

# Station News

The Connecticut Agricultural Experiment Station  
Volume 13 Issue 11 | November 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*

## This Issue

Administration	2
Analytical Chemistry	7
Entomology	9
Environmental Science and Forestry	15
Plant Pathology and Ecology	20
Valley Laboratory	26
Journal Articles Approved	27



**JASON C. WHITE, PH.D.**, along with **SARA THOMAS, PH.D.**, **SARA NASON, PH.D.**, and **NUBIA ZUVERZA-MENA, PH.D.**, participated in a Zoom call with collaborators from the University of Minnesota and Yale University to discuss progress on a joint NIEHS grant on PFAS phytoremediation (October 3); along with **CHRISTIAN DIMKPA, PH.D.** and **SHITAL VAIDYA, PH.D.**, hosted a Zoom call with collaborators at Johns Hopkins University to discuss progress on a joint USDA nanoscale phosphorus project (October 4); met by Teams with representatives of the agrichemical company Mosaic to discuss funding and research (October 5); participated by Zoom in the weekly all hands call for the NSF Center for Sustainable Nanotechnology (CSN) (October 4 & 25); represented CAES at Jones Family Farms where Terry Jones was presented with the Leopold Conservation Award (October 4); met by Teams with collaborators at the University of Minnesota and Katana Agriscience Corporation to discuss collaborative research (October 5 & 19); along with **MICHAEL LAST** hosted representatives from OPM and OFA during the CAES New Staff Meet and Greet event (October 6); participated in the monthly CSN Faculty meeting (October 6); met with staff from the Chief States Attorneys office to discuss upcoming testimony as the State Chemist (October 6); traveled to the University of Parma in Parma Italy and gave several lectures on sustainable nanotechnology and agriculture (October 9-13); met by Zoom with collaborators at Guangdong University of Technology to discuss joint research projects (October 12); gave a presentation by Zoom titled “Nano-enabled agriculture: A path to global food security in a changing climate” to the University of Minnesota, 9-9-9 Workshop on Science and Engineering in Agriculture and Biology (October 16); met by Teams with Professor Saion Sinha of the University of New Haven and of 12-15 Molecular Diagnostics to discuss collaborative research (October 17); met by collaborators at the University of California Irvine to discuss collaborative research on the USDA Closer to Zero initiative (October 17); hosted the quarterly CAES Board of Control meeting at the Valley Laboratory (October 18); provided testimony as the State Chemist for the Chief States Attorneys office in Bridgeport Superior Court (October 18); participated in the monthly board meeting of the International Phytotechnology Society (October 19); hosted and gave a CAES tour to Diwa Ratnam of Katana Agriscience Corporation (October 19); traveled to the University of Delaware and gave a seminar to the Department of Plant and Soil Sciences titled “Nano-enabled agriculture: A path to global food security in a changing climate” (October 19-20); participated in MS Thesis presentation and defense by Lucas Casabury, a master's student in the Plant and Soil Sciences Graduate Program (Jason White was on his committee) (October 23); along with the Department of Analytical Chemistry hosted Professor Saion Sinha of the University of New Haven and of 12-15 Molecular Diagnostics and his team for a product demonstration (October 24); participated in the PhD Dissertation defense of Gurpal Singh at the University of Massachusetts (October 26); participated in the CAHNR Dean’s Advisory Board at the University of Connecticut (October 26); hosted the quarterly meeting of the CAES Safety Committee (October 27); participated in a Zoom call with collaborators at the University of Massachusetts to discuss progress on a joint USDA proposal on nanoscale sulfur (October 27); traveled to St. Louis and gave a presentation titled “Nanobiotechnology-based strategies for enhanced crop resilience” at the 2023 ASA, CSSA, SSSA International Annual Meeting (October 29-31); and along with **NUBIA ZUVERZA-MENA, PH.D.** and **TRUNG BUI, PH.D.**, participated in a monthly USDA grant meeting on micro-nanoplastics with collaborators at Rutgers University and the New Jersey Institute of Technology (October 30).

## PUBLICATIONS:

1. Yue, L., Tao, M., Xu, L., Wang, C., Xu, Y., Liu, Y., Cao, X., **White, J. C.**, and Wang, Z. (2024). Size-dependent photocatalytic inactivation of *Microcystis aeruginosa* and degradation of microcystin by a copper metal organic framework *J. Haz. Mat.* 462, 132799.

**Abstract:** Water eutrophication has led to increasingly serious algal blooms (HABs) that pose significant threats to aquatic environmental and human health. Differently sized copper metal organic frameworks (Cu-MOF), including Cu-MOF-1 (30 nm), Cu-MOF-2, (40 nm), Cu-MOF-3 (50 nm), and Cu-MOF-4 (1  $\mu\text{m}\times 100\text{ nm}$ ), were prepared to inactivate *Microcystis aeruginosa* and degrade microcystin under visible light irradiation. The photocatalytic inactivation of *Microcystis aeruginosa* and microcystin degradation induced by Cu-MOFs exhibited significant size-dependent efficiency, following the order Cu-MOF-4 > Cu-MOF-3  $\approx$  Cu-MOF-2 > Cu-MOF-1. Mechanistically, 1) heteroaggregation between algal cells and the photocatalyst is a prerequisite for eliminating harmful algae by photocatalysis, with Cu-MOF-4 exhibiting greater heteroaggregation with algal cells than other Cu-MOFs; 2) Cu-MOF-4 had greater electron-hole pairs separation ability, thus exhibiting higher reactive oxygen species (ROS) production; 3) Cu-MOF-4 had greater hydrostability than other Cu-MOFs, leading to more sustained ROS ( $\text{O}_2^-$  and  $\cdot\text{OH}$ ) generation. Additionally, the reusability and anti-algal activity of Cu-MOF-4 in natural waters was greater than other Cu-MOFs. These findings provide mechanistic insight into the effect of particle size on photocatalytic inactivation of harmful algae, as well as the degradation of microcystin by Cu-MOF, and demonstrate the significant potential of this photocatalytic strategy for controlling harmful algal blooms.

2. Sigmon, L. R., **Vaidya, S.**, Thrasher, C., Mahad, S., **Dimkpa, C. O.**, **Elmer, W.**, **White, J. C.**, and Fairbrother, D. H. (2023). Role of phosphorus and biodegradable polymer type on phosphorus fate and efficacy in a plant-soil system. *J. Agric. Food Chem.* <https://doi.org/10.1021/acs.jafc.3c04735>

**Abstract:** Phosphorus (P) is critical for crop production but has high nutrient use inefficiency. Tomato was grown in soil amended with five P-sources, used as-is or embedded within a biodegradable polymer, polyhydroxyalkanoate (PHA). Correlation analysis identified treatments that maintain plant growth, improve bioavailable soil P, and reduce P loss. Three performance classes were identified: (i) micro- and nano-hydroxyapatite, which did not increase bioavailable P, plant P-uptake, or change P in runoff/leaching compared to controls; (ii) monocalcium phosphate (MCP), dicalcium phosphate (DCP), calcium pyrophosphate nanoparticles (CAP), and PHA-MCP that increased P-uptake and/or bioavailable P but also increased P loss in runoff/leaching; and (iii) PHA-DCP and PHA-CAP, where increased bioavailable P and plant P-uptake were achieved with minimal P loss in runoff/leaching. In addition to identifying treatments that maintain plant growth, increase bioavailable P, and minimize nutrient loss, correlation plots also revealed that (i) bioavailable P was a good indicator of plant P-uptake; (ii) leached P could be predicted from water solubility; and (iii) P loss through runoff versus leaching showed similar trends. This study highlights that biopolymers can promote plant P-uptake and improve bioavailable soil P, with implications for mitigating the negative environmental impacts of P loss from agricultural systems.

3. Deng, C., Protter, C. R., Wang, Y., Borgatta, J., Zhou, J., Wang, P., Goyal, V., Brown, H., Rodriguez-Otero, K., Dimkpa, C. O., Hernandez, R., Hamers, R. J., White, J. C., and Elmer, W. H. (2023). Nanoscale CuO charge and morphology control Fusarium suppression and nutrient biofortification in field-grown tomato and watermelon. *Sci. Tot. Environ.* 905, 167799.

