashtriya Krishi Vikas Yojana project “Climate Change impact studies under rainout-shelter in Agroecosystems”; as Co-Pi in NHAEP - IG project on “Research Cum Technology Transfer Centre on Protected Cultivation of horticultural crops” for developing platforms for protective and precision farming (Maharana Pratap Horticultural University, Karnal); as principal investigator in the Ministry of Human Resource Development (GOI) project under SPARC scheme on “Genotyping by Sequencing, Genome-wide Association Study, and Genomic Selection Approaches for the Complex Trait like Stress-tolerance and Yield in Soybean”; and as Co-PI in Ministry of steel sponsored project on “Development of steel slag based cost effective ecofriendly fertilizers for sustainable agriculture and inclusive growth”. He has completed one CEERES, US-Project (NUE/Drought/Salinity in rice) as Coordinator, where he developed pseudo fields for salinity and drought tolerance screening studies in maize, rice and wheat crop. He is the recipient of several awards like Distinguished Article Award (2012-2015) by the Genomics, Proteomics and Bioinformatics Journal of China and Young Scientist award given by KK Nanda foundation. He has published

a number of papers in peer reviewed journals with high impact factor and one book titled “Genotyping by Sequencing for Crop Improvement” by Wiley Publishing. He is also involved in teaching undergraduate and postgraduate courses as well as research. At The CAES, Vinod will be working with several staff involved in nanotechnology application and implications in agriculture and environment. He will bring expertise on plant physiology and efficacy testing of different nanomaterials being researched on.

## PUBLICATIONS

1. Awio, T., Struik, P. C., Senthilkumar, K., **Dimkpa, C. O.**, Otim-Nape, G. W., and Stomph, T. J. Indigenous nutrient supply, weeding and fertilisation strategies influence on-farm N, P and K use efficiency in lowland rice. (2023). *Nutrient Cycling in Agroecosystems*. DOI: [10.1007/s10705-023-10275-z](https://doi.org/10.1007/s10705-023-10275-z)
2. **Dimkpa, C. O.**, Adzawla, W., Pandey, R., Atakora W. K., Kouame, A. K., Jemo, M., and Bindraban, P. S. (2023). Fertilizers for food and nutrition security in sub-Saharan Africa: an overview of soil health implications. *Frontiers in Soil Science*, 3. DOI: [10.3389/fsoil.2023.1123931](https://doi.org/10.3389/fsoil.2023.1123931)
3. Sharma, S., Pandey, R., **Dimkpa, C. O.**, Kumar, A., and Bindraban, P. S. (2023). Growth stage-dependent foliar application of iron improves its mobilisation towards grain and enhances Fe use efficiency in rice. *Journal of Plant Growth Regulation*. DOI: [10.1007/s00344-023-10944-x](https://doi.org/10.1007/s00344-023-10944-x)



**Mr. Gregory Bugbee and Dr. Anuja Bharadwaj** staffing The CAES booth at Ag Day in Hartford, CT on March 22, 2023.



**DR. GOUDARZ MOLAEI** was interviewed by CBS Boston (March 2); WTNH Channel 8 (March 17); Journal Inquirer (March 20); Hartford Courant (March 20); Fox 61 (March 21); and WFSB (March 22) on the increased risk of human infection with tick-borne diseases particularly babesiosis.

**DR. GOUDARZ MOLAEI** with other members of the CAES Center for Vector Biology & Zoonotic Diseases hosted public health officials from Yale University, Western Connecticut State University, and the Connecticut Department of Public Health to discuss ongoing research on ticks and mosquitoes. Attendees met with groups throughout the day to discuss research and surveillance programs conducted among scientists and technical staff. A tour of The Connecticut Agricultural Experiment Station took place after the demonstrations and discussions. Representation from The CAES included **DR. PHILIP ARMSTRONG, DR. SCOTT WILLIAMS, DR. DOUG BRACKNEY, DR. ANDREA GLORIA-SORIA, DR. MEGAN LINSKE, MR. JOHN SHEPARD, MS. ANGELA BRANSFIELD, MR. MICHAEL MISENCIK, MS. NOELLE KHALIL, MS. TANYA PETRUFF, MS. JAMIE CANTONI, MR. DUNCAN COZENS, DR. REBECCA JOHNSON** and **DR. ANURAG KUMAR KUSHWAHA** (March 27).

**MS. TIA M. BLEVINS** participated in a three-part Invasive Insects webinar with UMass Extension which included topics on pest risk and climate change, spotted lanternfly updates, scouting techniques, biocontrol, and management in the landscape and vineyards, and beech leaf disease (January 25; February 8 and 22); participated in the virtual Spotted Lanternfly Summit presented by Pennsylvania Department of Agriculture (March 1–2); participated in USDA’s webinar for *Phytophthora ramorum* (March 8–9); participated in USDA’s United States-Canada Greenhouse-Grown Plant Certification Program webinar (March 28).

**MS. ANGELA BRANSFIELD** participated via Zoom in Yale’s Biosafety Committee meetings (March 23 and 27), and participated in a CAES Health and Safety Committee meeting (March 24).

**MS. JAMIE CANTONI** participated in a Zoom call with Ms. Shashika Lamahewa from the University of Connecticut to discuss updates to an invasive shrub cover study using drone assisted modeling (March 2); participated in an interview discussing ticks and Lyme disease for an episode on the CW Network *Mysteries Decoded* (March 17); and with **MS. NOELLE KHALIL** presented a talk titled “What’s that Tick?! Basic Identification of Commonly Encountered Tick Species in Connecticut” and assisted in hands-on tick identification at the Medical Entomology Workshop held for Connecticut’s public health officials (March 28).

**MR. MARK CREIGHTON** participated on a Zoom training seminar hosted by the USDA on *P. ramorum* detection and sampling in Green Houses ( March 8–9 ); participated in a AIA regional Honey Bee health update (March 10); presented a talk “Introduction to Basic Beekeeping” via Zoom for The Wethersfield Public Library (March 14); attended a Zoom talk on Giant Hornets and Honeybee Defenses with Dr. Heather Mattila (March 16); and attended a Zoom talk on the biology and history of Tropiclaelaps mites and its potential

impact on honeybees in the USA, by Dr. Samuel Ramsey (March 22).

**DR. HANY DWECK** trained a Yale rotation student in electrophysiology (March 27, 29, and 31).

**DR. KELSEY FISHER** attended the spotted lanternfly Virtual Summit (March 1-2); provided a statement about monarch butterfly conservation and collaboration with Pollinator Pathway for Nancy Chapman at Norwalk Plus magazine (March 6); participated with meeting with Pollinator Pathway about establishing pollinator habitat along the Farmington Canal Trail (March 10 and 27); attended the Forest Health Workshop at The CAES (March 7); attended the U.S. EPA Center for Integrated Pest Management Webinar “Spotted Lanternfly Update and Next Steps” (March 14); presented a 40-minute talk titled “Movement Ecology and Conservation Planning for Monarch Butterflies” at the Northeast Iowa Research Farm Association Annual Meeting (March 15); attended the Rusty Patched Bumble Bee Webinar “Bumble Bee Habitat Conservation and Management” (March 27); attended the Eastern Branch of the Entomological Society of America meeting in Providence, RI: presented a 10-minute oral presentation “Spatial-temporal trends in continental-scale monarch butterfly dispersal based variation in mitochondrial DNA and stable isotope ratios,” served as a judge for the student presentation competition, and volunteered as a greeter at the outreach event “It’s a Bugs World”; was interviewed by Katherine Hauswirth at the Day Magazine for a piece on monarch butterflies (March 28); and participated in a meeting to plan an “All About Pollinators” event in collaboration with CPEN-Community Placemaking Engagement Network to serve the Newhallville community.

**DR. ANDREA GLORIA-SORIA** presented the talk “Diversification Patterns of Invasive *Aedes* Mosquitoes” at the Virginia Tech Department of Entomology Seminar Series (March 3).

**DR. REBECCA JOHNSON** attended the Keystone Vector Biology conference: “Emerging Concepts and Novel Technologies” in Breckenridge, Colorado (February 13-17) and presented a talk and a poster describing how blood feeding dynamics reflective of mosquito behavior in the wild alter dengue virus dissemination in *Aedes aegypti*. She received a travel award from the conference organizers to attend this meeting.

