Station News

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

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

DR. JASON C. WHITE participated in a Zoom call as part of The International Network For Researching, Advancing, and Assessing Materials for Environmental Sustainability (INFRAMES) (April 3) to discuss planning for an upcoming conference in Venice Italy (April 1); participated in the bi-weekly Center for Sustainable Nanotechnology (CSN) Plant Biosurfaces working group call (April 1 and 17); along with **DR. SARA THOMAS, DR. SARA NASON,** 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 (April 4); 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 (April 4); hosted the monthly CAES J-Visa recipient meeting (April 5); met by Teams with scientific staff of Nutrien to discuss nanofertilizers and gave a presentation titled "Nanoscale fertilizers: Can we really do so much with so little?" (April 5); participated in the weekly CSN all hands Zoom call (April 5 and 12); held a Zoom call with collaborators at Auckland University (New Zealand) and Louisiana State University to discuss a joint publication (April 5); along with **DR. YI WANG** and **DR. NUBIA ZUVERZA-MENA** visited Brookhaven National Laboratory in Upton, NY, and gave an invited presentation titled "Nanotechnology-enabled Agriculture: A path to global food security?" (April 6); participated in a biweekly Zoom call to discuss organization of the 2023 International Phytotechnologies Conference in Chicago at the end of May (April 7); had a Zoom call with Dr. Sanghamitra Majumdar of the US FDA (April 7); participated in a Zoom call for the CSN to prepare for an upcoming NSF Site Visit (April 7, 14, and 21); met by Teams with scientific staff of Mosaic to discuss nanofertilizers and gave a presentation titled "Nanoscale fertilizers: Can we really do so much with so little?" (April 10); along with **DR. CHRISTIAN DIMKPA** had a Zoom conversation with Dr. Ramesh Raliya to discuss collaborative research (April 12); participated in a Zoom call with collaborators at Carnegie Mellon University and the University of California Riverside to discuss a potential Center proposal (April 13); participated in a FDA Zoom presentation of FDA federal and state programs for California Lutheran University (April 14); along with **DR. QUAN ZENG** began hosting Dr. Andrea Brunelli of Ca' Foscari University of Venice, Italy to conduct research on nanoscale management options for fire blight of apple (April 17); along with **MR. GREG BUGBEE, MS. SUMMER STEBBINS,** and **DR. JEREMIAH FOLEY** participated in the quarterly call of the Aquatic Invasive Species work group (April 17); along with **MR. MICHAEL LAST** participated in a call with DAS Construction Services to discuss the Valley Laboratory project (April 18); along with **MR. MICHAEL LAST** hosted the quarterly CAES Board of Control meeting (April 19); participated in the Farmland Preservation Advisory Board monthly meeting (April 20); gave introductory remarks at the NEVBD annual meeting at CAES (April 21); along with **DR. YI WANG** hosted a monthly meeting with University of Massachusetts colleagues on a USDA funded nanoscale sulfur project (April 21); attended the biannual NSF Site Visit of the CSN at the University of Wisconsin Madison and gave a presentation titled "Chemistry at Nanoparticle-Plant Interfaces" (April 23-25); and gave the Director's report at the Experiment Station Associates annual meeting (April 26).

PUBLICATIONS

1. Zhou, P., Zhang, P., Adeel, M., Shakoor, N., Jiang, Y., Zhao, W., Liu, W., Li, Y., Azeem, I., Rui, Y., Tan, Z., Guo. Z., **White, J. C.**, and Lynch, I. (2023). Nickel oxide nanoparticles improve soybean yield and enhance nitrogen assimilation. *Environ. Sci. Technol*. DOI: 10.1021/acs.est.3c00959

Abstract: Nickel (Ni) is a trace element beneficial for plant growth and development and could improve crop yield by stimulating urea decomposition and nitrogen-fixing enzyme activity. A full life cycle study was conducted to compare the long-term effects of soil-applied NiO nanoparticles (n-NiO), NiO bulk (b-NiO), and $NiSO_4$ at 10–200 mg kg^{-1} on plant growth and nutritional content of soybean. n-NiO at 50 mg kg^{-1} significantly promoted the seed yield by 39%. Only 50 mg kg^{-1} n-NiO promoted total fatty acid content and starch content by 28 and 19%, respectively. The increased yield and nutrition could be attributed to the regulatory effects of n-NiO, including photosynthesis, mineral homeostasis, phytohormone, and nitrogen metabolism. Furthermore, n-NiO maintained a Ni^{2+} supply for more extended periods than $NiSO_4$, reducing potential phytotoxicity concerns. Single-particle inductively coupled plasma mass spectrometry (sp-ICP-MS) for the first time confirmed that the majority of the Ni in seeds is in ionic form, with only 28–34% as n-NiO. These findings deepen our understanding of the potential of nanoscale and non-nanoscale Ni to accumulate and translocate in soybean, as well as the long-term fate of these materials in agricultural soils as a strategy for nanoenabled agriculture.

2. Borgatta, J., Shen, Y., **Tamez, C**., Green, C., Orbeck, J., **Cahill, M**., Protter, C., **Deng, C.**, **Wang, Y**., **Elmer, W.**, **White, J. C.**, and Hamers, R. L. (2023). Influence of CuO nanoparticle aspect ratio and surface charge on disease suppression in tomato (*Solanum lycopersicum*). *J. Agric. Food Chem*. DOI: 10.1021/acs.jafc.2c09153

Abstract: Nanoparticles (NPs) have been shown to deliver micronutrients to plants to increase health, biomass, and suppress disease. Nanoscale properties such as morphology, size, composition, and surface chemistry have all been shown to impact nanomaterial interactions with plant systems. An organic-ligand-free synthesis method was used to prepare positively charged copper oxide (CuO) nanospikes, negatively charged CuO nanospikes, and negatively charged CuO nanosheets with exposed (001) crystal faces. X-ray photoelectron spectroscopy (XPS) measurements show that the negative charge correlates to increased surface concentration of O on the NP surface, whereas relatively higher Cu concentrations are observed on the positively charged surfaces. The NPs were then used to treat tomato (Solanum lycopersicum) grown in soil infested with Fusarium oxysporum f. sp. lycopersici under greenhouse and field conditions. The negatively charged CuO significantly reduced disease progression and increased biomass, while the positively charged NPs and a CuSO4 salt control had little impact on the plants. Self-assembled monolayers were used to mimic the leaf surface to understand the intermolecular interactions between the NPs and the plant leaf, the data demonstrate that NP electrostatics and hydrogen bonding interactions play an important role in adsorption to leaf surfaces. These findings have important implications for the tunable design of materials as a strategy for the use of nano-enabled agriculture to increase food production.