**Abstract:** Limited data exist on how surface charge and morphology impact the effectiveness of nanoscale copper oxide (CuO) as an agricultural amendment under field conditions. This study investigated the impact of these factors on tomatoes and watermelons following foliar treatment with CuO nanosheets (NS-) or nanospikes (NP+ and NP-) exhibiting positive or negative surface charge. Results showed plant species-dependent benefits. Notably, tomatoes infected with *Fusarium oxysporum* had significantly reduced disease progression when treated with NS-. Watermelons benefited similarly from NP+. Although disease suppression was significant and trends indicated increased yield, the yield effects weren't statistically significant. However, several nanoscale treatments significantly enhanced the fruit's nutritional value, and this nano-enabled biofortification was a function of particle charge and morphology. Negatively charged nanospikes significantly increased the Fe content of healthy watermelon and tomato (20-28%) and Ca in healthy tomato (66%), compared to their positively charged counterpart. Negatively charged nanospikes also outperformed negatively charged nanosheets, leading to significant increases in the content of S and Mg in infected watermelon (37-38%), Fe in healthy watermelon (58%), and Ca (42%) in healthy tomato. These findings highlight the potential of tuning nanoscale CuO chemistry for disease suppression and enhanced food quality under field conditions.

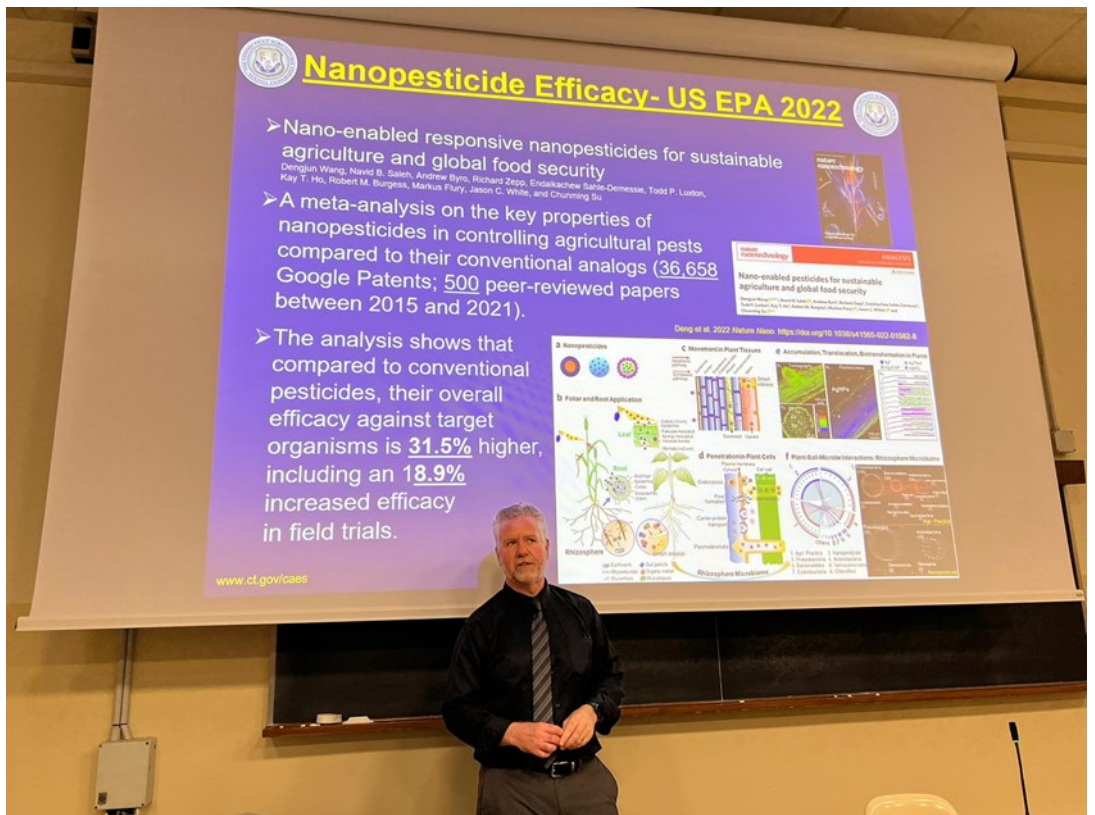
4. Hao, Y., Cai, Z., Ma, C., White, J. C., Cao, Y., Chang, Z., Xu, X., Han, L., Kia, W., Zhao, J., and Xing, B. (2023). Root exposure of graphitic carbon nitride (g-C3N4) modulates metabolite profile and endophytic bacterial community to alleviate cadmium and arsenate-induced phytotoxicity to rice (*Oryza sativa* L.). *ACS Nano*. In press.

**Abstract:** To investigate the mechanisms by which g-C3N4 alleviates the metal(loid)-induced phytotoxicity, rice seedlings were exposed to 50 and 250 mg/kg graphitic carbon nitride (g-C3N4) with or without co-exposure to 10 mg/kg Cd and 75 mg/kg As for 35 days. Treatment with 250 mg/kg g-C3N4 significantly increased shoot and root fresh weight by 22.4-29.9%, reduced Cd and As accumulations in rice tissues by 20.6-26.6%, and elevated the content of essential nutrients (e.g., K, S, Mg, Cu, and Zn) as compared to untreated controls. High-throughput sequencing showed that g-C3N4 treatment increased the proportion of plant growth promoting endophytic bacteria, including Streptomyces, Saccharimonadales, and Thermosporothrix, by 0.5-3.30 fold; these groups are known to be important to plant nutrient assimilation, as well as metal(loid)s resistance and bioremediation. In addition, the population of *Deinococcus* was decreased by 2.34-fold; this genera is known to inhibit the biotransformation As (V) to As (III). Metabolomics analyses highlighted differentially expressed metabolites (DEMs) involved in the metabolism of tyrosine metabolism, pyrimidines, and purines, as well as phenylpropanoid biosynthesis related to Cd/As-induced phytotoxicity. In the phenylpropanoid biosynthesis pathway, the increased expression of 4-coumarate (1.13-fold) and sinapyl alcohol (1.26-fold) triggered by g-C3N4 co-exposure with Cd or As played a critical role in promoting plant growth and enhancing rice resistance against metal(loid) stresses. Our findings demonstrate the potential of g-C3N4 to enhance plant growth and minimize the Cd/As-induced toxicity in rice, and pro-

vide a promising nano-enabled strategy for remediating heavy metal(loid)-contaminated soil.

5. Teng, M., Li, Y., Zhao, X., **White, J. C.**, Zhao, L., Sun, J., Zhao, W., and Wu, F. (2023). Vitamin D modulation of brain-gut-virome disorder caused by polystyrene nanoplastics exposure in zebrafish (*Danio rerio*). *Microbiome*. In press.

**Abstract:** Many studies have investigated how nanoplastics (NPs) exposure mediates nerve and intestinal toxicity through a dysregulated brain-gut axis interaction, but there are few studies aimed at alleviating those effects. To determine whether and how vitamin D can impact that toxicity, fish were supplemented with a vitamin D-low diet and vitamin D-high diet. Transmission Electron Microscopy (TEM) showed that Polystyrene nanoplastics (PS-NPs) accumulated in zebrafish brain and intestine, resulting in brain blood-brain barrier basement membrane damage and the vacuolization of intestinal goblet cells and mitochondria. A high concentration of vitamin D reduced the accumulation of PS-NPs in zebrafish brain tissues by 20%, intestinal tissues by 58.8% and 52.2%, respectively, and alleviated the pathological damage induced by PS-NPs. Adequate vitamin D significantly increased the content of serotonin (5-HT) and reduced the anxiety-like behavior of zebrafish caused by PS-NPs exposure. Virus metagenome showed that PS-NPs exposure affected the composition and abundance of zebrafish intestinal viruses. Differentially expressed viruses in the vitamin D-low and vitamin D-high group affected the secretion of brain neurotransmitters in zebrafish. Virus AF191073 was negatively correlated with neurotransmitter 5-HT, whereas KT319643 was positively correlated with malondialdehyde (MDA) content and the expression of cytochrome 1a1 (*cyp1a1*) and cytochrome 1b1 (*cyp1b1*) in the intestine. This suggests that AF191073 and KT319643 may be key viruses that mediate the vitamin D reduction in neurotoxicity and immunotoxicity induced by PS-NPs. Vitamin D can alleviate neurotoxicity and immunotoxicity induced by PS-NPs exposure by directionally altering the gut virome. These findings highlight the potential of vitamin D to alleviate the brain-gut-virome disorder caused by PS-NPs exposure and suggest potential therapeutic strategies to reduce the risk of NPs toxicity in aquaculture, that is, adding adequate vitamin D to diet.