**DR. MEGAN LINSKE** participated in a Zoom call with research collaborators from the Maine Medical Center Research Institute (MMCRI) on small mammal and tick sampling on Isle au Haut, Maine (March 8); participated in a meeting with research collaborators from BanfieldBio, Inc. and North Carolina State University about testing tick repellency of treated fabrics in field and laboratory settings (March 9); participated in an interview and field demonstration with The CW Network’s program Mysteries Decoded (March 17); participated in The Wildlife Society’s (TWS) Diversity, Equity, and Inclusivity (DEI) Network Meeting (March 20); presented a talk titled “Common Ticks and Tickborne Diseases in Connecticut” and assisted in tick identification at the Medical Entomology Workshop held for Connecticut’s public health officials (March 28); participated in a Zoom call with colleagues from MMCRI and Maine Department of Agriculture, Conservation, and Forestry, Bureau of Pesticide Control on logistics for a collaborative research involving the systemic acaricidal treatment of blacklegged tick hosts (March 29).

**DR. GALE RIDGE** presented a talk about bed bugs at the Medically Important Arthropods Workshop held at the Experiment Station (March 28).

**DR. CLAIRE RUTLEDGE** taught the class session “Tree Conditions Laboratory” for the Connecticut Tree Protective Society’s Arboriculture 101 course (March 2); presented a talk ‘The Impact of EAB Biological Control Agents on Ash Forest Structure in CT’ to the Forest Health Workshop at The CAES (March 7); helped administer the oral portion of the arborist license exam (3 applicants) (March 8); presented the invited talk “Impact of EAB invasion stage and post release time on the persistence and impact of introduced EAB larval parasitoids” at the Eastern Branch of the Entomological Society of America’s annual meeting in Providence, Rhode Island (March 19); and presented the talk “Entomology and Trees” at the Connecticut Tree Protective Society’s “Connecticut Tree Conditions in 2023.”

**MR. JOHN SHEPARD** spoke about mosquitoes and mosquito-borne viruses to a group of homeschool students (March 10); and presented a talk titled “Biology, Ecology, and Feeding Behavior of Mosquitoes in Connecticut” and assisted in mosquito identification at the Medical Entomology Workshop held for Connecticut’s public health officials (March 28)

**DR. VICTORIA SMITH** participated in the Spotted Lanternfly Summit, sponsored by Penn State University and held via Zoom (March 1-2); organized and participated in the annual Forest Health Monitoring Workshop, held in The Station’s Jones Auditorium (see the recording on our website: <https://portal.ct.gov/CAES/Publications/Publications/Forest-Health-Monitoring-Workshops/Forest-Health-Monitoring-Workshop-2023>) (March 7); participated in a workshop titled “*Phytophthora ramorum*: Focus on Field Activities”, held via Zoom (March 8-9); was interviewed by David Desiderato of the Granby Drummer, regarding spotted lanternfly (March 16); participated in a Plant Production Act (PPA) webinar, sponsored by the National Plant Board (March 20); participated in the Forest Program Management Review, in cooperation with DEEP and the US Forest Service, held at DEEP HQ in Hartford (March 21-22); participated in a webinar on the US-Canada Greenhouse Certification Program, sponsored by USDA Export Services (March 28); and participated in a call for planning the annual Eastern Plant Board meeting (March 29).

**MS. TRACY ZARRILLO** participated in a Zoom meeting with **DR. KELSEY FISHER**, **DR. KIMBERLY STONER**, and leaders of the Connecticut Pollinator Pathway to discuss future collaborations (March 10); participated in a Zoom meeting with Dr. Michael Ulyshen (USDA Forest Service), Dr. Kristi Sullivan (Cornell University), and Dr. Katherine Turo (Rutgers University) to discuss results from a collaborative project studying the vertical stratification of bees and wasps in forests and prepare for 2023 surveys (March 13); participated in a Zoom meeting with Dr. Steve Alm and Ms. Casey Johnson (University of Rhode Island) to discuss plans for surveying NRCS funded pollinator habitat in CT and RI (March 16); and participated in a Zoom meeting with Mr. Geordie Elkins, Ms. Sefra Alexandra, Ms. Loise Washer, **DR. KELSEY FISHER**, Ms. Deepika Saksena, Mr. Victor DeMasi, and Ms. Doreen Abubakar to discuss plans for “All Things Pollinator” events in 2023 (March 31).

## EVENTS

**MEDICAL ENTOMOLOGY WORKSHOP:** The CAES Center for Vector Biology & Zoonotic Diseases hosted a workshop for Connecticut’s public health officials to provide a hands-on learning experience on identification, biology, and ecology of ticks, mosquitoes, and bed bugs. **DR. JASON WHITE** and **DR. GOUDARZ MOLAEI** provided the opening and keynote address followed by presentations by **DR. MEGAN LINSKE**, **MR. JOHN SHEPARD**, **DR. GALE RIDGE**, **MS. NOELLE KHALIL**, and **MS. JAMIE CANTONI**. Technical assistance was provided by **MS. TANYA PETRUFF**, **MR. MICHAEL MISENCIK**, **MS. KATHERINE DUGAS**, and **MR. MICHAEL OLSON** (March 28).

## PUBLICATIONS

1. Rose, N. H., Badolo, A., Sylla, M., Akorli, J., Otoo, S., **Gloria-Soria, A.**, Powell, J. R., White, B. J., Crawford, J. E., and McBride, C. S. (2023). Dating the origin and spread of specialization on human hosts in *Aedes aegypti* mosquitoes. *eLife*. DOI: [10.7554/eLife.83524](https://doi.org/10.7554/eLife.83524)

**Abstract:** The globally invasive mosquito subspecies *Aedes aegypti aegypti* is an effective vector of human arboviruses, in part because it specializes in biting humans and breeding in human habitats. Recent work suggests that specialization first arose as an adaptation to long, hot dry seasons in the West African Sahel, where *Ae. aegypti* relies on human-stored water for breeding. Here, we use whole-genome cross-coalescent analysis to date the emergence of human-specialist populations and thus further probe the climate hypothesis. Importantly, we take advantage of the known migration of specialists out of Africa during the Atlantic Slave Trade to calibrate the coalescent clock and thus obtain a more precise estimate of the older evolutionary event than would otherwise be possible. We find that human-specialist mosquitoes diverged rapidly from ecological generalists approximately 5000 years ago, at the end of the African Humid Period—a time when the Sahara dried and water stored by humans became a uniquely stable, aquatic niche in the Sahel. We also use population genomic analyses to date a previously observed influx of human-specialist alleles into major West African cities. The characteristic length of tracts of human-specialist ancestry present on a generalist genetic background in Kumasi and Ouagadougou suggests the change in behavior occurred during rapid urbanization over the last 20–40 years. Taken together, we show that the timing and ecological context of two previously observed shifts towards human biting in *Ae. aegypti* differ; climate was likely the original driver, but urbanization has become increasingly important in recent decades.

2. **Fisher, K. E.**, Snyder, B. R., and Bradbury S. P. (2023). Blooming forbs utilized by breeding-season *Danaus plexippus* in the USA North-Central region. *Journal of the Lepidopterists’ Society*, 77(1), 29-42. DOI: [10.18473/lepi.77i1.a2](https://doi.org/10.18473/lepi.77i1.a2)

**Abstract:** *Danaus plexippus* (monarch butterfly) populations in North America east of the Rocky Mountains are in decline due to loss of habitat containing *Asclepias* spp. (milkweed) and blooming forbs. To support *D. plexippus* recovery, habitat restoration efforts use seed

mixes designed to maintain a diversity of species that bloom over the breeding and migration periods. The extent to which these species are uniquely attractive to foraging *D. plexippus* is unclear. We conducted observational studies at areas in Iowa USA with varying densities and diversities of *Asclepias* spp. and floral resources to help inform conservation management practices. Forty-two blooming forb species were present across four sites (2-4-ha) in Boone and Story counties from June through September in 2020. Many of the species present are commonly found in pollinator seed mixes. The number of blooming forbs species per site varied from 12 to 24 across the four months; the minimum and maximum density of species-specific inflorescences ranged from 8.45 to 36.3 inflorescence/m<sup>2</sup>. We observed *D. plexippus* nectaring on 27 of the 42 species across the sites. Based on total feeding events observed and the species-specific density of inflorescences, *Asclepias syriaca*, *Asclepias verticillata*, *Helianthus grosseserratus*, and *Cirsium vulgare* were favored for nectaring at each site where they were present. Additional species were favored in some, but not all, sites including *Symphotrichum pilosum*, *Eupatorium altissimum*, *Trifolium pratense*, *Echinacea pallida*, and *Verbena urticifolia*. Findings suggest variation in preference may be due, in part, to site-specific and surrounding landscape features. Future studies on *D. plexippus* foraging behavior could address the interacting roles of habitat and landscape features, as well as species-specific flower size and shape, scent, nutrition, and nectar abundance. While forb utilization is likely influenced by site- and plant-specific features, preferred species we observed are typically included in recommended native seed mix designed to ensure blooms from June through September to support migratory and non-migratory, breeding *D. plexippus*.