3. Wang, Z., Liu, Y., Luo, X., Wang, C., Yue, L., **Elmer, W.**, Parkash Dhankher, O., **White, J. C.**, Cao, X., and Xing, B. (2023). Mechanistic investigation of enhanced bacterial soft rot resistance in lettuce (*Lactuca sativa* L.) with elemental sulfur nanomaterials. *Sci. Tot. Environ*, *884*. DOI: 10.1016/j.scitotenv.2023.163793

Abstract: Crop diseases significantly threaten global food security and will worsen with a changing climate. “Organic” elemental sulfur nanomaterials (S NMs) were investigated for control of bacterial pathogen *Pectobacterium carotovorum* on lettuce (*Lactuca sativa*). Foliar application with S NMs at 10-100 mg/L significantly suppressed the occurrence of bac-

terial soft rot, with 100 mg/L decreasing disease incidence by 94.1% as compared with infected controls. The disease control efficiency of S based materials (100 mg/L) and a conventional pesticide (1000 mg/L) followed the order of S NMs ≈ pesticide > S bulk particles (BPs) > sulfate. The disease control efficiency of S NMs was 1.33- and 3.20-fold that of S BPs and sulfate, respectively, and the shoot and root biomass with S NMs was 1.25- and 1.17-fold that of the pesticide treated plants. Mechanistically, S NMs (1) activated salicylic acid (SA) and jasmonic acid (JA) dependent systemic acquired resistance and systematic induced resistance, thereby upregulating pathogenesis-related gene expression; (2) enhanced antioxidative enzyme activity and antioxidative gene expression, thereby alleviating the oxidative stress; and (3) exhibited direct in vivo antibacterial activity. Metabolomics analysis demonstrated that S NMs also promoted the tricarboxylic acid cycle and increased SA and JA metabolite biosynthesis. Moreover, foliar application of S NMs not only increased nutritive quality, but also generated more economic benefit compared with a conventional pesticide. These findings highlight the significant potential of S NMs as a novel and eco-friendly strategy to manage crop disease.

4. Liao, Y. U., Pereira, J., Huang, Z., Fan, Q., Santra, S., **White, J. C.,** De La Torre-Roche, R., Da Silva, W. S., Vallad, G. E., Freeman, J., Jones, J. B., and Paret, M. L. (2023). Potential of novel magnesium nanomaterial to manage bacterial spot disease of tomato in the greenhouse and field conditions. *Plants*. DOI: 10.3390/plants12091832

Abstract: Bacterial spot of tomato is among the most economically relevant diseases affecting tomato plants globally. In previous studies, non-formulated magnesium oxide nanoparticles (nano-MgOs) significantly reduced the disease severity in greenhouse and field conditions. However, the aggregation of nano-MgO in liquid suspension makes it challenging to use in field applications. Therefore, we formulated two novel MgO nanomaterials (SgMg #3 and SgMg #2.5) and one $MgOH_2$ nanomaterial (SgMc) and evaluated their physical characteristics, antibacterial properties, and disease reduction abilities. Among the three Mg nanomaterials, SgMc showed the highest efficacy against copper-tolerant strains of *Xanthomonas perforans* in vitro, and provided disease reduction in the greenhouse experiments compared with commercial Cu bactericide and an untreated control. However, SgMc was not consistently effective in field conditions. To determine the cause of its inconsistent efficacy in different environments, we monitored particle size, zeta potential, morphology, and crystallinity for all three formulated materials and nano-MgOs. The MgO particle size was determined by the scanning electron microscopy (SEM) and dynamic light scattering (DLS) techniques. An X-ray diffraction (XRD) study confirmed a change in the crystallinity of MgO from a periclase to an $Mg(OH)_2$ brucite crystal structure. As a result, the bactericidal activity correlated with the high crystallinity present in nano-MgOs and SgMc, while the inconsistent antimicrobial potency of SgMg #3 and SgMg #2.5 might have been related to loss of crystallinity. Future studies are needed to determine which specific variables impair the performance of these nanomaterials in the field compared to under greenhouse conditions. Although SgMc did not lead to significant disease severity reduction in the field, it still has the potential to act as an alternative to Cu against bacterial spot disease in tomato transplant production.

ANALYTICAL CHEMISTRY

No submissions this month.

ENTOMOLOGY

DR. GOUDARZ MOLAEI was interviewed by Channel 3 WFSB and Fox 61(April 11), AARP Media (April 14), Associated Press (April 18), WCBS RadioNews 880 (April 24), WFSB (April 25), WFMJ TV Ohio (April 28), and Fox 61 (April 28) on tick activity this year; and presented an invited talk, "Ticks and Tick-Borne Diseases of the Connecticut River Valley" at the Dinosaur State Park organized by the Central Connecticut Health District (April 27).

DR. GOUDARZ MOLAEI, DR. PHILIP ARMSTRONG, MS. NOELLE KHALIL, and MS. ANGELA BRANSFIELD hosted a group of Yale Emergency and Wilderness Medicine residents and discussed tick and mosquito surveillance programs at the CAES and provided them with a tour of tick and mosquito laboratories as well as the BSL3 laboratory (April 19).

DR. GOUDARZ MOLAEI, DR. PHILIP ARMSTRONG, DR. SCOTT WILLIAMS, DR. DOUG BRACKNEY, DR. ANDREA GLORIA-SORIA, DR. HANY DWECK, MR. JOHN SHEPARD, MS. ANGELA BRANSFIELD, MS. NOELLE KHALIL, MS. TANYA PETRUFF, MR. DUNCAN COZENS, MS. HEIDI STUBER, DR. REBECCA JOHNSON, DR. ANURAG KUMAR KUSHWAHA, and **DR. KIRBY STAFFORD** attended the 2023 Annual Meeting of The Northeast Regional Center for Excellence in Vector-Borne Diseases held at The CAES (April 21).

MS. ANGELA BRANSFIELD participated via Zoom in Yale University's Biosafety Committee meeting (April 20); participated in a CAES DEI Disability and Accessibility subcommittee meeting (April 20).

MS. JAMIE CANTONI participated in the Girl Scouts of Connecticut's STEMagination event held at Naugatuck Valley Community College in Waterbury, and spoke with groups of young future leaders and chaperones about careers in science and presented information pertaining to the Active Tick Surveillance Program and ongoing tick management projects (April 21); hosted, along with **DR. KELSEY FISHER, MS. KATHERINE DUGAS,** and **MS. FELICIA MILLETT**, hands-on demonstrations and activities involving ticks, Madagascar hissing cockroaches, butterflies, and nematodes for elementary school students and teachers for St. Thomas's Day School annual STEAM event (April 26).

MR. MARK CREIGHTON spoke with a group of students at the Montessori School in New Hartford, CT on Honey bees and beekeeping, and then he and the student group visited the school apiary and opened hives to further explore the biology of honeybees (April 20); spoke to members of the Suffield Garden Club at Hilltop Farm in Suffield CT on Straw Bale Gardening (April 22); and visited A and Z Apiaries in Hampton, CT and inspected new bee packages and spoke with beekeepers on honey bee management topics (April).