Jason White lecturing at the University of Parma, Parma Italy.

**CHRISTIAN DIMKPA, PH.D.**, was a keynote speaker at the 1st International Conference on Soil Sustainability and Innovation (ICSSI) as part of the 47th National Congress of Soil Sciences activities of Mexico. He gave a presentation on *Nanomaterials in agriculture: insights into soil health and quality implications*. The event took place at the National Autonomous University of Mexico (UNAM) Mexico City from October 16 to 20, 2023. The congress brought together scientists, academics, technicians, students, businesspeople, and agricultural and forestry producers to exchange experiences related to the rational and efficient use of soil resources that ultimately lead to sustainable development. Attendance was approximately 150 participants. During the meeting, a group of the participants visited the CORENADR Agricultural Research Center in Xochimilco (pictured).

**CARLOS TAMEZ, PH.D.** attended the EPA National Pesticide Laboratory Workshop for training in a quaternary ammonium herbicide residue extraction method. The event also included discussions on working in labs that are ISO 17025 accredited, use laboratory information management systems (LIMS), and/or are paperless. Additionally, there was a seminar about providing expert testimony. This workshop was hosted by the Wisconsin Department of Agriculture, Trade, and Consumer Protection in Madison, WI, October 24–27, 2023.

#### PUBLICATIONS:

1. Sigmon\*, L. R., Vaidya\*, S. R., Thrasher, C., Mahad, S., Dimkpa, C. O., Elmer, W., White, J. C., and Fairbrother, D. H. (2023). Identifying the role of phosphorous type and biodegradable polymer on phosphorus fate in a plant-soil system to optimize treatment efficacy and sustainability. *Journal of Agricultural and Food Chemistry*, 71, 16493–16503. DOI: [10.1021/acs.jafc.3c04735](https://doi.org/10.1021/acs.jafc.3c04735)

**Abstract:** Phosphorus (P) is critical for crop production but has a high nutrient use inefficiency. Tomato was grown in soil amended with five P-sources, used as-is, or embedded within a biodegradable polymer, polyhydroxyalkanoate (PHA). Correlation analysis identified treatments that maintain plant growth, improve bioavailable soil P, and reduce P loss. Three performance classes were identified: (i) micro- and nanohydroxyapatite, which did not increase bioavailable P, plant P-uptake, or change P in runoff/leaching compared to controls; (ii) monocalcium phosphate (MCP), dicalcium phosphate (DCP), calcium pyrophosphate nanoparticles (CAP), and PHA-MCP that increased P-uptake and/or bioavailable P but also increased P loss in runoff/leaching; and (iii) PHA-DCP and PHA-CAP, where increased bioavailable P and plant P-uptake were achieved with minimal P loss in runoff/leaching. In addition to identifying treatments that maintain plant growth, increase bioavailable P, and minimize nutrient loss, correlation plots also revealed that (i) bioavailable P was a good indicator of plant P-uptake; (ii) leached P could be predicted from water solubility; and (iii) P loss through runoff versus leaching showed similar trends. This study highlights that biopolymers can promote plant P-uptake and improve bioavailable soil P, with implications for mitigating the negative environmental impacts of P loss from agricultural systems.



At the 1st International Conference on Soil Sustainability and Innovation (ICSSI) as part of the 47th National Congress of Soil Sciences activities of Mexico, a group of the participants visited the CORENADR Agricultural Research Center in Xochimilco.



**Carlos Tamez** attended the EPA National Pesticide Laboratory Workshop for training in a quaternary ammonium herbicide residue extraction method.





**GOUDARZ MOLAEI, PH.D.** with Ary Faraji, Ph.D. and **THEODORE G. ANDREADIS, PH.D.** organized and co-edited a “Special Collection: Emerging and Lesser-Known Arboviruses Impacting Animal and Human Health”, which included 10 articles, for the Journal of Medical Entomology (October 20); provided an overview of the CAES tick and tick-borne disease surveillance programs to the state auditors (October 6); participated in the Northeast Regional Center for Excellence in Vector-Borne Diseases (NEVBD) and Training and Evaluation Center (TEC) Leadership meeting (October 17); and participated in the monthly meeting of the CT Tick-borne Disease group, including CAES, CT Department of Public Health (CT DPH), and Yale Emerging Infections Program, and presented a short talk about tick and tick-borne disease activity in Connecticut (October 31).

**PHILIP ARMSTRONG, PH.D.** gave an overview of the mosquito surveillance program to state auditors (October 6); met with the Connecticut Commissioner of Public Health and DPH staff to discuss recent EEE virus activity in Connecticut and responses to protect the public (October 10); and served on NIH study section to review grant applications and met with the panel in Arlington, VA (October 12-13).

**TIA M. BLEVINS** participated in the Horticultural Inspection Society (HIS) Eastern Chapter’s 2023 Interstate Inspection Meeting, held in Lewiston, NY. The group of 46 inspectors from the Eastern Chapter and Central Chapter of HIS visited multiple locations to observe box tree moth infestations (October 2-5); traveled to Sandwich, MA, with personnel from USDA-APHIS-Plant Protection and Quarantine and from Massachusetts and Rhode Island, to observe box tree moth at two locations (October 19).

**ANGELA BRANSFIELD** met with representatives from the Office of Policy and Management and Office of Fiscal Analysis to talk about research conducted in the BSL3 Laboratory (October 6); participated via Zoom in Yale University’s Biosafety Committee meeting (October 19); participated in the Federal Select Agent Program’s Responsible Official webinar “Restricted Experiments and Enhanced Select Agents and Toxins Workgroup (Form 1: Section 7), History and Evolution of the U.S. Federal Select Agent Program (FSAP): 20 Years and Counting” (October 26); participated in a CAES Health and Safety Committee meeting (October 27); and participated in a CAES DEI Disability and Accessibility subcommittee meeting (October 31).

**KELSEY FISHER, PH.D.** presented at the Entomology monthly journal club (October 5); met with University of Maryland collaborators and presented during their seminar series (October 12-13); was interviewed by Rich Hill and Laura Modlin on the Organic Farm Stand radio show on WPKN 89.5 (October 19); hosted scientists from University of Guelph, the Ohio State University, and Bayer Agrosiences to monitor European corn borer populations in Connecticut (October 20); and provided information about research for credit opportunities at CAES for Quinnipiac students (October 24).

**MEGAN LINSKE, PH.D.** participated in the Northeast Section of the Wildlife Society’s (NETWS) Executive Committee Zoom meeting as Section Past President and Workshop Committee Chairperson (October 3); participated in a meeting with Banfield Bio, Inc. and North Carolina State University to discuss updates in field and laboratory trials (October 4); participated in the Deer-Targeted Tick-Control Working Group’s monthly meeting (October 4); participated in a collaborative meeting with members of MaineHealth to dis-

cuss the CDC-funded, five year systemic acaricide study (October 11); participated in the Northeast Regional Center for Excellence in Vector-Borne Diseases (NEVBD) and Training and Evaluation Center (TEC) Leadership meeting (October 17); and participated in a call with staff from the CDC Division of Vector-Borne Diseases on progress made on a funded integrated tick management project (October 18).

**JACOB RICKER** attended NPB's 2023 Interstate Inspection Meeting, in Lewiston, NY, which included discussion, presentations, and field meetings (October 2-5); virtually attended UMass Extension's 2023 Invasive Insect Certification Program (October 10-11); and participated in a multiagency field meeting to investigate box tree moth infestations in Barnstable County, MA (October 19).

**GALE RIDGE, PH.D.** had a table at the annual Bethany Harvest Festival (October 1); interviewed by the Danbury News Times about the Spotted Lanternfly, *Lycoma delicatula*, its distribution in Connecticut and feeding damage (October 2); interviewed via Zoom by WFSB Channel 3 about brown marmorated stink bugs, Western conifer seed bugs, and multi-colored Asian lady beetles entering citizens home (October 3); interviewed by WNBC CT about brown marmorated stink bugs and why they were entering citizens homes (October 3); interviewed about insects and plants of the Autumn by the West Hartford digital paper WeHa (October 3); interviewed by Channel 8 News about stink bugs and why there were more this year (October 5); interviewed by the Hearst Media, CT about stink bugs and how to manage them in buildings (October 5); presented a talk on Asian jumping worms via Zoom as part of the Cornell University New York State IPM program (October 6); and interview by Time Magazine about a current issue of bed bug infestations in Paris prior to the 2024 summer Olympics which the city is hosting (October 6).