3. McMillan, J. R., Chaves, L. F., and **Armstrong, P. M.** (2023). Ecological predictors of mosquito population and arbovirus transmission synchrony estimates. *Journal of Medical Entomology*, 60(3). DOI: [10.1093/jme/tjad024](https://doi.org/10.1093/jme/tjad024)

**Abstract:** Quantifying synchrony in species population fluctuations and determining its driving factors can inform multiple aspects of ecological and epidemiological research and policy decisions. We examined seasonal mosquito and arbovirus surveillance data collected in Connecticut, United States from 2001 to 2020 to quantify spatial relationships in 19 mosquito species and 7 arboviruses timeseries accounting for environmental factors such as climate and land cover characteristics. We determined that mosquito collections, on average, were significantly correlated up to 10 km though highly variable among the examined species. Few arboviruses displayed any synchrony and significant maximum correlated distances never exceeded 5 km. After accounting for distance, mixed effects models showed that mosquito or arbovirus identity explained more variance in synchrony estimates than climate or land cover factors. Correlated mosquito collections up to 10-20 km suggest that mosquito control operations for nuisance and disease vectors alike must expand treatment zones to regional scales for operations to have population-level impacts. Species identity matters as well, and some mosquito species will require much larger treatment zones than others. The much shorter correlated detection distances for arboviruses reinforce the notion that focal-level processes drive vector-borne pathogen transmission dynamics and risk of spillover into human populations.



**Dr. Scott Williams and Dr. Megan Linske** demonstrating field equipment used in recent integrated tick management research during the CAES meeting with Yale University, Western Connecticut State University, and the Connecticut Department of Public Health on March 27, 2023.



**Dr. Philip Armstrong and Mr. John Shepard** provided updates on mosquito surveillance and control during the CAES meeting with Yale University, Western Connecticut State University, and the Connecticut Department of Public Health on March 27, 2023.



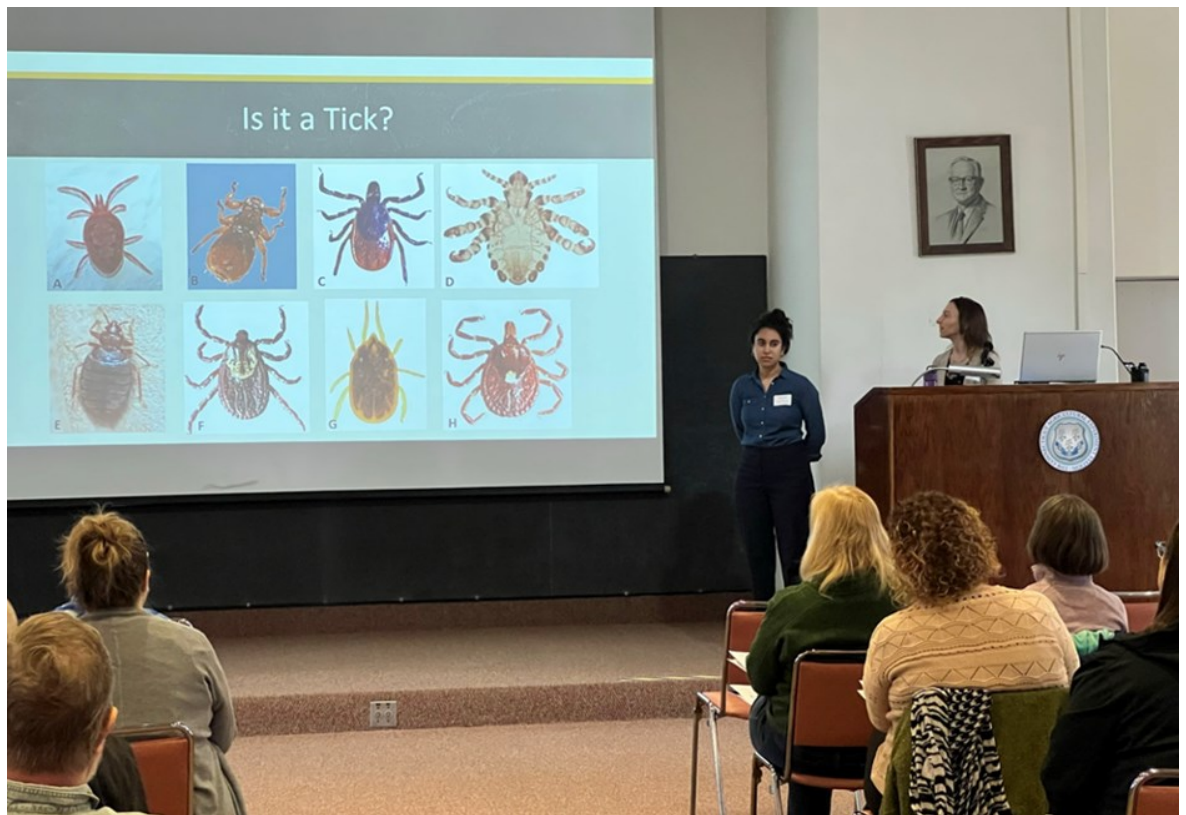
**Dr. Megan Linske** presented on ticks and tickborne diseases in Connecticut at the CAES Medical Entomology Workshop on March 28, 2023.



**Mr. John Shepard** presenting on mosquitoes at the CAES Medical Entomology Workshop on March 28, 2023.



**Dr. Gale Ridge** presenting on bed bugs at the CAES Medical Entomology Workshop on March 28, 2023.

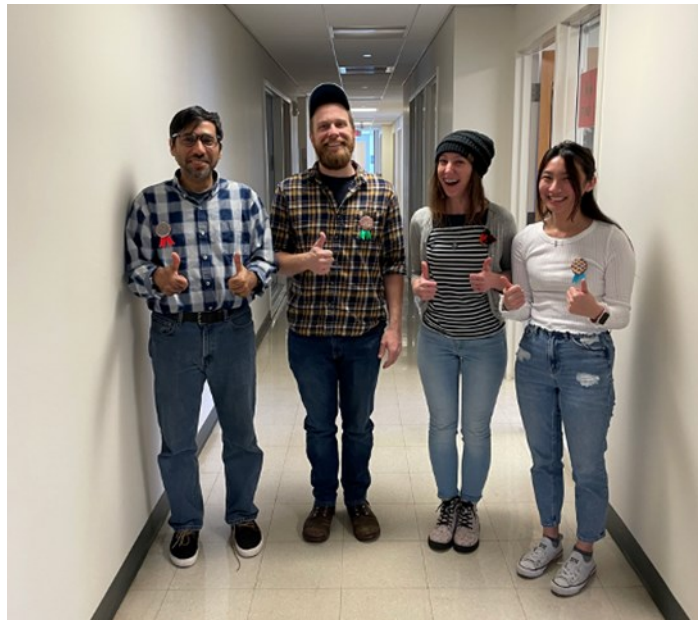


**Ms. Noelle Khalil** and **Ms. Jamie Cantoni** presenting on tick identification at the CAES Medical Entomology Workshop on March 28, 2023.





Pi Day was celebrated on 3/16/23 by the Entomology Department. The department shared five pies, including Shepard's pie, quiche, fruit pies, and chocolate chip pie.



There was also a competition to see who memorized the most digits of Pi. **Ms. Kristy Lok** placed first with 22 digits, followed by **Dr. Hany Dweck** and **Mr. Jacob Ricker** with 11 digits, and **MS. Jamie Cantoni** with 10 digits.