DR. HANY DWECK proposed and received acceptance for a symposium, "New advances in insect chemoreception" for the annual meeting of the Entomological Society of America, to be held in Maryland, November 5-8, 2023 (April 14); participated in a symposium on "Spotted Lanternfly in Connecticut" (April 17); and served as a judge at Quinnipiac University 12th annual student research conference (April 26).

DR. KELSEY FISHER met with faculty and students at Western Connecticut State University (April 3 and 25), University of Maryland (April 4), and UConn (April 5); interviewed Dr. Steven P. Bradbury about his experience with conducting engaging research for an asynchronous webinar series hosted by the Communication and Engagement Section of the Ecological Society of America (April 5); met with faculty and students at Iowa State University (April 5 and 19); presented about her career journey and experiences with polli-

nator research to inform conservation strategies at the Housatonic Valley Regional High School Science Day (April 6); attended the CAES DEI committee meeting (April 11); participated in meetings with Pollinator Pathway about establishing pollinator habitat along the Farmington Canal Trail (April 11 and 25); met with students and faculty at Quinnipiac University (April 12) and Wesleyan University (April 13 and 25); attended the CAES Spotted Lanternfly Workshop for grape growers in CT (April 17); and met with students and staff at the University of Minnesota to form collaborative relationships for current and future research projects (April 21); hosted an outreach event with **MS. JAMIE CANTONI, MS. KATHERINE DUGAS,** and **MS. FELICIA MILLETT** to provide a hands-on experience with arthropods for kindergarten, 1st, and 2nd grade students from the St. Thomas Day School (April 26); judged the Sigma Xi poster session at Quinnipiac University (April 26); collaborated with **DR. RAQUEL ROCHA, DR. CLAIRE RUTLEDGE, MS. TRACY ZARRILLO, DR. QUAN ZENG,** and **DR. SALMA MUKHTAR** on planning and execution of various projects.

DR. ANDREA GLORIA-SORIA presented an invited talk, "*Aedes aegypti* Axiom SNP Chip Validation for Population Genetics" at the Caccone group weekly lab meeting at the Ecology and Evolutionary Biology Department of Yale University (April 3), and gave a keynote presentation, "My career in STEM: How did I get here?" at the STEM-A-THON: Underrepresentation: from adversity to success in STEM careers. Albertus Magnus College, New Haven, CT (April 13).

MS. NOELLE KHALIL presented a talk "Evidence of *Uranotaenia sapphirina* Feeding on Annelid Worms in the Northeastern U.S." to the 2023 Annual Meeting of The Northeast Regional Center for Excellence in Vector-Borne Diseases held at the CAES (April 21). Her coauthors were **MR. JOHN SHEPARD**, Ms. Kimberly Foss, and **DR. GOUDARZ MOLAEI**.

DR. MEGAN LINSKE participated in a Center for Disease Control and Prevention (CDC) hosted meeting to discuss recent advances in white-tailed deer management and the impact on ticks and tick-borne diseases (April 5); participated in a Zoom call with the Wildlife Society's (TWS) Leadership Institute Application committee as a member and alumni to discuss the recent applicants and to select the class of 2023 (April 6 and 13); participated in a call with members of Genesis Labs, Inc. to discuss the 2023 field season and the application of their rodent-targeted products (April 10); participated in the CAES Diversity, Equity, and Inclusivity (DEI) meeting to discuss station-wide updates (April 11); participated in an interview with NBC news to discuss the upcoming tick season and the impacts of the past winter weather conditions (April 18); presented an invited talk titled "New and Emerging Ticks and Tick-borne Diseases in Connecticut" at the Timpro Annual Meeting hosted by the Connecticut Professional Timber Producers Association at Deer Lake Reservation in Killingworth, CT (April 21); hosted a guided nature hike at Deer Lake Reservation for Earth Day in Killingworth, CT (April 22); participated in a Zoom call with the TWS DEI Networking Committee to discuss updates in current and future DEI initiatives (April 25); hosted the Northeast Section of the Wildlife Society's (NETWS) Annual Executive Committee Members meeting as President of the NETWS section at the Northeast Fish and Wildlife Agencies Conference (NEAFWA) in Hershey, PA (April 30).

DR. GALE RIDGE presented the talk, "Jumping Worms in Connecticut" via Zoom to the annual meeting of the Experiment Station Associates (April 26).

DR. CLAIRE RUTLEDGE taught the laboratory session "Tree Conditions Laboratory" for the Connecticut Tree Protective Society's Arboriculture 101 course (April 6); organized and ran the symposium on "Spotted Lanternfly in Connecticut" at The CAES (April 17); presented the talk "The Spotted Lanternfly" at the Earthplace, Westport, CT (April 20); and

presented the talk, "Spotted Lanternfly" via Zoom to the annual meeting of the Experiment Station Associates (April 26).

DR. VICTORIA SMITH participated in the 97th annual meeting of the Eastern Plant Board, held at the 1620 Hotel in Plymouth, Massachusetts (April 3-6); was interviewed by Skyler Henry of CBS News, Washington DC, about spotted lanternfly (April 12); participated in the Spotted Lanternfly in Connecticut Symposium, held in the Jones Auditorium, with a presentation on the regulatory status of SLF in CT (April 17); participated in the CT Professional Timber Producers Association meeting, held at Deer Lake Reservation in Killingworth, with an SLF update (April 21).

DR. KIRBY C. STAFFORD III (Emeritus) presented a talk on ticks and tick control to the Olde Ripton (Shelton) Garden Club (March 6); presented a talk on ticks, tick-borne diseases, and tick control at the Middlesex Community College for the Middlesex Institute for Lifelong Education (MILE) program (April 13), and attended the annual meeting of the Northeast Regional Center for Excellence in Vector-Borne Diseases (April 21).

MS. TRACY ZARRILLO presented a talk titled "Specialist Bees in Connecticut" to the Connecticut Botanical Society (April 1); and hosted a visit from Dr. Joan Milam from the University of Massachusetts to discuss taxonomic updates in the bee genera *Lasioglossum* and *Nomada* (April 4).

PUBLICATIONS

1. Zhang, L., Sun, H., Grosse-Wilde, E., Zhang, L., Hansson, B. S., and **Dweck, H. K. M**. (2023). Cross-generation pheromonal communication drives Drosophila oviposition site choice. *Current Biology*, *33*, 1–9. DOI: 10.1016/j.cub.2023.03.090

Abstract: In a heterogeneous and changing environment, oviposition site selection strongly affects the survival and fitness of the offspring. Similarly, competition between larvae affects their prospects. However, little is known about the involvement of pheromones in regulating these processes. Here, we show that mated females of *Drosophila melanogaster* prefer to lay eggs on substrates containing extracts of conspecific larvae. After analyzing these extracts chemically, we test each compound in an oviposition assay and find that mated females display a dose-dependent preference to lay eggs on substrates spiked with (Z)-9-octadecenoic acid ethyl ester (OE). This egg-laying preference relies on gustatory receptor Gr32a and tarsal sensory neurons expressing this receptor. The concentration of OE also regulates larval place choice in a dose-dependent manner. Physiologically, OE activates female tarsal Gr32a+ neurons. In conclusion, our results reveal a cross-generation communication strategy essential for oviposition site selection and regulation of larval density.