**VICTORIA SMITH, PH.D.** was interviewed by the Danbury News Times about spotted lanternfly (October 2); participated in the Horticultural Inspection Society Eastern Chapter 2023 Interstate Inspection Meeting in Lewiston, NY, concerning box tree moth (October 2-5); participated in the Invasive Insect Certification Program, sponsored by UMass, held via Zoom (October 10-11); traveled to Sandwich, MA, with personnel from USDA-APHIS -Plant Protection and Quarantine and from Massachusetts and Rhode Island, to observe box tree moth (October 19); participated in the National Plant Board Safeguarding Meeting regarding box tree moth in Cincinnati, OH (October 24-25).

**KIRBY C. STAFFORD III, PH.D** (Emeritus) presented a talk on tick management for the Tick Academy (October 12); participated via Zoom in a meeting of the CAES Institutional Animal Care and Use Committee (October 18); and presented a talk on the history of CAES titled "Birth of an Idea: A History of the Connecticut Agricultural Experiment Station" for the luncheon seminar series (October 18).

**KIMBERLY STONER, PH.D.** (Emeritus) staffed a table at the Gather New Haven Harvest Festival, representing CT NOFA (October 1); was interviewed by WNHH New Haven Independent Radio about the CT Environmental Rights Amendment and entomology (October 3); participated in a meeting of the Working Lands Alliance Steering Committee (October 17); organized and led a forum on the Farm Bill for CT NOFA and the CT Climate Crisis Mobilization (October 22); and met with CT Senator Martin Looney as part of a Climate, Coffee, and Conversation organized by the League of Conservation Voters (October 25).

## PUBLICATIONS:

1. Faraji A., Molaei G., and Andreadis T. G. (2023). Special Collection: Emerging and Lesser-Known Arboviruses Impacting Animal and Human Health. *Journal of Medical Entomology*, 60(6), 1139–1141. <https://doi.org/10.1093/jme/tjad140>

**Abstract:** Arboviruses (arthropod-borne viruses) are a class of viral pathogens that are transmitted by arthropod vectors in nature. They are responsible for many vector-borne diseases that continue to plague humans and animals and impact the health of ecosystems globally. The biological transmission of arboviruses generally occurs in nature between susceptible vertebrate hosts and hematophagous insects such as biting midges, mosquitoes, and ticks. The morbidity and mortality associated with vector-borne diseases have not lessened in recent years but continue to rise as a result of changes in climate, land use patterns, rapidity and frequency of worldwide human travel, increases in animal migrations and trade, and the continuing geographic range expansion of insect vector species.

2. Shepard J. J., and Armstrong P. M. (2023). Jamestown Canyon Virus Comes Into View: Understanding the Threat from an Underrecognized Arbovirus. *Journal of Medical Entomology*, 60(6), 1242–1251. <https://doi.org/10.1093/jme/tjad069>

**Abstract:** This review examines the epidemiology, ecology, and evolution of Jamestown Canyon virus (JCV) and highlights new findings from the literature to better understand the virus, the vectors driving its transmission, and its emergence as an agent of arboviral disease. We also reanalyze data from the Connecticut Arbovirus Surveillance Program which represents the largest dataset on JCV infection in mosquitoes. JCV is a member of the California serogroup of the genus Orthobunyavirus, family Peribunyaviridae, and is found throughout much of temperate North America. This segmented, negative-sense RNA virus evolves predominately by genetic drift punctuated by infrequent episodes of genetic reassortment among novel strains. It frequently infects humans within affected communities and occasionally causes febrile illness and neuroinvasive disease in people. Reported human cases are relatively rare but are on the rise during the last 20 yr, particularly within the northcentral and northeastern United States. JCV appears to overwinter and reemerge each season by transovarial or vertical transmission involving univoltine *Aedes* (Diptera: Culicidae) species, specifically members of the *Aedes communis* (de Geer) and *Ae. stimulans* (Walker) Groups. The virus is further amplified in a mosquito-deer transmission cycle involving a diversity of mammalophilic mosquito species. Despite progress in our understanding of this virus, many aspects of the vector biology, virology, and human disease remain poorly understood. Remaining questions and future directions of research are discussed.

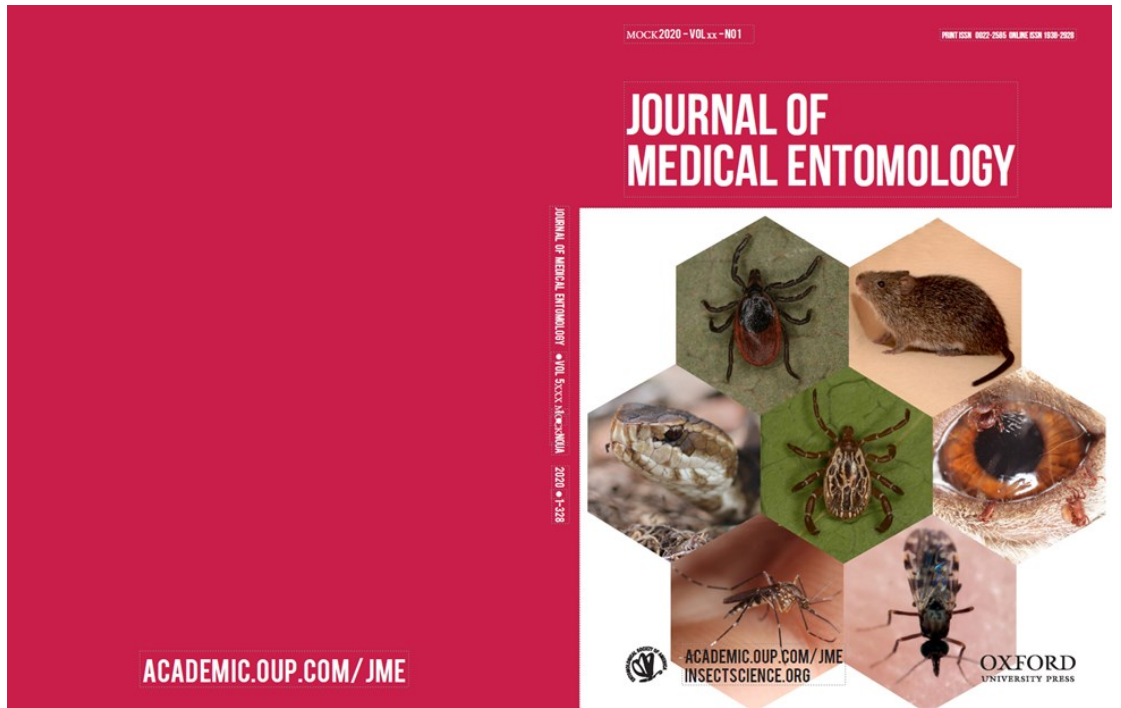
3. Brackney, D. E., and Vogels, C. B. F. (2023). The Known Unknowns of Powassan Virus Ecology. *Journal of Medical Entomology*, 60(6), 1142–1148. <https://doi.org/10.1093/jme/tjad095>

**Abstract:** Powassan virus (POWV; Family: Flaviviridae, Genus: Flavivirus) is the sole North American member of the tick-borne encephalitis sero-complex. While associated with high rates of morbidity and mortality, POWV has historically been of little public health concern due to low incidence rates. However, over the last 20 yr, incidence rates have increased highlighting the growing epidemiological threat. Currently, there are no

vaccines or therapeutics with tick habitat reduction, acaricide application, and public awareness programs being our primary means of intervention. The effectiveness of these control strategies is dependent on having a sound understanding of the virus's ecology. In this Forum, we review what is currently known about POWV ecology, identify gaps in our knowledge, and discuss prevailing and alternative hypotheses about transmission dynamics, reservoir hosts, and spatial focality.