**DR. SCOTT WILLIAMS** participated in Zoom meeting with research collaborators from Maine Medical Center Research Institute (March 8); participated in Zoom meeting with research collaborators from BanfieldBio, Inc. and North Carolina State University about testing tick repellency of treated fabrics (March 9); presented virtual lecture titled “Oral Delivery of Low-dose Fipronil for Experimental Systemic Acaricidal Treatment of White-footed Mice Against *Ixodes scapularis*” for the Department of Defense’s Deployed War Fighter Protection Research Symposium (90 attendees) (March 16); with **DR. MEGAN LINSKE, MS. JAMIE CANTONI,** and **MR. DUNCAN COZENS,** entertained a film crew from The CW Network’s program *Mysteries Decoded* and were interviewed about blacklegged tick collection, pathogen testing, and the origin of Lyme disease to be aired on a future episode (March 17); participated in a Zoom call with University of Massachusetts colleagues about research pertaining to the relationship of acorn abundance, mice, and human cases of Lyme disease throughout Connecticut (March 20); participated in a Zoom call with residents of the Town of Woodbridge on participation in a future integrated tick management study (March 22); met with public health officials from Yale University, Western Connecticut State University, and the Connecticut Department of Public Health and spoke about ongoing research on the systemic acaricidal treatment of hosts against blacklegged ticks (March 27); participated in a Zoom call with colleagues from the Maine Medical Center Research Institute and Maine Department of Agriculture, Conservation, and Forestry, Bureau of Pesticide Control on logistics for a collaborative research venture involving the systemic acaricidal treatment of blacklegged tick hosts (March 29).

**MR. JOSEPH P. BARSKY** presented “2022 Acorn Mast Survey Results” during the 2023 Forest Health Workshop at The CAES (50 attendees) (March 7); presented “Invasive Species and Climate Change” for the Youth and Climate Series, sponsored by NY and CT Audubon Societies (26 students and 6 teachers attended) (March 9); moderated silvicultural session and participated in executive committee meetings at the New England Society of American Foresters Annual Meeting in Nashua, NH (March 13-16); participated in virtual meeting to discuss collaborative research with University of Massachusetts resource professionals involving acorn mast abundance and Lyme disease incidence rates (March 20); met with Connor Hogan of McLean Game Refuge to discuss collaborative forest research on slash walls in Goshen, CT (March 29); participated in the Region 12 Agricultural Science and Technology Education Compliance Review (March 30-31).

**MR. GREGORY BUGBEE** with **MS. SUMMER STEBBINS** and **MS. RILEY DOHERTY** hosted a meeting with Dr. Berk Calli from Worcester Polytechnic Institute and Dr. Taskin Padir from Northeastern University on using robotics to manage aquatic plants (March 3); gave a talk on “Composting” to the Wethersfield Garden Club at the Solomon Wells House. (40 attendees) (March 6); with **MS. SUMMER STEBBINS,** gave a workshop on invasive aquatic plants at the annual meeting of the Connecticut Association of Wetland Scientists at the Eversource headquarters in Berlin. (200 attendees) (March 9); with **MS. SUMMER STEBBINS,** gave a soil testing workshop to a group of seven, young, homeschooled students (March 13); interviewed on soil contamination by Teresa Barger of Connecticut Magazine (March 20); gave a seminar titled “Container Gardening Indoors and Out” to the Simsbury Garden Club at the Simsbury Library (40 attendees)

(March 21); gave a seminar titled “Container Gardening Indoors and Out” at the Waterbury Senior Center (40 attendees) (March 21); with **MS. SUMMER STEBBINS**, staffed the CAES table at Ag Day at the Capitol in Hartford (March 22); with **MS. SUMMER STEBBINS** and **MS. RILEY DOHERTY**, hosted a United States Army Corps of Engineers meeting for government officials at the CAES Windsor auditorium and spoke on “Hydrilla in the Connecticut River” (30 attendees) (March 30).

**DR. SUSANNA KERIÖ** met with Dr. Chandi Witharana (UConn) to discuss collaboration related to street tree inventories (March 1); gave a talk on “Urban Tree Health Challenges and Urban Maple Condition in New Haven” at the CT Forest Health Monitoring Workshop (March 7); administered the arborist examinations (March 8 and 17); participated in the New England Society of American Foresters (NESAF) annual meeting in Nashua, NH (March 13-16); with **DR. FAISAL QASEEM** as contributing author, presented a research poster titled "Urban Maple Health in New Haven, Connecticut" at the NESAF meeting (March 14); participated in a CT Urban Forest Council meeting to discuss the council's grant programs (March 17); presented invited lecture titled "Abiotic Factors and Tree Health in Connecticut" at the CT Tree Protective Association's Tree Health workshop (March 23).

**DR. SARA NASON** participated in virtual meetings for the Benchmarking and Publications for Non-Targeted Analysis working group (March 3, 13, and 14); met virtually with representatives from the medical devices industry to discuss use of non-targeted analysis for regulatory purposes (March 10).

**MS. SUMMER STEBBINS** was accepted into the Graduate School at the University of Connecticut, Storrs in pursuit of her Ph.D. in Remote Sensing in the Department of Natural Resources and the Environment within the Department of Agriculture, Health, and Natural Resources (March 10).

**DR. BLAIRE STEVEN** presented an invited lecture at Thompsons Rivers University in Kamloops, Canada titled "Biological Soil Crusts as a Model for Terrestrial Carbon Cycling" (30 students, 10 faculty) and met with University administrators concerning collaboration potential for work at the new high Arctic Research Station in Cambridge Bay, Nunuvut (March 15-17).

**DR. JEFFREY WARD (Emeritus)** participated in an Updated Silvics of North America Project convening conference call (March 1); participated in an Updated Silvics of North America Project, Invasives Core Committee meeting (March 3); spoke on "Slash Walls and Beyond" at the 26<sup>th</sup> Forest Health Monitoring Workshop in New Haven (68 attendees) (March 7); was awarded the New England Society of American Foresters David M. Smith Silviculture award in Nashua, NH (March 15); spoke on “Slash Walls to Reduce Browse Damage in Southern New England” at the New England Society of American Foresters' annual meeting in Nashua, NH (37 attendees) (March 15); spoke on “A Short History of the Connecticut Forest” at the Old Lyme Land Trust annual meeting (48 attendees) (March 19); participated in a Connecticut Forest and Park Association (CFPA) Board of Directors meeting (March 22); along with **MR. JOSEPH P. BARSKY**, met with Joe Welsh, Jon Zeiner, and Robert Turnbull (Aquarion Water Company) in Goshen to discuss alternative forest management practices (March 27).

**DR. LEIGH WHITTINGHILL** met with Bonnie Potocki and Dennis Hicks from Green Skies to discuss possible collaborations on a possible collaboration on vegetable production under solar panels (March 7); participated in the Connecticut Council on Soil and Water Conservation quarterly meeting (March 16); met with Jane Hayes (Hoffman Hayes and Gardner Jane) and Anèl Dannhauser to discuss a potential research collaboration examining green roof community gardens in Toronto (March 17).

## PUBLICATIONS

1. Kummel, M. L., **Shabtai, I.**, Nir, S., and Mishael, Y. G. (2023). DOM removal from surface water by activated carbon vs. a nanocomposite: an experimental and modeling approach to optimize treatment. *Environmental Science: Water Research & Technology*. DOI: [10.1039/D3EW00010A](https://doi.org/10.1039/D3EW00010A)

**Abstract:** Dissolved organic matter (DOM) is commonly removed from surface water by adsorption columns packed with sand (enhanced with coagulants), high-cost activated carbons, or specifically developed adsorbents. A main challenge in removing DOM is its chemical heterogeneity, both within and among water bodies, which makes adsorbent selection, DOM removal efficiency and removal prediction complex. Our approach to address these challenges consisted of three steps: 1. developing a facile UV-based methodology to represent DOM composition using three operationally defined fractions: humic acid, fulvic acid, and a non-UV-254 nm absorbing fraction, 2) parameterizing a hydraulic-adsorption model using commercially available humic and fulvic acids, and 3) applying the parameterized model to predict DOM removal from surface waters, which we mathematically partitioned using our UV methodology. We tested DOM removal from binary solutions of HA and FA and from three surface waters ranging in UV absorption properties by three adsorbents ranging in surface properties - new and regenerated granular activated carbon (GAC and rGAC, respectively) and a clay-polymer nanocomposite (PD-MMT). Despite the complexity of surface water DOM, we found that DOM removal can be predicted by its Specific Absorption of UV at 254 nm (SUVA<sub>254</sub>), and that the SUVA<sub>254</sub> was positively correlated with DOM removal by PD-MMT and negatively correlated with DOM removal by rGAC and GAC. One implication is that a column can potentially be tailored with an optimal adsorbent composition, i.e., PD-MMT and GAC based on water source SUVA<sub>254</sub>. Facile DOM characterization using UV absorption enabled to predict DOM removal by three adsorbents from three surface waters. Finally, we estimated column capacity for UV254 adsorbing compounds under large treatment scales and found that the capacity of PD-MMT was three times larger than that of a commercial GAC.