2. Khalil, N., **Shepard, J. J.**, Foss, K., and **Molaei, G.** (2023). Evidence of *Uranotaenia sapphirina* (Diptera: Culicidae) feeding on annelid worms in the Northeastern United States. *Journal of Medical Entomology*, *60*(3), 425-431. DOI: 10.1093/jme/tjad034

Abstract: Mosquito host-feeding behavior is an important parameter for determining the vector potential of mosquito species in a given locale. Despite the recent discovery of *Uranotaenia sapphirina* Osten Sacken feeding on annelid hosts in Florida, host association studies for this mosquito species in the United States remain limited. To investigate the blood-feeding pattern of *Ur. sapphirina* in the northeastern United States, mosquitoes were collected from Massachusetts, Connecticut, and New Jersey using CDC miniature light traps, peat fiber resting boxes, gravid traps, and backpack aspirators. Vertebrate and invertebrate hosts of this mosquito species were identified through PCR amplification and nucle-

otide sequencing of portions of the mitochondrial cytochrome b gene and the 28S ribosomal RNA gene, respectively. Of 21 (24.7%) specimens successfully identified to host species, 47.6% contained solely annelid blood, 14.3% mammalian blood, 14.3% avian blood, and 23.8% with mixed blood of annelid and avian origin. The mud earthworm, *Sparganophilus tennesseensis* Reynolds (Haplotaxida: Sparganophilidae), was identified as the most common host (n = 14, including mixed bloods), followed by American robin, *Turdus migratorius* (n = 7, including mixed bloods). Testing of these blood engorged mosquitoes for West Nile virus and eastern equine encephalitis virus did not result in any positive specimens. This is the first report of *Ur. sapphirina* feeding on annelids and on both vertebrate and invertebrate hosts in mixed bloodmeals in the northeastern United States. Our findings support the recent report of *Ur. sapphirina* feeding on invertebrates and further emphasizes the inclination of some mosquito species to feed on a wider range of hosts spanning nontraditional taxonomic groups.

3. Vogels, C. B. F., **Brackney, D. E.**, Dupuis, A. P., Robich, R. M., Fauver, J. R., Brito, A. F., **Williams, S. C.**, **Anderson, J. F.**, Lubelczyk, C. B., Lange, R. E., Prusinski, M. A., Kramer, L. D., Gangloff-Kaufmann, J. L., Goodman, L. B., Baele, G. B., Smith, R. P., **Armstrong, P. M.**, Ciota, A. T., Dellicour, S., and Grubaugh, N. D. (2023). Phylogeographic reconstruction of the emergence and spread of Powassan virus in the northeastern United States. *The Proceedings of the National Academy of Sciences (PNAS).* DOI: 10.1073/pnas.2218012120

Abstract: Powassan virus is an emerging tick-borne virus of concern for public health, but very little is known about its transmission patterns and ecology. Here, we expanded the genomic dataset by sequencing 279 Powassan viruses isolated from Ixodes scapularis ticks from the northeastern United States. Our phylogeographic reconstructions revealed that Powassan virus lineage II was likely introduced or emerged from a relict population in the Northeast between 1940 and 1975. Sequences strongly clustered by sampling location, suggesting a highly focal geographical distribution. Our analyses further indicated that Powassan virus lineage II emerged in the northeastern United States mostly following a south-to-north pattern, with a weighted lineage dispersal velocity of ~3 km/y. Since the emergence in the Northeast, we found an overall increase in the effective population size of Powassan virus lineage II, but with growth stagnating during recent years. The cascading effect of population expansion of white-tailed deer and I. scapularis populations likely facilitated the emergence of Powassan virus in the northeastern United States.

ENVIRONMENTAL SCIENCE AND FORESTRY

DR. SCOTT WILLIAMS met virtually with and spoke to students in the STEM program from Staples High School (Westport, CT) about career paths in the sciences (12 attendees) (April 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, and Michigan State University about tick management strategies involving white-tailed deer (April 5); participated in a conference call on collaborative research efforts with scientists from Genesis Laboratories, Inc. (April 10); met with Valley Laboratory plant pathology scientist candidate Dr. Chase Crowell (April 13); with **DR. MEGAN LINSKE** traveled to Isle au Haut, ME to meet with staff from MaineHealth Institute for Research and island residents regarding collaborative research on the integrated tick management strategy of systemic acaricidal treatment of mice and deer as part of a recently awarded 5-year CDC grant (April 16-18); interviewed by Associated Press reporter Patrick Whittle about an early tick season (April 18); met with Valley Laboratory plant pathology scientist candidate Dr. Nate Westrick (April 19); 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 (April 19); attended the virtual defense of Yale University School of Medicine Ph. D. candidate Rebecca Earnest (April 20); participated in the 2023 Annual Meeting of the Northeast Regional Center for Excellence in Vector-Borne Diseases and presented invited lecture titled "Experimental Systemic Acaricidal Treatment of Wildlife Hosts" Jones Auditorium, New Haven, CT (100 attendees) (April 21); participated in a Zoom call with scientists from Maine Medical Center Research Institute and Columbia University on next steps forward on a collaborative research project (April 25); as Executive Treasurer, participated in the Annual Meeting of the Executive Committee of the Northeast Section of the Wildlife Society in Hershey, Pennsylvania, and was re-elected to a two-year term as Treasurer (April 30).

MR. JOSEPH P. BARSKY presented "Native Trees and Shrubs" to the Spring Glen Garden Club at Lockwood Farm (10 attendees) (April 10); along with **DR. JEFFREY WARD**, participated in the Forest Ecosystem Monitoring Cooperative State Partnership Virtual Conference Call (8 participants) (April 21); collaborated with soil scientists from the USDA-NRCS in Morris on a forest soil carbon study (April 17-21); demonstrated forestry sampling techniques to high school students from The Sound School at CAES, New Haven (10 students, 2 adults) (April 24).

MR. GREGORY BUGBEE gave a soil testing demonstration to students from Options Employment & Educational Services (6 students) (April 4); with **MS. SUMMER STEBBINS** and **MS. RILEY DOHERTY**, gave a seminar on Connecticut's Invasive Aquatic Plants at Three Rivers Community College in Norwich (30 attendees) (April 5); with **MS. SUMMER STEBBINS** and **MS. RILEY DOHERTY**, presented a lecture on "Hydrilla in the Connecticut River" to the Essex Harbor Management Commission at the Essex Town Hall (12 attendees) (April 27); with **MS. SUMMER STEBBINS** and **MS. RILEY DOHERTY**, hosted the annual meeting of the Connecticut Federation of Lakes and presented lecture titled "Invasive Plants in Connecticut Lakes and Ponds" in Jones Auditorium, New Haven, CT (40 attendees) (April 29).