4. Soghigian, J., Sither, C., Justi, S. A., Morinaga, G., Cassel, B. K., Vitek, C. J., Livdahl, T., Xia, S., **Gloria-Soria, A.**, Powell, J.R., Zavortink, T., Hardy, C. M., Burkett-Cadena, N. D., Reeves, L. E., Wilkerson, R. C., Dunn, R. R., Yeates, D. K., Sallum, M. A., Byrd, B. D., Trautwein, M. D., Linton, Y.-M., Reiskind, M. H., and Wiegmann, B. M. (2023). Phylogenomics Reveals the History of Host Use in Mosquitoes. *Nat. Commun.* 14, 6252. <https://doi.org/10.1038/s41467-023-41764-y>

**Abstract:** Mosquitoes have profoundly affected human history and continue to threaten human health through the transmission of a diverse array of pathogens. The phylogeny of mosquitoes has remained poorly characterized due to difficulty in taxonomic sampling and limited availability of genomic data beyond the most important vector species. Here, we used phylogenomic analysis of 709 single copy ortholog groups from 256 mosquito species to produce a strongly supported phylogeny that resolves the position of the major disease vector species and the major mosquito lineages. Our analyses support an origin of mosquitoes in the early Triassic (217 MYA [highest posterior density region: 188–250 MYA]), considerably older than previous estimates. Moreover, we utilize an extensive database of host associations for mosquitoes to show that mosquitoes have shifted to feeding upon the blood of mammals numerous times, and that mosquito diversification and host-use patterns within major lineages appear to coincide in earth history both with major continental drift events and with the diversification of vertebrate classes.



Special Collection: Emerging and Lesser-Known Arboviruses Impacting Animal and Human Health. By Ary Faraji, **Goudarz Molaei, Ph.D.**, and **Theodore G. Andreadis, Ph.D.**



**Victoria Smith, Ph.D.**

Examination of box tree moth infested boxwoods in an arboretum near Cincinnati, OH.



Group of inspectors from Eastern and Central Chapters of the Horticultural Inspection Society.



Three box tree moth pupae (*Cydalima perspectalis*), at different levels of maturity. Photographed by **Jacob Ricker**.



Close-up of a box tree moth larvae (*Cydalima perspectalis*), resting on a damaged boxwood leaf with frass. Photographed by **Jacob Ricker**.

## GRANTS AWARDED:

**1. ITAMAR SHABTAI, PH.D.** received a Foundation for Food & Agriculture Research's (FFAR) New Innovator Award "Evaluating the use of calcium containing amendments to manage the bioavailability of organic carbon in agricultural soils" \$449,607, as PI.

## PUBLICATIONS:

**1. Hyde, J., Brackney, D. E., and Steven, B. (2023).** Three species of axenic mosquito larvae recruit a shared core of bacteria in a common garden experiment. *Applied and Environmental Microbiology*. DOI: [10.1128/aem.00778-23](https://doi.org/10.1128/aem.00778-23)

**Abstract:** In this study, we describe the generation of two new species of axenic mosquito, *Aedes albopictus* and *Aedes triseriatus*. Along with *Aedes aegypti*, axenic larvae of these three species were exposed to an environmental water source to document the assembly of the microbiome in a common garden experiment. Additionally, the larvae were reared either individually or combinatorially with the other species to characterize the effects of co-rearing on the composition of the microbiome. We found that the microbiome of the larvae was composed of a relatively low-diversity collection of bacteria from the colonizing water. The abundance of bacteria in the water was a poor predictor of their abundance in the larvae, suggesting the larval microbiome is made up of a subset of relatively rare aquatic bacteria. We found 11 bacterial 16S rRNA gene amplicon sequence variants (ASVs) that were conserved among  $\geq 90\%$  of the mosquitoes sampled, including 2 found in 100% of the larvae, pointing to a conserved core of bacteria capable of colonizing all three species of mosquito. Yet, the abundance of these ASVs varied widely between larvae, suggesting individuals harbored largely unique microbiome structures, even if they overlapped in membership. Finally, larvae reared in a tripartite mix of the host-species consistently showed a convergence in the structure of their microbiome, indicating that multi-species interactions between hosts potentially lead to shifts in the composition of their respective microbiomes.

**2. Shabtai, I. A., Wilhelm, R., Schweizer, S., Hoeschen, C., Buckley, D., and Lehmann, J. (2023).** Calcium promotes persistent soil organic matter by altering microbial transformation of plant litter. *Nature Communications*, 14, 6609. DOI: [10.1038/s41467-023-42291-6](https://doi.org/10.1038/s41467-023-42291-6).

**Abstract:** Calcium (Ca) can contribute to soil organic carbon (SOC) persistence by mediating physico-chemical interactions between organic compounds and minerals. Yet, Ca is also crucial for microbial adhesion, potentially affecting colonization of plant and mineral surfaces. The importance of Ca as a mediator of microbe-mineral-organic matter interactions and resulting SOC transformation has been largely overlooked. We incubated  $^{44}\text{Ca}$  labeled soils with  $^{13}\text{C}^{15}\text{N}$  labeled leaf litter to study how Ca affects microbial transformation of litter and formation of mineral associated organic matter. Here we show that Ca additions promote hyphae-forming bacteria, which often specialize in colonizing surfaces, and increase incorporation of litter into microbial biomass and carbon use efficiency by approximately 45% each. Ca additions reduce cumulative  $\text{CO}_2$  production by 4%, while promoting associations between minerals and microbial byproducts of plant litter. These findings expand the role of Ca in SOC persistence from solely a driver of physico-chemical reactions to a mediator of coupled abiotic-biotic cycling of SOC.

**DEPARTMENTAL RESEARCH UPDATES:**

**SCOTT WILLIAMS, PH.D.** as Executive Treasurer, participated in a Zoom meeting of the Executive Committee of the Northeast Section of The Wildlife Society (October 3); attended a graduate committee meeting for University of Connecticut's College of Agriculture and Natural Resources Department of Natural Resources and the Environment Master's Degree Student Samantha Lewis, Storrs, CT (October 3); participated in a collaborative Zoom call with members of the Banfield Biologic NIH SBIR-funded tick repellent fabric team (October 4); participated in a Zoom call with staff from CDC Division of Vector-Borne Diseases, University of Massachusetts, University of Rhode Island, Penn State University, State of Massachusetts, MaineHealth, Michigan State University, Texas A&M University, and Genesis Laboratories about tick management strategies involving white-tailed deer (October 4); participated in a Zoom call with members of the MaineHealth vector-borne disease ecology team and progress on an ongoing collaborative grant (October 11); participated in a Zoom call for members of the Professional Certification Review Board of The Wildlife Society (October 12); participated in a Zoom meeting of the Centers for Disease Control and Prevention-funded Teaching & Evaluation Center leadership meeting (October 17); 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 (October 18); participated in a working group Zoom meeting on rodenticide use and possible negative repercussions due to effects from biomagnification in higher order predators (October 31).

**JOSEPH P. BARSKY** met with Dan Evans (CT-DEEP) to discuss a collaborative forest research project in post-emerald ash borer invasion areas Ashford, CT (October 11); met with Joe Schnierlein, Lou Bacchiocchi (Aspetuck Land Trust), and Robert Turnbull (Aquarion Water Company) to discuss a collaborative forest research project in post-emerald ash borer invasion areas in Redding, CT (October 30); attended Tolland Soil Survey Office Technical Team Meeting to discuss collaborative soil science project on long term forest research sites in CT (October 31).

**GREGORY BUGBEE** was interviewed on Connecticut River hydrilla by Adé Ben-Salahuddin for an episode of the podcast "Bird Notes" (October 1); Interviewed by Debra Aleksinas of the Lakeville Journal on hydrilla in East Twin Lake (October 4).

**RILEY DOHERTY** wrote an article titled "Invasive Hydrilla on the Move" for distribution to Connecticut Federation of Lakes (CFL) members in their CFL e-newsletter (October 10); hosted a table for the Office of Aquatic Invasive Species at the Eightmile River Fest in East Haddam (October 14).

**JEREMIAH FOLEY, IV, PH.D.** hosted Daniel Gebler, Ph.D., a visiting professor from the University Poznań, Poland (October 2–13); presented "*Hydrilla verticillate*: A novel threat to Northeastern waterways" at the 2023 Sussex Plant Biology Symposium, New Haven, CT (50 attendees) (October 20) .