2. Wang, Y., Zhang, X., Zhang, W., Peng, M., Tan, G., **Qaseem, M. F.**, Li, H., and Wu, A-M. (2023). Physiological and transcriptomic responses to magnesium deficiency in *Neolamarckia cadamba*. *Plant Physiology and Biochemistry*, 197. DOI: [10.1016/j.plaphy.2023.107645](https://doi.org/10.1016/j.plaphy.2023.107645).

**Abstract:** Magnesium (Mg<sup>2+</sup>) is a critical component of chlorophyll and enzymes involved in various physiological and biochemical processes essential for plant growth, biomass accumulation, and photosynthesis. Mg<sup>2+</sup> deficiency (MgD) is common in hot and rainy sub-

tropical areas due to its easy loss from soil. *Neolamarckia cadamba*, an important tropical tree in South Asia, faces severe effects of MgD, however, the responses of *N. cadamba* to MgD stress remain unclear. In here, effects of *N. cadamba* under MgD stress were investigated. The study revealed that MgD had lower plant biomass, fresh and dry weight, root length, root volume, and surface area compared to CK (normal  $Mg^{2+}$ ). As treatment time increased, the leaves began to yellow, and lesions appeared. Chlorophyll *a*, chlorophyll *b*, and total chlorophyll content, along with fluorescence-related parameters and leaf photosynthetic capacity, were significantly reduced in MgD stress compared to CK treatment. Transcriptome analysis showed that transporters as well as transcription factors (TFs) from MYC (v-myc avian myelocytomatosis viral oncogene homolog), MYB (v-myb avian myeloblastosis viral oncogene homolog), bHLH (basic helix-loop-helix) and WRKY families were upregulated in leaves at 10 d of MgD stress, indicating that magnesium signaling transduction might be activated to compensate MgD. In addition, genes including chlorophyll(ide) *b* reductase (*NYC1/NOL*) chlorophyll/bacteriochlorophyll synthase (*G4*) and 7-hydroxymethyl chlorophyll *a* reductase synthesizing (*HCAR*) chlorophyll *a* and chlorophyll *b* were down-regulated in leaves, while those scavenging reactive oxygen species (ROS) were mainly up-regulated at 10 d of MgD stress. These results shed light on underlying MgD in *N. cadamba*.



**Dr. Scott Williams, Dr. Megan Linske, and Ms. Jamie Cantoni** hosted a film crew from the CW's *Mysteries Decoded* with co-host Tracy Walder (far left), producer Lisa Lumar (second from left) and host Jennifer Marshall (third from left) on a private property in Lyme, CT to demonstrate tick sampling techniques and discuss the origins of Lyme disease.

**DR. LINDSAY TRIPLETT**, served as a discussion moderator for the “Networking 101” workshop at the Northeastern Division of the American Phytopathological Society in Southbury, CT (21 adults) (March 8); along with **DR. STEPHEN TAERUM**, led a 90-minute workshop titled “Microbial Predators in Soil- Hunting for Healthy Soil Ecosystems” at the winter meeting of the Northeast Organic Farming Association of Connecticut (CT-NOFA) in Middletown, CT (18 adults) (March 12); organized and hosted a visit of invited speaker Dr. Sydney Everhart (March 15); and participated in project planning conference calls with collaborators at Penn State University (5 participants) (March 21) and Southern Connecticut State University (3 participants) (March 30).

**DR. DONALD E. AYLOR (Emeritus)** gave an invited lecture titled “Dispersal of Plant Pathogens over Multiple Spatial and Temporal Scales” to the Department of Energy (DOE) funded National Virtual Biosecurity of Bioenergy Crops Center (NVBBCC) Planning Meeting held at Brookhaven National Laboratory, Upton, NY via MS Teams (30 adult participants) (March 30). Dr. Aylor also participated in a broad range of discussions on the intersection of aerially dispersed plant pathogens and the sustainability of bioenergy crops during breakout sessions at this same meeting (30 adult participants) (March 30-31).

**DR. WASHINGTON DA SILVA** held a Zoom meeting with Dr. Marcia Ambrosio, a professor at the Universidade Federal Rural do Semi-Árido (UFERSA) to discuss ongoing collaborations on melon diseases and to screen students from UFERSA to come to the da Silva Laboratory at The CAES for internships (March 1); along with **DR. JASON WHITE** and **DR. YI WANG** had Zoom calls with collaborators from New Zealand to discuss testing sulfur nanoparticles to control powdery mildew on grapes plants at Lockwood Farm (March 7 and 29); participated in the Annual Meeting of the Northeastern APS meeting and gave a presentation titled “The Genomic Region Matters When Synthesizing dsRNA for Plant Virus Suppression via RNAi” in Southbury CT (24 attendees) (March 9-10); met with met Dr. Sydney Everhart to discuss the possibility of Dr. da Silva to mentor graduate students from UConn (March 15); met with Dr. Fereshteh Shahoveisi, an assistant professor at the University of Maryland, via Zoom to discuss a collaborative project involving RNA interference and nanotechnology to control dollar spot pathogens (March 28); participated in discussions on the intersection of aerially dispersed plant pathogens and the sustainability of bioenergy crops during breakout sessions during the Department of Energy (DoE) funded National Virtual Biosecurity of Bioenergy Crops Center (NVBBCC) Planning Meeting held at Brookhaven National Laboratory, Upton, NY (March 30-31); gave an invited seminar titled “Nano-enabled Technologies: Prospective weapons to tackle destructive plant pathogens” to the via MS Teams (30 adult participants) (March 31), and was a chair of the session “Pathogen Remediation” for the DoE meeting (30 adult participants) (March 31).

**DR. WADE ELMER (Emeritus)** participated in the Annual Meeting of the Northeastern APS meeting and presented “Nano Cu for Crop Disease Management” in Southbury, CT (24 attendees) (March 9-10); presented the talk “Earthworms and Soil Health” at the South Windsor community center in South Windsor (23 adults) (March 16).

**DR. MOHAMED-AMINE HASSANI** gave an invited seminar titled “Modulation Of Flower Microbiota to Mitigate Fire Blight Disease Incidence” for Quinnipiac University’s chapter of Sigma XI’s seminar series, at Quinnipiac University (10 adults) (March 6); was awarded SHARP scholarship by Columbia Mailman school of public health for professional development training course (March 21).

**DR. YONGHAO LI** with **MS. FELICIA MILLETT** instructed “Tree Diseases” in the Hands-on Night of the Connecticut Tree Protective Association Arboriculture 101 Course in New Haven (35 adults) (March 2); with **MS. FELICIA MILLETT**, presented “2022 Plant Disease Updates – CAES” at the Northeast Plant Diagnostic Network Regional Meeting in Southbury (21 adults) (March 6); attended Core Accreditation Training in Southbury (March 6-7); presented “Organic Disease Management” at the CT NOFA’s Winter Conference via Zoom (44 adults) (March 8); participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (7 adults) (March 8); presented “Spring and Summer Gardening Tips” to Morris Cove Garden Club in New Haven (13 adults) (March 8); presented “Lawn Care” to the North Haven Garden Club members in North Haven (23 adults) (March 9); attended the National Plant Diagnostic Network Phytophthora 101 Molecular Diagnostics Workshop at USDA-Plant Pathogen Confirmatory Diagnostic Laboratory in Beltsville, MD (March 20-22).

**DR. ROBERT MARRA** met via Zoom with collaborators from the US Forest Service, USDA-ARS, and Japan, to plan the 2024 expedition to Japan to study the foliar nematode disease of Japanese beech, *Fagus crenata* (6 adults) (March 1). Presented an update on beech leaf disease to foresters and tree care professionals at the Forest Health Monitoring Workshop in Jones Auditorium (70 adults) (March 7). Hosted and attended the annual meeting of the Northeastern Division American Phytopathological Society at the Heritage Inn in Southbury, CT (March 8-10) (60 adults). Held a second meeting via Zoom with collaborators from the US Forest Service, USDA-ARS, and Japan, to plan the 2024 expedition to Japan to study the foliar nematode disease of Japanese beech, *Fagus crenata* (March 13) (6 adults). Presented a talk “Fungi of the Forest” to the Bethany Garden Club (20 adults) (March 13). Gave a presentation, via Zoom, on beech leaf disease to the annual meeting of the New England Chapter of the International Society of Arboriculture (110 adults) (March 15). Participated in the TPX Board Meeting (5 adults) (March 17). Was interviewed about beech leaf disease by Susan Robinson of the CT Botanical Society (March 17). Was interviewed about beech leaf disease, and climate change impacts on tree health, by Marguerite Holloway of The New Yorker (March 20). Participated via Zoom in the semi-monthly meeting of the Beech Leaf Disease Working Group (50 adults) (March 31).