DR. SUSANNA KERIÖ presented an invited lecture on "Chestnut Research at CAES" at the annual meeting of the Connecticut Chapter of The American Chestnut Foundation (30 attendees) (April 15); participated in the Yale University Biosafety Committee meeting (April 20); presented an invited lecture on "Drought and Urban Tree Health" to Massachusetts arborists (170 attendees) (April 25); presented an invited webinar on "Urban Tree Health in a Changing Climate" at the Arbor Day event organized by the Rice Creek Field Station, SUNY Oswego (April 28).

DR. SARA NASON met virtually with the Benchmarking and Publications for Non-targeted Analysis working group (April 13, 18, and 24); with **DR. CLAIRE RUTLEDGE** and **MS. SUMMER STEBBINS**, gave an educational tour of The CAES to students from the Sound School (April 24); presented lecture titled "An Overview of PFAS Research at CAES" and hosted the round table discussion at the CAES PFAS mini-Symposium, New Haven, CT (April 28).

DR. ITAMAR SHABTAI met with a colleague from the University of Idaho to discuss an ongoing joint research project (April 10); with **DR. BLAIRE STEVEN**, met with a collaborator from the University of Maryland, Baltimore, to discuss a joint NSF grant proposal (April 13); joined Natural Resources Conservation Service (NRCS) staff to sample soils from White Memorial Foundation Forest experimental plots as part of a project evaluating Dynamic Soil Properties (April 17, 18, and 20); met with collaborators from Cornell University to discuss a joint NASA-ROSES grant proposal (April 18); worked remotely at the STXM-NEXAFS beamline at the Canadian Light Source synchrotron (April 26-29).

DR. JEFFREY WARD (Emeritus) was appointed to the Connecticut Forest Practices Advisory Board by Governor Ned Lamont (April 4); met with Will Hochholzer and Nate Piche (DEEP Forestry) at Cockaponset State Forest to discuss forest regeneration practices (April 18); participated in a Forest Ecosystem Monitoring Cooperative (FEMC) Steering Committee Meeting (April 19); organized, hosted, and spoke at the FEMC's Connecticut State Partnership organizing meeting (12 attendees) (April 21); spoke of forest management and succession at Master Woodland Manager Forest Ecology field workshop in North Madison (10 attendees) (April 22); spoke on "Gardening with Deer" for the Long Hill Garden Club in Trumbull (41 attendees) (April 24).

DR. LEIGH WHITTINGHILL participated in The CAES DEI Committee meeting (April 11); participated in the DEI Disability and Accessibility Sub-Committee meeting and became the designated reporter for the DEI Committee (April 20); met with the Connecticut Small Fruit and Vegetable Conference planning committee to start work on the 2024 conference (April 24); served as a judge for the Sigma Xi Quinnipiac Chapter Student Research Conference (April 26); presented virtual workshop titled "Water Conservation as a Climate Smart Ag Practice Workshop" to New Haven area beginning and urban farmers (April 27); mentored a Quinnipiac University student for research experience credit (ending April 28).

PUBLICATIONS

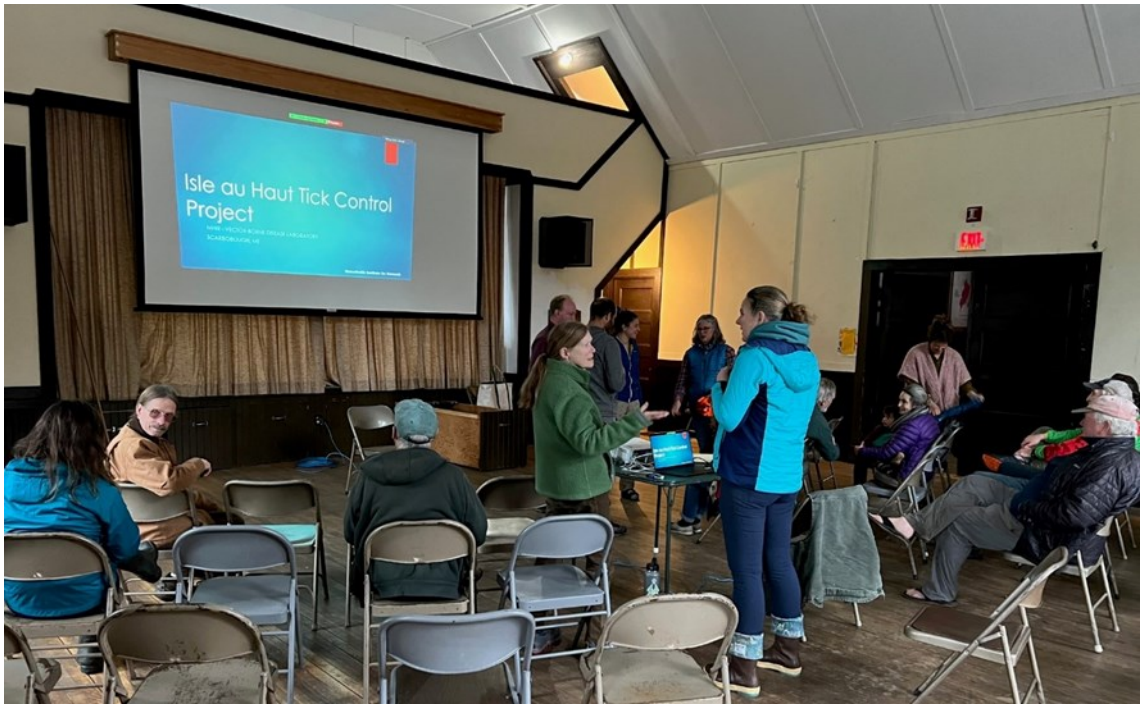
1. Leite, A. A., Carrijo, L., Melo, A., Carlos, L., Hurtarte, C., Zuin, L., Dela Piccolla, C., Werder, D., **Shabtai, I.**, and Lehmann, J. (2023). Magnesium-enriched poultry manure enhances phosphorus bioavailability in biochars. *Chemosphere*. DOI: 10.1016/j.chemosphere.2023.138759