**SUSANNA KERIÖ, PH.D.** met with the Connecticut Urban Forestry Coordinator Danica Doroski, Ph.D. to discuss collaboration on a chapter for the Updated Silvics of North America Project (October 5); gave a field tour of the chestnut plots at Lockwood Farm and helped to organize the Connecticut celebration of the 40<sup>th</sup> anniversary of The American Chestnut Foundation (October 8); with **NUBIA ZUVERZA-MENA, Ph.D.**, hosted seven students for a visit to the chestnut plots at Lockwood Farm from Wesleyan University with Elaine Gan, Ph.D. (October 9); participated in an NSF grant discussion led by Tara Trammell, Ph.D. (University of Delaware) with Richard Hallett, Ph.D. (USFS) and Max Piana, Ph.D. (USFS) (October 12); attended the World Forum on Urban Forestry in Washington DC (October 15-19); gave a talk at the Sussex Symposium at Yale University titled "Conditions impacting maple health in New Haven" (30 attendees) (October 20); participated in an NSF grant discussion led by Tara Trammell, Ph.D. (University of Delaware) with USFS scientists Richard Hallett, Ph.D., Vince D'Amico, Ph.D., Nancy Sonti, Ph.D., and Meghan Avolio, Ph.D. from John Hopkins University (October 27).

**SARA NASON, PH.D.** participated in the Connecticut PFAS testing Laboratory Capacity and Capability discussion group meeting (October 10); attended meetings for the Best Practices for Non-Targeted Analysis working group (October 11, 12, 17, and 25).

**ITAMAR SHABTAI, PH.D.** presented at the UMass Stockbridge Seminar series on "The role of minerals, microbes, and roots in controlling soil organic carbon dynamics - from field scale to sub-micron scale," (25 attendees) (October 16); gave an oral presentation "Probing the Spatial and Chemical Distribution of MAOM in the Rhizosphere" at the 2023 ASA-CSSA-SSSA International Annual Meeting in St. Louis, MO (October 30).

**SUMMER STEBBINS** hosted The Northeast Aquatic Plant Management Society Plant Camp at Camp Hazen, Chester, CT (40 attendees) (September 13); gave a talk titled "Using GIS to Map Invasive Aquatic Plants in Connecticut" at the Northeast Arc Users Group conference in New Haven, CT (40 attendees) (October 16); attended the North American Lake Management Society conference in Erie, PA gave a talk titled "Using GIS to Map Invasive Aquatic Plants in Connecticut" (40 attendees) (October 23).

**ELISABETH WARD, PH.D.** was appointed as the Connecticut representative for the Northeast-Midwest State Foresters Alliance Forest Health committee (October 3); met with Dan Evans (CT DEEP, Forestry Division) at Natchaug State Forest to discuss sites for a long-term project on forest resiliency to emerald ash borer invasion (October 11); participated in the monthly State Coordinators meeting for the Forest Ecosystem Monitoring Cooperative (October 12); participated in the Soil Health Committee meeting for the Connecticut Council on Soil and Water Conservation (October 17); met with the staff of Senator Chris Murphy to discuss forest health issues in Connecticut along with Alison Adams (Director, Forest Ecosystem Monitoring Cooperative) and Chris Martin (State Forester, CT DEEP) (October 18); with **CLAIRE RUTLEDGE, PH.D.** met with Jack Hatajik, Sara Kuebbing, PH.D., Marlyse Duguid, PH.D., and Mark Bradford, PH.D. (The Forest School, Yale University) to discuss project looking at understory plant dynamics following emerald ash borer invasion along (October 25); met with Rob Turnbull (Aquarian Water Company), Joe Schnierlein (Aspetuck Land Trust), and Lou Bacchiocchi (Aspetuck Land Trust) to select sites in Fairfield county to study understory plant dynamics following emerald ash borer invasion (October 30).

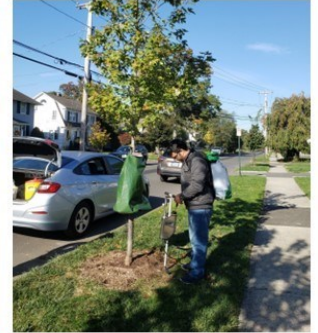
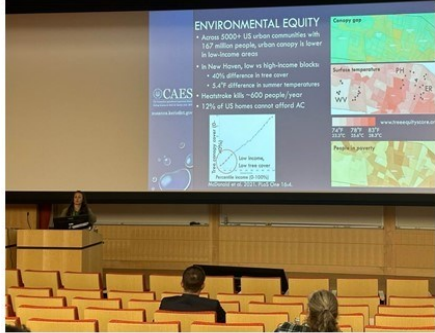
**JEFFREY WARD, PH.D.** (Emeritus) spoke of forest management and succession at Master Woodland Manager Module 2: Forest Ecology field workshop in North Madison (18 attendees) (September 16); lead "The Edible Forest Walk" at Great Mountain Forest in Norfolk along with Matt Gallagher (GMF Forester) (37 attendees) (October 14); interviewed about invasive bamboo by Jamila Young of the Journal Inquirer (October 19); participated in a Connecticut Forest and Park Association Board of Directors meeting (October 25); participated in a CT DEEP Forest Practices Advisory Board meeting in Middlefield (October 25); participated in a meeting of the Great Mountain Forest Trustees in Norfolk (October 28).

**LEIGH WHITTINGHILL, PH.D.** participated in a virtual meeting to discuss an Urban Agriculture Multistate project collaboration with scientists and extension specialists from universities throughout the Northeast (October 4); participated in the Connecticut Council on Soil and Water Conservation Soil Health Committee meeting to discuss the draft soil health plan (October 17); presented a virtual talk titled "The effect of annual compost additions to green roof media on cut-and-come-again lettuce production" at the Green Roofs for Healthy Cities Green Infrastructure Research Symposium (34 attendees) (October 25); attended the first graduate committee meeting for Ph. D. Student Alvaro Daniel Pantoja-Benavides in the Department of Plant Science & Landscape Architecture at the University of Connecticut, Storrs (October 26).

**OTHER DEPARTMENTAL NEWS:** We would like to welcome Iris X. Wang to the Agricultural Experiment Station family. Iris was brought into the world, fittingly, on Labor Day (September 4). Iris was 6 pounds at birth and is the daughter of proud father ESF Postdoctoral Scientist **ZHENGYANG (PHILIP) WANG, PH.D.** and his lovely wife Jing Xie. Philip informs that "pepper" in Chinese means "great performance" (see photo). Well done Philip and Jing. Congratulations on your great performance!



Iris X. Wang, born September 4, 2023. Daughter of **Zhengyang (Philip) Wang** and Jing Xie. Congratulations!



**Top:** Dr. Zuverza and Dr. Kerio participated the CT celebration of the TACF 40th anniversary at Lockwood Farm on October 8, 2023.  
**Bottom:** Dr. Kerio with Wesleyan University students in Lockwood; talk at Sussex symposium at Yale, and field work in Fairfield with Dr. Qaseem.

## PLANT PATHOLOGY AND ECOLOGY

**LINDSAY TRIPLETT, PH.D.** hosted two representatives from the Office of Public Management on a tour of the CAES New Haven Campus (October 6), hosted an orientation session for new scientists at CAES (5 attendees) (October 6); participated in a meeting of the Centennial Executive Committee of the Hamden Garden Club (22 attendees) (October 12), co-authored a poster with student Alex Carabetta titled “All together now: the relationship between predatory protists and bacterial multicellular structures” at the Sussex Symposium (70 attendees) (October 20); spoke on CAES research opportunities at a summer internship symposium at Quinnipiac University, along with Kelsey Fisher (19 attendees) (October 24); participated in a grant planning meeting with the soil predators working group in Portland, OR (6 attendees) (October 25-29),

**WASHINGTON DA SILVA, PH.D.** visited the University of Maryland and gave an invited seminar titled “Nano-enabled technologies: prospective weapons to tackle destructive plant pathogens” (34 adults) (October 2); was interviewed by the graduate students, Anthony Matarazzo and Joseph Romanowski, for the Podcast series: “Blue Genes and Boots featured on Spotify” at Texas A&M University (October 11); participated in the Genome Editing Symposium at Texas A&M University in College Station, TX, and gave an invited seminar titled “Small Things Considered: Using RNA Molecules and Nanotechnology to Control Plant Pathogens” (121 adults) (October 12); The **da Silva Lab** members participated in the Sussex Symposium held at Yale University on October 20: they presented posters – Undergrad student **Juliana Milagres** (Application of exogenous dsRNA for the control of PVY), Ph.D. students **Maria Helena Diogenes** (Routes of Infection of *Fusarium* spp. in Melon) and **Talison da Costa** (RNAi-mediated silencing of pathogenicity related genes in *Fusarium solani*), and **Rania Eltanbouly** and **Raja Muthuramalingam** (Gene Delivery in Plants Using Nanocarriers).