**MS. FELICIA MILLETT**, with **DR. YONGHAO LI**, instructed “Tree Diseases” in the Hands-on Night of the Connecticut Tree Protective Association Arboriculture 101 Course in New Haven (35 adults) (March 2); with **DR. YONGHAO LI**, presented “2022 Plant Disease Updates – CAES” at the Northeast Plant Diagnostic Network Regional Meeting in Southbury (21 adults) (March 6); attended Core Accreditation Training in Southbury, CT (March 6-7); presented “2022 Plant Disease Updates – CAES” during the Joint Extension/Industry meeting (40 adults) (March 8) at the annual meeting of the Northeastern Division of the American Phytopathological Society (March 8-10) and presented a talk “Abscission

Points of Trichomes are Host Entry Points of the Fire Blight Pathogen on Apple Leaves” as a participant in the Graduate Student Symposium (60 adults) (March 9); attended two workshops organized by the National Plant Diagnostic Network (NPDN) at the USDA’s Plant Pathogen Confirmatory Diagnostics Laboratory in Laurel, MD: the Phytoplasma Molecular Workshop (March 14-15) and the IsoThermal Amplification Workshop (March 16-17); participated in the NPDN Proficiency Committee Meeting via Zoom (8 adults) (March 21); and was elected to the position of Vice-Chair of the Proficiency Committee; presented “Plant Pathology and Projections” at the Connecticut Tree Protective Association’s Tree Conditions Workshop in New Haven (85 adults) (March 23).

**DR. RAJA MUTHURAMALINGAM** presented a talk titled “Investigating the Use of Nanocarriers for Targeted Gene Therapy in Plant Pathogen Control” at the Annual Meeting of the Northeastern Division of the American Phytopathological Society, Southbury, CT (26 adults) (March 9).

**DR. RAVI PATEL** presented a talk titled “Physiological and Genetic Mechanisms Associated With Antibiotic Persisters of *Pseudomonas syringae* pv. *phaseolicola*” at the Annual Meeting of the Northeastern Division of the American Phytopathological Society, Southbury, CT (26 adults) (March 10).

**DR. RAQUEL ROCHA** participated in a Ph.D. defense committee in Biochemistry from the Federal University of Ceara-Brazil (February 27); initiated an international research collaboration with the Federal University of Minas Gerais-Brazil to study virulence aspects of soilborne plant pathogens (March 3); and participated at the Northeastern APS meeting, where she moderated the "Career Workshop: Networking 101" (March 8-10).

**DR. NEIL SCHULTES** had a Zoom meeting with collaborators Drs. Timothy McNellis (Penn. State University) and Srdjan Acimovic (Virginia Tech. University) to discuss upcoming experiments and grant opportunities (February 14), had a meeting with the Quinipiac Sigma Xi Chapter executive board discussing the upcoming Student Conference in April (February 15), participated in The CAES BSL3 laboratory drills/training in Jones auditorium (February 16), worked with **MR. ETHAN PAINE** in learning Fungal DNA isolation procedures (February 21), attended the Northeast Regional American Phytopathological society meeting in Southbury, CT (March 8-10); had a Zoom conference with **DRS. JASON WHITE, CHAOYI DENG,** Swadeshmukul Santra and Laurene Tetard (University of Central Florida) discussing developing technologies for nano-level pH detection on leaf surfaces (March 15), attended a CAES IACUC meeting (March 22).

**DR. STEPHEN TAERUM** along with **LINDSAY TRIPLETT** led a 90-minute workshop titled “Microbial Predators in Soil - Hunting for Healthy Soil Ecosystems” at the winter meeting of the Northeast Organic Farming Association of Connecticut (CT-NOFA) in Middletown, CT (18 adults) (March 12).

**DR. QUAN ZENG** gave an invited seminar titled “Considering Microbiome In The Host-Microbe Interaction Research” at the Department of Biological Sciences, University of Wisconsin-Milwaukee, in Wisconsin (80 adults) (February 10); met Vijay Choppakatla of Biosafe and discussed collaboration in field studies (February 24); was interviewed by Kate Prengaman from Good Fruit Grower magazine about the use of Blossom Protect in fire



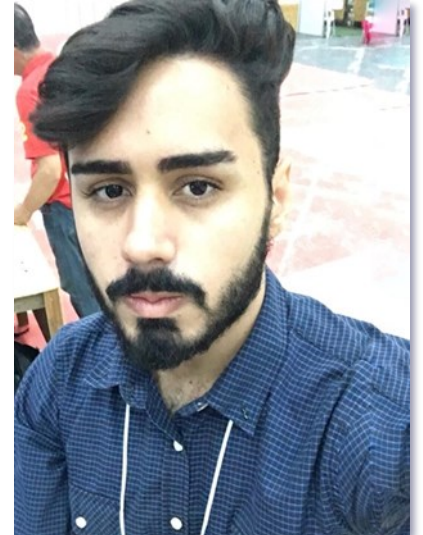
blight control (March 1), had a conference call with Drs Jose Francisco, Andrea Brunelli, and **JASON WHITE** regarding collaboration in using nanoparticle to manage plant diseases (March 8); participated in the Northeastern APS meeting where Ms. Renee Smith, participant in the 2022 CAES Plant Health Fellows program, gave an oral presentation titled “Identification of Yeasts from Apple Flower Microbiome for the Induction of Systemic Induced Resistance in Apple Trees” based on her project mentored by **QUAN ZENG** at The CAES (26 adults) (March 9); and **DR. ZENG** gave an oral presentation “Bacterial Interspecies Communication in Soybean Rhizosphere” in during the annual meeting in Southbury, CT (March 9-10); hosted a group of researchers and graduate students from University of Maine lead by Dr. Jianjun Hao and offered a tour of the station facilities and introduced about ongoing research (March 10); met Dr. Sydney Everhart and introduced about ongoing research programs (March 15); participated in panel discussion about streptomycin resistance in *Erwinia amylovora* in the Northeastern U.S. during the Stupid Question Session webinar at Cornell University (20 adults) (March 15); gave a guest lecture for students at China Agricultural University for their “Plant Protection and Disease Management” class on the topic of “Fire Blight” through Zoom (150 adults) (March 22), gave a guest lecture for students at the Department of Plant, Soil and Microbial Sciences, Michigan State University for their “Prokaryotic Plant Disease” class on the topic of “Innovations in Plant Disease Management” through Zoom (25 adults) (March 28).

## NEW STUDENTS, STAFF, AND VOLUNTEERS



**MR. JOSEPH LIQUORI** started as Plant Research Technician in the Department of Plant Pathology and Ecology on March 10, 2023. Joe earned a BS in Sustainable Plant and Soil Systems from the University of Connecticut, and has two years of experience in wholesale plant propagation and pest control at Summer Hill Nursery in Madison, CT. At The CAES, he will be responsible for maintaining the scheduling, safety training, sanitation, and operation of the greenhouse and other plant growth facilities and providing research support to greenhouse users when available. He grew up in East Haven, completed a minor concentration in Spanish, and lives with his dog in the East Shore section of New Haven.

**Mr. Talison da Costa**, a Ph.D. student from the Universidade Federal Rural do Semi-Árido (UFERSA) in Brazil, will spend one year at the **DA SILVA LABORATORY** at The CAES to work on a project involving RNA interference (RNAi) and nanocarriers to control root rot diseases in melons.



**Dr. Francisco Faggion**, a professor at Universidade de Brasilia (UNB) in Brazil, started a sabbatical at the **DA SILVA LABORATORY** and will work on developing a mini sprayer to test the application of nanocarriers loaded with dsRNA on potato plants in protected environments and in small field trials.