Abstract: Pyrolysis of calcium-rich feedstock (e.g., poultry manure) generates semi-crystalline and crystalline phosphorus (P) species, compromising its short-term availability to plants. However, enriching poultry manure with magnesium (Mg) before pyrolysis may improve the ability of biochar to supply P. This study investigated how increasing the Mg/Ca ratio and pyrolysis temperature of poultry manure affected its P availability and speciation. Mg enrichment by ~2.1% increased P availability (extracted using 2% citric and formic acid) by 20% in Mg-biochar at pyrolysis temperatures up to 600 °C. Linear combination fitting of P K-edge XANES of biochar, and Mg/Ca stoichiometry, indicate that P species, mainly Ca–P and Mg–P, are altered after pyrolysis. At 300 °C, adding Mg as magnesium hydroxide [$Mg(OH)_2$] created $MgNH_4PO_4$ (18%) and $Mg_3(PO_4)_2.8H_2O$ (23%) in the biochar, while without addition of Mg $Ca_3(PO_4)_2$ (11%) predominated, both differing only for pyrophosphate, 33 and 16%, respectively. Similarly, the P $L_{2,3}$ edge XANES data of

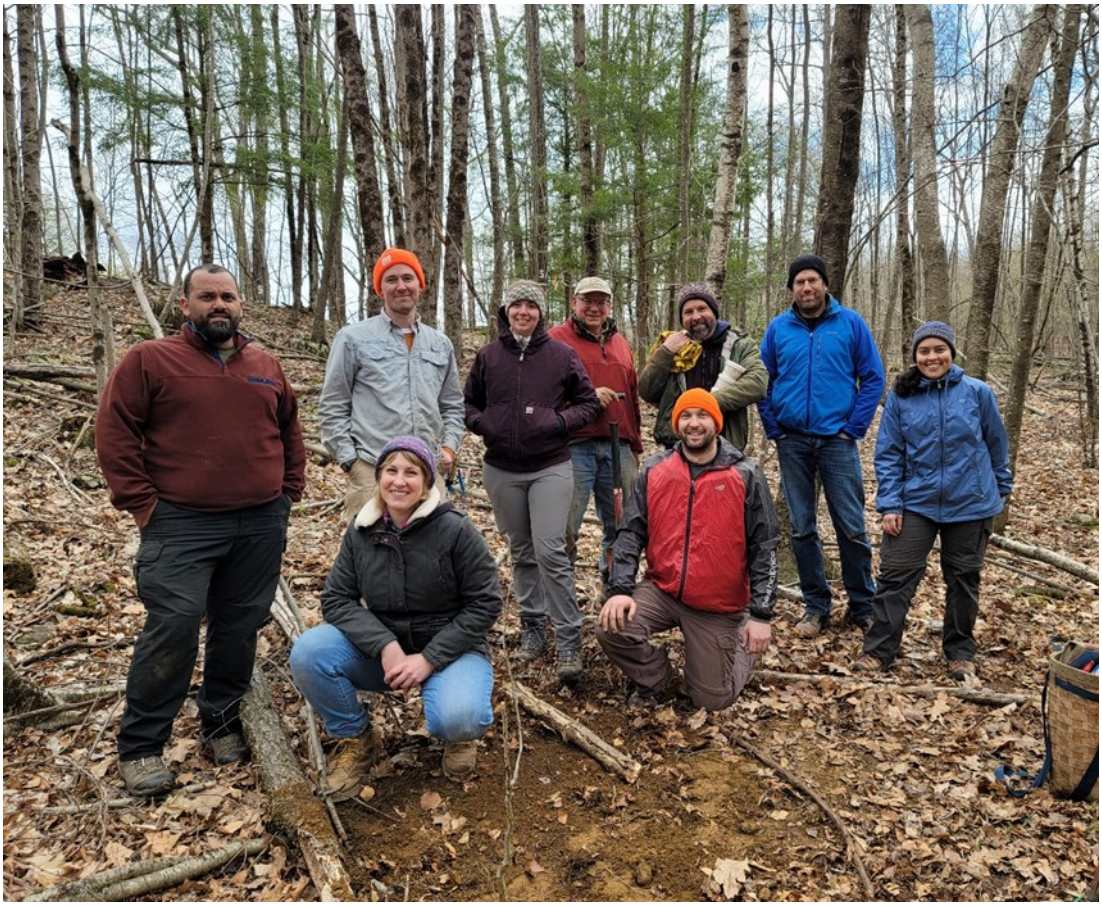
biochar made with Mg were indicative of either $MgHPO_4.3H_2O$ or $Mg_3(PO_4)_2.8H_2O$, in comparison to $CaHPO_4.2H_2O$ or $Ca_3(PO_4)_2$ without Mg. More importantly, hydroxyapatite [$Ca_5(PO_4)_3(OH)$] was not identified with Mg additions, while it was abundant in biochars produced without Mg both at 600 (12%) and 700 °C (32%). The presence of Mg formed Mg–P minerals that could enhance P mobility in soil more than Ca–P, and may have resulted in greater P availability in Mg-enriched biochars. Thus, a relatively low Mg enrichment can be an approach for designing and optimize biochar as a P fertilizer from P-rich excreta, with the potential to improve P availability and contribute to the sustainable use of organic residues.

2. Lin, E. Z., **Nason, S. L.**, Zhong, A., Fortner, J., and Godri Pollitt, K. J. (2023). Trace analysis of per- and polyfluorinated alkyl substances (PFAS) in dried blood spots – Demonstration of reproducibility and comparability to venous blood samples. *Science of the Total Environment*, *883*. DOI: 10.1016/j.scitotenv.2023.163530