**YONGHAO LI, PH.D.** participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (6 adults) (October 11); attended the Plant Diagnostic Network Northeast Regional monthly meeting via Zoom (October 12); gave a lecture “Diseases of Trees” for the Connecticut Tree Protective Association Arboriculture 101 Courses in New Haven (30 adults) (October 12); along with **MS. FELICIA MILLETT**, met Elema Karlsen-Ayala. PH.D. (USDA Forest Service Northern Research Station) and discussed common woody plant diseases in Connecticut (October 16); interviewed by Ms. Jamia Young at Journal Inquirer about running bamboo issues in Connecticut (October 18); presented “Common Perennial Diseases and Their Managements” to the Kensington Garden Club members in Berlin (35 adults) (October 19); presented “Common Perennial Diseases and Their Managements” to the Colchester Garden Club members in Colchester (21 adults) (October 23); instructed “Tree Diseases” in the Hand-on Night for the Connecticut Tree Protective Association Arboriculture 101 Courses in New Haven (30 adults) (October 26).

**ROBERT MARRA, PH.D.** was interviewed about beech leaf disease by WBUR’s Paula Moura (October 12); gave a presentation on beech leaf disease to the Flanders Land Trust (20 adults) (October 24); hosted the annual meeting of the Connecticut Botanical Society in Jones Auditorium (50 adults) (October 28).

**FELICIA MILLETT** participated in the National Plant Diagnostic Network (NPDN)

Cross Committee Meeting (28 adults) (October 11); participated in the Northeast Plant Diagnostic Network monthly meeting (17 adults) (October 12); with **Yonghao Li, PH.D.** met with Elena Karlsen-Ayala, from the USDA Forest Service Northern Research Station (October 16); participated in the NPDN Proficiency Committee Meeting (6 adults) (October 17); participated in the NPDN Professional Development Committee Meeting (10 adults) (October 24); participated in the NPDN National Meeting Workshops and Fieldtrips Sub-Committee Meeting (5 adults) (October 26); and presented on “Diseases of Trees” to the CTPA Arboriculture 101 course “Tree Conditions Lab” (30 adults) (October 26).

**RAQUEL ROCHA, PH.D.** gave a presentation on her current research on the molecular strategies used by plant parasitic nematodes and plant pathogenic fungi to cause disease at Yale University (20 adults) (October 16). She also presented her current research projects to the CAES Board of Control (7 adults) (October 18).

**NEIL SCHULTES, PH.D.** presented a poster “Is amino acid synthesis necessary for epiphytic growth of *Erwinia amylovora* on apple flower stigmas” at the Sussex Symposium of Plant Biology at Yale University on (~75 attendees) (October 20); served as a judge for the oral and poster presentations in the First Annual CAES Postdoctoral Fellow Research Symposium, (October 22); and presented a talk “Growth of *Erwinia amylovora* amino acid auxotrophs on the apple stigma” at the Northeast Tree Fruit Integrated Pest Management Working Group in Lake George, NY (40 attendees) (November 24-25).

**STEPHEN TAERUM, PH.D.** presented a talk titled “Protist associates help shape plant microbiomes” at the 2023 Sussex Symposium at Yale University (70 attendees) (October 20), and participated in a grant planning meeting with the soil predators working group in Portland, OR (6 attendees) (October 25-29).

**QUAN ZENG, PH.D.** participated a MS defense of Jared Zaporski (Michigan State University) (October 2); hosted a Lockwood Lecturer, George Sundin, Ph.D. (Michigan State University) who visited CAES and delivered a lecture on October 11th; participated in discussions of the American Phytopathological Society, Biological Control Committee (20 participants) (October 13); visited College of Agriculture and Life Sciences, Seoul National University (October 14-17), was invited by the Korean Ministry of Rural Development Administration (RDA) and participated in the Korean Plant Pathological Society (KSPP) Annual Meeting (October 18-21) and delivered a keynote lecture on yeast induced host defense response in apple against fire blight (500 adults) (October 20), visited Southwestern University, College of Pharmaceutical and Biological Engineering in Chongqing China and delivered an invited seminar “How Flower Microbiome Influence Host Pathogen Interactions in Fire Blight” (150 adults) (October 26).

## ARTICLES APPROVED FOR SUBMISSION:

1. **Schultes, N. P.**, Sinn, J. P., and McNellis, T. W. Synthesis of aspartic acid and tyrosine by the fire blight pathogen *Erwinia amylovora* is not required for proliferation on apple flower stigmas or virulence in fruitlets. *Microbial Pathology*.

## PUBLICATIONS:

1. da Silva, R. M., Ambrósio, M. M. Q., Neto, J. A. S., Silva, J. L. S., da Costa, T. E., Figueiredo, F. R. A., Barroso, K. A., **da Silva, W.**, and Holanda, I. S. A. (2023). First report of *Lasiodiplodia brasiliensis* causing root rot in melon plants in northeastern Brazil. *Plant Disease*, 108(1). <https://doi.org/10.1094/PDIS-07-23-1443-PDN>

**Abstract:** Melon (*Cucumis melo* L.) is the second most exported fruit in Brazil with an annual production of 27.5 million tons (FAO 2023). From September 2019 through February 2020, 50-day-old melon plants started showing root rot symptoms (dark-brown necrotic zones in their roots that extended to the collar zone) in northeastern Brazil, 30% of the plants in the fields were affected by the disease. The fields are in clay soil where melon, in monoculture, is produced all year long with three cycles of the culture per year. A total of 132 samples from “Yellow” and “Cantaloupe” cultivars were collected from four melon fields (4°59'45.3"S, 37°33'39.7"W; 4°57'10.2"S, 37°31'37.1"W; 5°38'17.9"S, 37°56'27.7"W; and 5°00'25.5"S, 37°23'55.3"W). Small pieces of diseased tissues were surface disinfested in 70% ethanol for 30 sec, in 2% sodium hypochlorite for 1 min, washed in sterilized distilled water, plated on a PDA Petri dishes with tetracycline (0.05g/L), and incubated for seven days at 28 ± 2 °C. Nine representative isolates were selected for downstream analysis. Colonies were white and later became dark gray, pycnidia and conidia were produced after 30 days of incubation at 25°C under near-UV light in water-agar medium. Conidia were hyaline when immature and dark brown when mature, ranging from cylindrical subovoid to ellipsoidal and septate to non-septate, and with an average size of 12.54 to 21.97 µm. The colonies were morphologically identified as *Lasiodiplodia* sp. (Phillips et al. 2013). Total DNA from the isolates was extracted and the ITS, TUB, and TEF-1α genes (Jayawardena et al. 2019) were partially amplified by PCR, Sanger sequenced, and deposited in Genbank: ITS (OM102511 to OM102520), TUB (OR062087 to OR062094 and OR062095), and TEF-1α (OP536826 to OP536835). Blastn analysis of the partial sequences ITS (519bp), TUB (388bp), and TEF-1α (315bp) showed 100% nucleotide similarity of the isolates with sequences of *L. brasiliensis* and *L. theobromae* from the GenBank. A phylogenetic tree was constructed using the Maximum Parsimony Analysis method. All nine isolates were grouped into the *L. brasiliensis* clade with 71% bootstrap support, confirming the isolates's identity. Pathogenicity assays were conducted in a greenhouse using the wooden toothpick inoculation method (Nogueira et al. 2019). “Goldex” Yellow melon seedlings were used in a completely randomized experimental design, with 10 treatments (9 isolates + Mock) and six replicates, with one plant per pot. Plants were inoculated 15 days after sowing, and disease severity was evaluated 50 days after inoculation. All nine isolates caused symptoms in the assessed melon plants. The fungus was reisolated from the lesions and looked morphologically identical to the inoculated fungus, fulfilling Koch’s postulates. The pathogenicity test was repeated and yielded similar results. All samples in this study were provided by melon growers who were concerned about the high incidence of root rot

disease in their plantations. More research needs to be conducted to determine the epidemiology and the extension of the economic impact caused by this pathogen to melons to develop strategies for disease control to properly assist the growers’s concerns. This pathogen has been reported to cause disease in other crops in Brazil, e.g., watermelon (Alves et al. 2023) and apples (Martins et al. 2018). However, to the best of our knowledge, this is the first report of *L. brasiliensis* causing root rot in melons in Brazil.