## PUBLICATIONS

1. **Rocha, R.**, Hussey, R., Pepi, L., Azadi, P., and Mitchum, M. (2023). Discovery of novel effector protein candidates produced in the dorsal gland of root-knot nematode adult females. *Molecular Plant-Microbe Interactions*. DOI: [10.1094/MPMI-11-22-0232-R](https://doi.org/10.1094/MPMI-11-22-0232-R)

**Abstract:** Root-knot nematodes (RKN; *Meloidogyne* spp.) represent one of the most damaging groups of plant-parasitic nematodes. They secrete effector proteins through a protrusible stylet to manipulate host cells for their benefit. Stylet-secreted effector proteins are produced within specialized secretory esophageal gland cells, one dorsal (DG) and two subventral (SvG), whose activity differ throughout the nematode life cycle. Previous gland transcriptomic profiling studies identified dozens of candidate RKN effectors, but were focused on the juvenile stages of the nematode when the SvGs are most active. We developed a new approach to enrich for the active DGs of RKN *M. incognita* adult females for RNA and protein extraction. Female heads were manually cut from the body, and a combination of sonication/vortexing was used to dislodge contents inside the heads. DG-enriched fractions were collected by filtering using cell strainers. Comparative transcriptome profiling of pre-parasitic second-stage juveniles, female heads, and DG-enriched samples was conducted using RNA sequencing. Application of an established effector mining pipeline led to the identification of 83 candidate effector genes upregulated in DG-enriched samples of adult females that code for proteins with a predicted signal peptide, but lack transmembrane domains or homology to proteins in the free-living nematode *Caenorhabditis elegans*. *In situ* hybridization resulted in the identification of 14 new DG-specific candidate effectors expressed in adult females. Taken together, we have identified novel candidate *Meloidogyne* effector genes that may have essential roles during later stages of parasitism.

2. **Zeng, Q.**, Johnson, K. B., Mukhtar, S., Nason, S., Huntley, R., Millett, F., Yang, C. H., **Hassani, M. A.**, **Zuverza-Mena, N.**, Abril, M., and Sundin, G. (2023). *Aureobasidium pullulans* from the fire blight biocontrol product, Blossom Protect, induces host resistance in apple flowers. *Phytopathology*. DOI: [10.1094/PHYTO-12-22-0452-R](https://doi.org/10.1094/PHYTO-12-22-0452-R)

**Abstract:** Fire blight, caused by *Erwinia amylovora*, is a devastating disease of apple. Blossom Protect, a product consisting of *Aureobasidium pullulans* as the active ingredient, is one of the most effective biological controls of fire blight. It has been postulated that the mode of action of *A. pullulans* is to compete against and to antagonize epiphytic growth of *E. amylovora* on flowers, but recent studies have found that flowers treated with Blossom Protect harbored similar to only slightly reduced *E. amylovora* populations compared to non-treated flowers. In this study, we tested the hypothesis that *A. pullulans*-mediated biocontrol of fire blight is the result of induced host resistance. We found that PR genes in the systemic acquired resistance pathway, but not genes in the induced systemic resistance pathway, were induced in hypanthial tissue of apple flowers after Blossom Protect treatment. Additionally, the induction of PR gene expression was coupled with an increase of plant-derived salicylic acid in this tissue. After inoculation with *E. amylovora*, PR gene expression was suppressed in non-treated flowers, but in flowers pre-treated with Blossom Protect, the heightened PR expression offset the immune repression caused by *E. amylovora*, and prevented infection. Temporal and spatial analysis of PR-gene induction showed

that induction of PR genes occurred 2 days after Blossom Protect treatment, and required direct flower-yeast contact. Finally, we observed deterioration of the epidermal layer of the hypanthium in some of the Blossom Protect-treated flowers, suggesting that PR-gene induction in flowers may be a result of pathogenesis by *A. pullulans*.

**3. Triplett, L. R., Taerum, S., and Patel, R. R. (2023).** Protists at the plant-bacterial interface: Impacts and prospective applications. *Physiological and Molecular Plant Pathology*. DOI: [10.1016/j.pmpp.2023.102011](https://doi.org/10.1016/j.pmpp.2023.102011)

**Abstract:** Protists are nonfungal eukaryotes that represent a vastly diverse component of plant microbial communities. Predatory protists provide plant microbiome ecosystems with nutrient recycling, culling and dispersal of the bacterial community, and selection and activation of microbial biocontrol or growth promoting traits, all functions important for plant health. Here, we briefly review protist interactions with bacteria in the rhizosphere, following topics discussed at the 12th Japan-US Seminar in Plant Pathology. We discuss how understanding of the specificity and signaling mechanisms of predator-prey interactions at the plant interface could be used to develop novel products and strategies for sustainable crop production.



Thirteen members of the Plant Pathology and Ecology Department participated in the Annual Meeting of the Northeastern Division of the American Phytopathological Society from March 8-10, 2023 in Southbury, CT. *Back row, Left-Right: Quan Zeng, Washington da Silva, Juliana Milagres, Ravikumar Patel, Neil Schultes, Yonghao Li, and Raja Muthuramalingam. Front row: Renee Smith, Wade Elmer, Lindsay Triplett, and Felicia Millett. In attendance but not pictured: are Robert Marra (conference co-organizer) and Raquel Rocha.*

**DR. DEWEI LI** presented a seminar “Indoor Fungi: Hidden molds, and airborne fungal spores” to Yale Environmental Health & Safety via Zoom (22 attendees) (March 6).

**DR. JATINDER S. AULAKH** submitted two factsheets titled “Postemergence Herbicide Tank-mixes for Summer Weed Management” and “Wild Buckwheat Identification and Management in Christmas Trees” for publication in the Real Tree Line Journal (March 16) attended the Northeastern Invasive Plant Council zoom meeting (March 30).

**DR. RICHARD COWLES** presented “CAES Research Projects in Christmas trees” for the Connecticut Christmas Tree Growers’ Association Winter Meeting, Middletown, CT (73 participants) (March 4); lectured on “Life After Neonics?” to the New England Regional Turf Conference, Providence, RI, (80 attendees) (March 9).

**MS. ROSE HISKES**, with **MS. DIANE RIDDLE**, hosted Claire, a girl scout in the diagnostic office for her gardening badge (March 7); **MS. HISKES** chaired a virtual CIPWG Outdoor Educator committee meeting (5 attendees) (March 16).

**DR. JAMES LAMONDIA (Emeritus)** chaired the CT Agricultural Information Council meeting for selection of the CT Outstanding Young Farmer (March 6); and participated in Agriculture Day at the Capital, speaking about the 2022 Century Farm Award recognizing Fairholm Farms (100 attendees) (March 22).

### GRANTS AWARDED

- 1. DR. DEWEI LI** was awarded with a Specialty Crop Block grant (USDA Agreement No. AM21SCBPCT1109) “Study of morel (*Morchella* sp.), a gourmet wild mushroom as an intercrop of Christmas trees.” 2023-2024. \$87,941.
- 2. DR. DEWEI LI** received a one-year grant from Farmington River Coordinating Committee for “Fungal Diversity Study in the Upper Farmington River Watershed.” \$12,235.

### PUBLICATIONS

- Wan, Y., Li, D.-W., Si, Y.-Z., Li, M., Huang, L. and Zhu, L.-H. (2023). Three new species of *Diaporthe* causing leaf blight on *Acer palmatum* from China. *Plant Disease*, 107(3), 849-860. DOI: [10.1094/PDIS-06-22-1475-RE](https://doi.org/10.1094/PDIS-06-22-1475-RE)

**Abstract:** *Diaporthe* spp. are often reported as plant pathogens, endophytes, and saprobes. In this study, three new species (*Diaporthe foliicola*, *D. monospora*, and *D. nanjingensis*) on *Acer palmatum* were described and illustrated based on morphological characteristics and phylogenetic analyses. Phylogenetic relationships of the new species were determined by multilocus phylogenetic analyses based on partial sequences of the internal transcribed spacer (ITS) region, translation elongation factor 1- $\alpha$  (*TEF*),  $\beta$ -tubulin (*TUB*), histone H3 (*HIS*), and calmodulin (*CAL*) genes. Genealogical concordance phylogenetic species recog-

dition with a pairwise homoplasy index test was used to verify the conclusions of the phylogenetic analyses. All species were illustrated and their morphology and phylogenetic relationships with other related *Diaporthe* spp. are discussed. In addition, the tests of Koch's postulates showed that the three new species were pathogens causing leaf blight on *A. palmatum*.