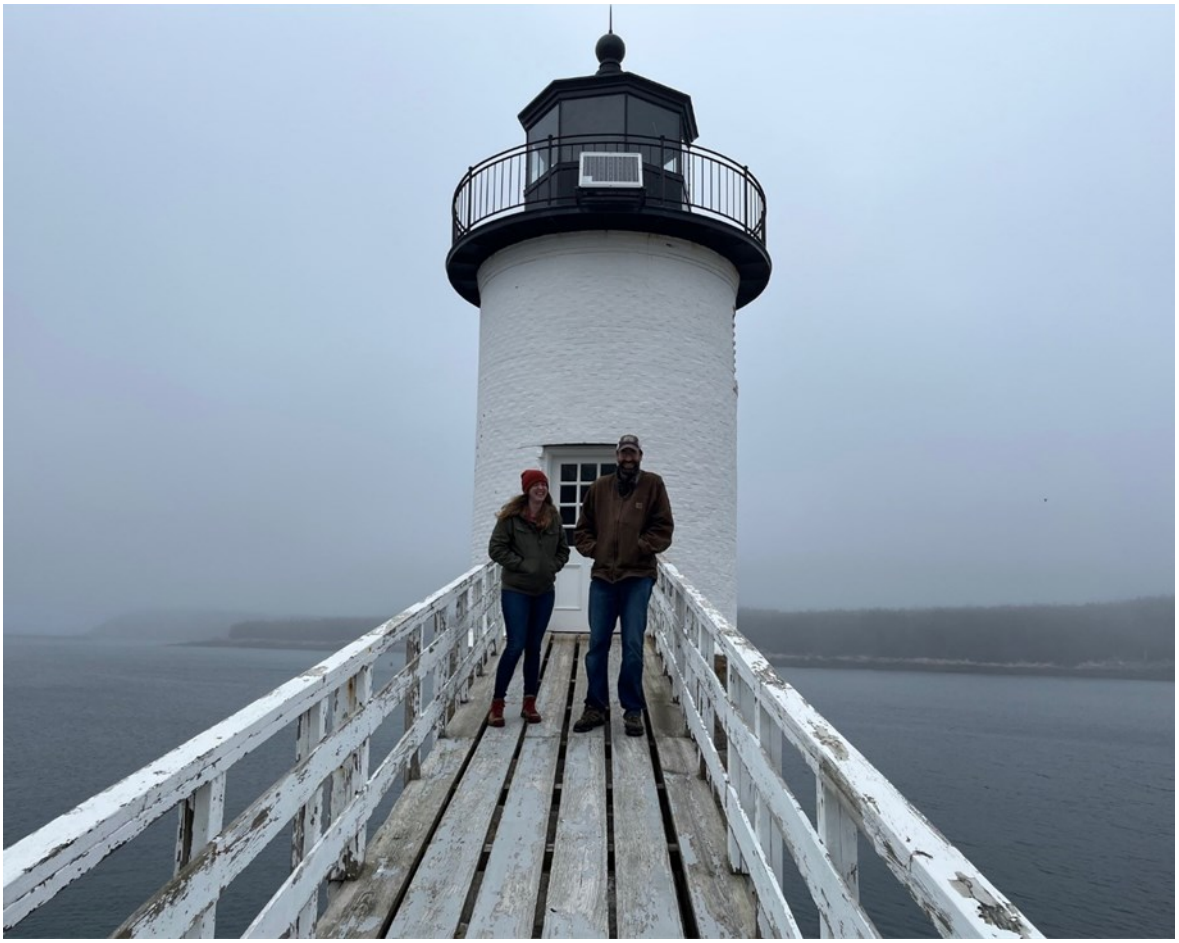
Abstract: Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that have been widely used in consumer, personal care, and household products for their stain- and water-repellent properties. PFAS exposure has been linked to various adverse health outcomes. Such exposure has commonly been evaluated in venous blood samples. While this sample type can be obtained from healthy adults, a less invasive method of blood collection is required when evaluating vulnerable populations. Dried blood spots (DBS) have gained attention as a biomatrix for exposure assessment given the relative ease of collection, transport, and storage. The objective of this study was to develop and validate an analytical method to measure PFAS in DBS. A workflow is presented for extracting PFAS from DBS, chemical analysis by liquid chromatography-high resolution mass spectrometry, normalization for blood mass, and blank correction to account for potential contamination. Over 80 % recovery was achieved for the 22 PFAS measured with an average coefficient of variation of 14 %. Comparison of PFAS concentrations detected in DBS and paired whole blood samples from six healthy adults was correlated ($R^2 > 0.9$). Findings demonstrate trace levels of a broad range of PFAS in DBS can be reproducibly measured and are comparable to liquid whole blood samples. DBS can offer novel insights to environmental exposures, including during critical windows of susceptibility (i.e., in utero, early life), which have been largely uncharacterized.



Drs. Scott Williams and **Megan Linske** oversaw the Isle au Haut Town Meeting run by MaineHealth Institute for Research staff explaining the proposed tick control project and fielded questions/concerns from the audience.



Dr. Itamar Shabtai and **Mr. Joseph Barsky** joined with NRCS staff at a soil sampling pit at White Memorial Foundation Forest in Morris, CT as part of a project evaluating dynamic soil properties.



Drs. Williams and **Megan Linske** joined MaineHealth Institute for Research staff with White Buffalo, Inc. biologist Dane Stevens for a tour of the island including a visit to the 1907 Victorian Isle au Haut lighthouse.

PLANT PATHOLOGY AND ECOLOGY

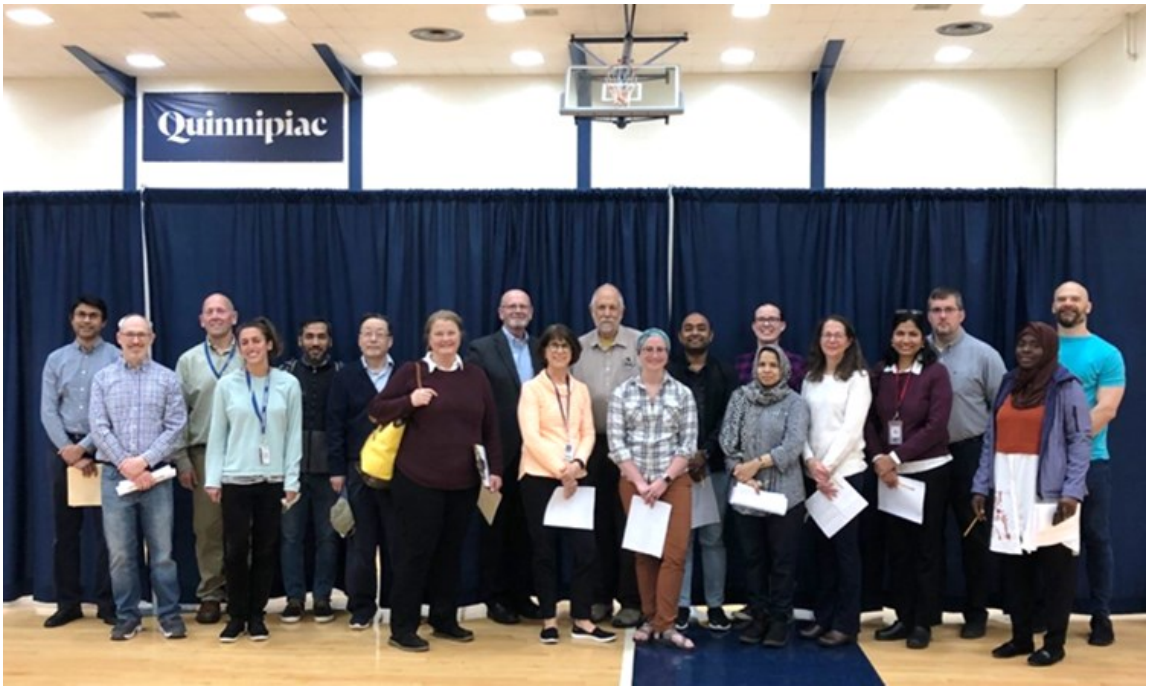
DR. LINDSAY TRIPLETT gave a lecture titled "The History of Carolina Rice" to the Waterbury Senior Center (32 adults) (April 18), and participated in a meeting of the Soil Predators Working Group via Zoom (6 adults) (April 12).

DR. ROBERT MARRA presented a talk "The Role of Fungi in Forests" to the PierceCare Senior Living Center in Brooklyn, CT (20 adults) (April 19); participated as a judge in the Sigma Xi Student Research Symposium at Quinnipiac University (April 26).