## GRANTS AWARDED:

**1. QUAN ZENG, PH.D., YONGHAO LI, PH.D.,** and Kenneth Johnson, Ph.D. (Oregon State Univ.) are awarded a USDA-NIFA-OREI four-year grant to identify yeasts that induce apple immunity and deploy them towards organic control of apple diseases (\$997,657 to CAES), **QUAN ZENG, PH.D.** is also awarded a USDA-NIFA-ORG grant as a co-PI, (\$279,480 to CAES) to study a biological control product *Pseudomonas soli* T307 in collaboration with Ching-Hong Yang, Ph.D. (University of Wisconsin-Milwaukee).



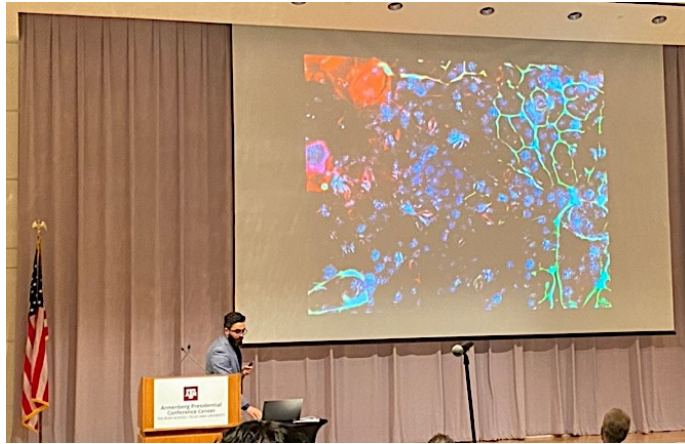
**Quan Zeng, Ph.D.** and other invited speakers interacting with KSPP organization committee members and Korean Ministry of Rural Development Administration officials at the 2023 KSPP conference.



**Quan Zeng, Ph.D.** visiting Zou lab of biological engineering and fermentation at Southwestern University in Chongqing China.



**Washington da Silva, Ph.D.** being interviewed for the Podcast Blue Genes and Boots at Texas A&M University, College Station, TX.



**Washington da Silva, Ph.D.** delivering an invited seminar in the Genome Editing Symposium at Texas A&M University, College Station, TX.



**Da Silva Lab** members at the Sussex Symposium at Yale University, New Haven, CT.



## OTHER DEPARTMENTAL NEWS:



The Plant Pathology Department held a potluck lunch to say farewell to **Zeng Lab** postdoctoral scientists **Mohamed-Amine Hassani** and **Salma Mukhtar**. Salma is starting a new position working on turfgrass disease at Rutgers University, and Amine is moving on to study the tick microbiome at Harvard University. Best of luck to Salma and Amine!



The Plant Pathology Department came in first place in the 3<sup>rd</sup> Annual Pumpkin Carving Contest (pumpkin design lead: Juliana Milagres), and the Valley Lab was first runner up with a pumpkin carved by **Nate Westrick**. Many thanks to **Gale Ridge** and **Katherine Dugas** for organizing this year!

**DEWEI LI, PH.D., RICH COWLES, PH.D., NATE WESTRICK, PH.D., JIM PRES-TE, ROSE HISKES, and DIANE RIDDLE** hosted a visit by Bloomfield Agriscience Freshman (11 attendees) (October 27). Each Valley Laboratory staff member made an oral presentation about their research/work to the students and their teacher.

**RICHARD COWLES, PH.D.** presented “Facts and Fallacies of Organics” to the Spring Glen Garden Club, Hamden, (14 participants) (October 9); was interviewed by Robin Kazmier of “Science Friday” resulting in the following piece on their web site: <https://www.sciencefriday.com/articles/identify-beech-leaf-disease/> (October 11); co-presented virtually with **Robert Marra, Ph.D.** “Beech leaf disease biology and management,” as a Flanders Land Trust Hot Topics subject, (18 attendees) (October 24); discussed “Importance of exotic invasives,” to the Bloomfield High School Introduction to Agriculture class, (15 students) (October 27); was interviewed by Sophie Noelle Hartley of MIT’s Science Writing Program on beech leaf disease (October 30).

**ROSE HISKES** with Victoria Wallace from UConn Extension, conducted a General Meeting and a Steering Committee Meeting of the Connecticut Invasive Plant Working Group (CIPWG) at the Tolland Agricultural Center in Tolland (15 and 10 attendees respectively) (October 11); taught a class on Exotic Insects to the St. Joseph College entomology class via Zoom (11 attendees) (October 18); participated as the Connecticut Agricultural Experiment Station (CAES) representative at the Invasive Plant Council (IPC) meeting via Zoom (October 18); mentored Wilton High School sophomore Shriya Natajaran with her science project developing an artificial intelligence app that would analyze photos of invasive plants over time and space (October 20); with other Valley Lab staff, presented the Diagnostic Office work to Bloomfield Agriscience Freshman (11 attendees) (October 27).

**JAMES LAMONDIA, PH.D.,** (Emeritus) and **RICHARD COWLES, PH.D.** were interviewed about beech leaf disease by Jennifer Ahrens of Connecticut Public Radio WNPR (October 11).

# CAES



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# STATION NEWS



Awad, J., Brar, G., Cadwalader, E., Dillard, D., Esposito, L., **Fisher, K.**, Lucky, A., Sandall, E., Seltsmann, K., Ware, J. L., Winton, R., and Yemi, J. The insect decline task force biodiversity term definitions list. *American Entomologist*.

Barroso, K., Milagres, J., Shidore, T. Muthuramalingam, R., Eltanbouly, R., Ambrósio, M., and **da Silva, W.** The genomic region matters when synthesizing dsRNA for plant virus suppression via RNAi. *PLOS Pathogens*.

**Cahill, M. S., Arsenault, T., Bui, T., Zuverza-Mena, N., Bharadwaj, A., Prapayotin-Riveros, K., and Dimkpa, C. O.** Copper stimulates tetrahydrocannabinol (THC) and cannabidiol (CBD) production in hemp (*Cannabis sativa* L.). *Journal of Agriculture and Food Chemistry*.

Cao, Y., Ma, C., Cao, Y., Zhang, F., Yu, H., Tong, R., Yan, W., Kah, M., **White, J. C.**, and Xing, B. Engineered nanomaterials to minimize metal(loid) accumulation in crops and ensure food safety in sustainable agriculture. *Nature Nanotechnology*.

deMaynadier, P., Schlesinger, M., Hardy, S. P., McFarland, K. P., Saucier, L., White, E. L., **Zarrillo, T. A.**, and Young, B. E. Insect pollinators: The time is now for identifying species of greatest conservation need. *Wildlife Society Journal*.

**Schultes, N. P.**, Sinn, J. P., and McNellis, T. W. Synthesis of aspartic acid and tyrosine by the fire blight pathogen *Erwinia amylovora* is not required for proliferation on apple flower stigmas or virulence in fruitlets. *Microbial Pathogenesis*.

**Steven, B., Hassani, A. M., LaReau, J. C., Wang, Y., and White, J. C.** Nanoscale sulfur alters the bacterial and eukaryotic communities of the tomato rhizosphere and their interactions with a fungal pathogen. *Environmental Science: Nano*.

The subapical labial sensory organ of the spotted lanternfly *Lycorma delicatula*. **Dweck, H.** and **Rutledge, C.** *Current Biology*.

**Westrick, N. M.**, Dominguez, E. G., Bondy, M., Hull, C. M., Smith, D. L., and Kabbage, M. a single laccase acts as a key component of environmental sensing in a broad host range fungal pathogen. *Nature Communications*.

**Whittinghill, L.**, Jackson, C., and Poudel, P. The effects of annual compost addition to agricultural green roofs on runoff water quality. *HortScience*.



# CAES

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## The Connecticut Agricultural Experiment Station

Main Laboratories  
123 Huntington Street  
New Haven, CT 06511-2016  
Phone: 203-974-8500



Main Laboratories, New Haven



Lockwood Farm, Hamden

Lockwood Farm  
890 Evergreen Avenue  
Hamden, CT 06518-2361  
Phone: 203-974-8618

Griswold Research Center  
190 Sheldon Road  
Griswold, CT 06351-3627  
Phone: 860-376-0365



Griswold Research Center, Griswold



Valley Laboratory, Windsor

Valley Laboratory  
153 Cook Hill Road  
Windsor, CT 06095-0248  
Phone: 860-683-4977

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