2. Si, Y.-Z., Sun, J.-W., Wan, Y., Chen, Y.-N., He, J., Li, W.-Z., Li, D.-W., and Zhu, L.-H. (2023). *Neofusicoccum cryptomeriae* sp. nov. and *N. parvum* cause stem basal canker of *Cryptomeria japonica* in China. *Fungi*, 9, 404. DOI: [10.3390/jof9040404](https://doi.org/10.3390/jof9040404)

**Abstract:** *Cryptomeria japonica* D. Don is a coniferous tree species widely grown in southern China for its high ornamental value. Recently, during disease surveys in China, a symptom of dieback occurred on *C. japonica* in Nanjing, Jiangsu Province, China. A total of 130 trees were surveyed and more than 90% showed the same symptom. The crowns of affected trees were brown when viewing from a distance, and the bark showed no difference from the healthy ones. In this study, 157 isolates were isolated from the 3 affected plants of *C. japonica*, and based on the living culture on PDA, the fungal isolates were preliminarily divided into 6 groups. Thirteen representative isolates were selected for the pathogenicity test, and seven of them showed obvious pathogenicity on *C. japonica*, causing stem basal canker. These isolates were identified based on comparisons of the DNA sequences of the internal transcribed spacer regions (ITS), partial translation elongation factor 1-alpha (*tef1*),  $\beta$ -tubulin (*tub2*), and DNA-directed RNA polymerase II subunit (*rpb2*) and combined with their morphological characteristics. Results showed that these seven isolates belong to two taxa in *Neofusicoccum*, including a species new to science. The new species, *Neofusicoccum cryptomeriae*, was hereby described and illustrated. The other species was *N. parvum*. Both species were pathogens of stem basal canker of *Cryptomeria japonica*.

3. Liao, Y.-C.-Z., Sun, J.-W., Li, D.-W., Nong, M.-L., and Zhu, L.-H. (2023). The first report of top blight of *Cunninghamia lanceolata* caused by *Diaporthe unshiuensis* and *Diaporthe hongkongensis* in China. *Plant Disease*, 107(3), 962. DOI: [10.1094/PDIS-06-22-1467-PDN](https://doi.org/10.1094/PDIS-06-22-1467-PDN)

**Abstract:** *Cunninghamia lanceolata* (Lamb.) Hook. is an important conifer species widely planted in southern China (Shi et al. 2010). A top blight, with an incidence of 20% (40/200 seedlings), occurred on 1-year-old seedlings of *C. lanceolata* in a nursery in Luzhai, Guangxi, China in August 2021. The disease mainly occurred on shoot tips. The infected needles and shoots appeared brown to brownish red. White conidial tendrils oozed from pycnidia under wet-weather conditions. Lesion margins from fresh samples were cut into small pieces ( $n = 100$ ), which were sterilized according to the method of Mao et al. (2021) and placed on potato dextrose agar (PDA) at 25°C. Three isolates (GXJ2, GXJ4, and GXJ6) were obtained and deposited in the China Forestry Culture Collection Center (CFCC 55717, CFCC 55716, and CFCC 55722). The colony of GXJ2 on PDA was white, with sparse aerial mycelia, and became grey with time. The  $\alpha$  conidia were fusiform, hyaline, aseptate, and  $6.7 \pm 0.6 \times 2.6 \pm 0.2 \mu\text{m}$  ( $n = 30$ ). The  $\beta$  conidia were filiform, hyaline, curved, and  $30.4 \pm 2.1 \times 1.4 \pm 0.1 \mu\text{m}$  ( $n = 30$ ). Colonies of GXJ4 and GXJ6 were white, with moderate aerial mycelia, which collapsed at the center, and the collapsed parts were

iron gray. The  $\alpha$  conidia were  $7.8 \pm 0.8 \times 2.5 \pm 0.2 \mu\text{m}$  ( $n = 30$ ). The  $\beta$  conidia were absent. Morphological characters of three isolates matched those of *Diaporthe* spp. (Gomes et al. 2013). The partial sequences of ITS, *EF1- $\alpha$* , *CAL*,  *$\beta$ -tub*, and *HIS* genes were amplified with primers ITS1/ITS4, EF1-728F/EF1-986R, CAL228F/CAL737R,  $\beta$ t2a/ $\beta$ t2b, and CYLH3F/H3-1b according to the method of Gomes et al. (2013), respectively. The sequences for the five genes of each of three isolates were deposited in GenBank (accession nos. in supplementary material). BLAST results showed that the ITS, *EF1- $\alpha$* ,  *$\beta$ -tub*, *HIS*, and *CAL* sequences of GXJ2 were highly similar (>99%) with sequences of *Diaporthe unshiuensis*, while sequences of GXJ4 and GXJ6 were highly similar (>99%) to those of *D. hongkongensis*. Phylogenetic analyses using concatenated sequences placed GXJ2 in the clade of *D. unshiuensis*, and GXJ4 and GXJ6 in the clade of *D. hongkongensis*. Based on the phylogeny and morphology, GXJ2 was identified as *D. unshiuensis*, and GXJ4 and GXJ6 as *D. hongkongensis*. Pathogenicity tests were performed on nine 1-year-old seedlings of *C. lanceolata*, and 10 needles at shoot tip per seedling were slightly wounded and inoculated with 5-mm mycelial plugs from one of three isolates. Three control seedlings were treated with PDA plugs. Each plant was covered with a plastic bag after inoculation and kept in an air-conditioned nursery at 25°C/16°C (day/night). Symptoms appeared 5 to 8 days after inoculation and were similar to those observed in the nursery. *D. unshiuensis* and *D. hongkongensis* were reisolated from the inoculated seedlings and were confirmed based on morphology and ITS sequences. The controls were symptomless, and no fungus was isolated from them. *D. unshiuensis* was first reported as an endophyte on the fruit of *Citrus unshiu* (Huang et al. 2015) and caused peach constriction canker (Wang et al. 2021) and shoot blight of kiwifruit (Du et al. 2021). *D. hongkongensis* was first described from fruit of *Dichroa febrifuga* (Gomes et al. 2013) and caused shoot canker of pear (Guo et al. 2020), shoot blight and leaf spot of kiwifruit (Du et al. 2021), and fruit rot of peach (Zhang et al. 2021). This is the first report of *D. unshiuensis* and *D. hongkongensis* causing top blight of *C. lanceolata*. This study provides a basis for controlling this newly emerging disease in the nursery.

**Brackney, D.** and Vogels, C. The known unknowns of Powassan virus ecology. *Journal of Medical Entomology*.

Channab, A.-E., El Idrissi, A., Zahouilyac, M., and **White, J. C.** Starch-based controlled release fertilizers: A review. *International Journal of Biological Macromolecules*.

Daughtrey, M. L., Luster, D. G., Calabro, J., Gray, J., Hall, C., Weiland, J. E., Baysal-Gurel, F., Gouker, F...**LaMondia, J. A.**...and Hong, C. Fighting a good fight against an invasive pathogen through an international consortium: The Boxwood Blight Insight Group (BBIG). *Phytopathology*.

**Fisher, K.**, and Bradbury, S. Monarch breeding habitat restoration: How movement ecology research can inform best practices for site selection. *Current Opinions in Insect Science*.

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**Rutledge, C. E.** and Clark, R. E. Temporal and spatial dynamics of the emerald ash borer invasion in Connecticut as shown by the native digging wasp *Cerceris fumipennis* (Hymenoptera: Crabronidae). *Frontiers in Insect Science*.

**Schultes, N. P.**, Sinn, J. P., and McNellis, T. W. Glyceraldehyde-3-phosphate dehydrogenase is required for fire blight disease establishment in apple fruitlets. *Physiological and Molecular Plant Pathology*.

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**Shepard, J. J.** and **Armstrong, P. M.** Jamestown Canyon virus comes into view: Understanding the threat from an underrecognized arbovirus. *Journal of Medical Entomology*.

Si, Y.-Z., Sun, J.-W., Wan, Y., Chen, Y.-N., He, J., Li, W.-Z., **Li, D.-W.**, and Zhu, L.-H. *Neofusicoccum cryptomeriae* sp. nov. and *N. parvum* cause stem basal canker of *Cryptomeria japonica* in China. *Journal of Fungi*.



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# STATION NEWS

Staver, L. W., Stevenson, J. C., Cornwell, J. C., Nidzeiko, N. J., Staver, K. W., Owens, M. S. and **Elmer, W. H.** Silicon pools, fluxes and the potential benefits of a soil amendment in a nitrogen-enriched tidal marsh restoration. *Frontiers in Ecology and Evolution*.

Tuga, B., O’Keefe, T., **Deng, C.**, Ligocki, A., **White, J. C.**, and Haynes, C. Designing nanoparticles for sustainable agricultural applications. *Trends in Chemistry*.

Vollmar, A. K. R., Lin, E. Z., **Nason, S. L.**, Santiago, K., Johnson, C. H., Ma, X., Godri Pollitt, K. J., and Deziel, N. C. Per- and polyfluoroalkyl substances (PFAS) and thyroid hormone measurements in dried blood spots and neonatal characteristics: A pilot study. *Journal of Exposure Science and Environmental Epidemiology*.



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