MS. FELICIA MILLETT with **MS. KATHERINE DUGAS,** represented the PDIO and IIO labs at the Agriscience Career Fair at the Wamogo High school in Litchfield (60 students) (April 5); participated in the NPDN Cross Committee Meeting via Zoom (23 adults) (April 5); instructed "Diplodia Blight of Pines" in the Connecticut Tree Protective Association's Arboriculture 101 Review Night in New Haven (35 adults) (April 6); participated in the NPDN Proficiency Committee Meeting via Zoom (10 adults) (April 18); presented to 1st and 2nd graders as part of St. Thomas's School STEAM Festival in Jones Auditorium with **MS. JAMIE CANTONI, MS. KATHERINE DUGAS**, and **DR. KELSEY FISHER** (35 students) (April 26); and participated in the NEPDN Monthly Meeting via Zoom (10 adults) (April 27).

DR. YONGHAO LI instructed "Phytophthora bleeding canker" in the Review Night of the Connecticut Tree Protective Association Arboriculture 101 Course in New Haven (35 adults) (April 6); Participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (7 adults) (April 12); as a guest speaker, presented "Sustainable Disease Management" in 11th Jane Goodall Symposium – Sustainability at Western Connecticut State University 2033, in Danbury (32 adults) (April 19); attended the Northeast Plant Diagnostic Network monthly meeting via Zoom (April 27); presented "Gardening with Native Plants" to Wethersfield Public Library education program via Zoom (21 adults) (April 27).

DR. QUAN ZENG was interviewed by Ms. Kate Prengaman from Good Fruit Growers for an grower outreach article: https://www.goodfruit.com/a-plan-of-defense-against-fire-blight (March 28), met the Valley Laboratory Mycologist candidates (April 13 and 19), had Zoom meeting with a SCRI grant planning team (April 17).



Thanks to all of The CAES staff who served as judges in the 12th annual Quinnipiac chapter of Sigma Xi student research conference at Quinnipiac University, Hamden, CT (April 26) (~75 attendees). Analytical Chemistry; **Ms. Terri Arsenault**, **Drs. Anuja Bharadwaj**, **Nassifatou Tittikpina** and **Yi Wang**: Entomology; **Drs. Hany Dweck** and **Kelsey Fisher**: Environmental Science and Forestry; **Drs. Charles Vossbrinck** and **Leigh Whittinghill**: Plant Pathology and Ecology **Ms. Regan Huntley**, **Drs. Robert Marra, Salma Mukhtar, Ravi Patel, Neil Schultes** and **Stephen Taerum**; Valley Laboratory; **Dr. DeWei Li**.

DR. CAROLE CHEAH gave a presentation on collaborations to protect hemlocks in Connecticut for the Forest Health Monitoring Workshop at The CAES, New Haven (68 attendees) (March 7); was interviewed by Heather Thomson, Interim Executive Director, for the Great Mountain Forest April 2023 Newsletter (March 23).

MS. ROSE HISKES conducted an invasive plant site visit at the Little River Preserve with Jim Sanders in Oxford, (April 15); conducted a Connecticut Invasive Plant Working Group (CIPWG) Invasive Plant Walk and Cut in Hebron, (12 attendees) (April 22); gave a talk on "Using Botany to Sustainably Manage Invasive Plants" at the Naugatuck Valley Council of Governments Sustainability Forum (55 attendees) (April 27).

PUBLICATIONS

1. Zhang, M.-Y., **Li, D.-W.***, Si, Y.-Z., Ju, Y., Zhu, L.-H.* (2023). *Colletotrichum* species associated with anthracnose in *Salix babylonica* in China. *Plants*, *12*, 1679. DOI: 10.3390/plants12081679

Abstract: *Salix babylonica* L. is a popular ornamental tree species in China and widely cultivated in Asia, Europe, and North America. Anthracnose in *S. babylonica* poses a serious threat to its growth and reduces its medicinal properties. In 2021, a total of 55 *Colletotrichum* isolates were isolated from symptomatic leaves in three provinces in China. Phylogenetic analyses using six loci (ITS, ACT, CHS-1, TUB2, CAL, and GAPDH) and a morphological characterization of the 55 isolates showed that they belonged to four species of Colletotrichum, including *C. aenigma*, *C. fructicola*, *C. gloeosporioides* s.s., and *C. siamense*. Among them, *C. siamense* was the dominant species, and *C. gloeosporioides* s.s. was occasionally discovered from the host tissues. Pathogenicity tests revealed that all the isolates of the aforementioned species were pathogenic to the host, and there were significant differences in pathogenicity or virulence among these isolates. The information on the diversity of *Colletotrichum* spp. that causes *S. babylonica* anthracnose in China is new.

2. Wan, Y., Si, W., Si, Y.-Z., **Li, D.-W.**, and Zhu, L.-H. (2023). First report of *Diaporthe eres* causing leaf spot of *Viburnum odoratissimum* var. *awabuki* in China. *Plant Disease*, *107*(3), 954. DOI: 10.1094/PDIS-05-22-1187-PDN

Abstract: *Viburnum odoratissimum* var. *awabuki* (K. Koch) Zabel ex Rumpl. is an evergreen tree used as a landscape plant in China (Xue et al. 2020). In June 2019, a foliar disease of ~60% incidence was observed on *V. odoratissimum* var. *awabuki* at the campus of Nanjing Forestry University, Jiangsu, China. The symptoms were initially irregular small red-brown spots, which later enlarged and became brown to black. Small tissue pieces (3 to 4 mm^2) cut from lesion margins were surfaced sterilized in 75% ethanol for 30 s and 1.5% NaClO for 60 s, rinsed in sterile water, and placed on potato dextrose agar (PDA) at 25°C. Pure cultures were obtained from the tips of hyphae. Using the standard phytopathological procedure, two representative isolates (SH161 and SH181) were obtained and deposited at Nanjing Forestry University. The colony on PDA was white with aerial mycelium, radiate, and the reverse was white. Black pycnidia developed on sterilized alfalfa stems at 25°C with a 14/10 h light/dark cycle for 20 days. Conidiophores were hyaline, branched, straight to sinuous, 9.4 to 26.0 × 1.0 to 2.5 µm (n = 30). Conidiogenous cells were 2.1 to 15.1 × 0.9 to 2.5 µm (n = 30). Alpha conidia were 7.4 ± 0.6 × 2.0 ± 0.2 µm (n = 50), hyaline, ellipsoidal to lanceolate. Beta conidia were 29.5 ± 1.8 × 1.1 ± 0.1 µm (n = 30), aseptate, hyaline, smooth, curved to hooked. Morphological features of two isolates matched those of *Diaporthe* spp. (Udayanga et al. 2014). DNA of two isolates was extracted and the internal transcribed spacer region (ITS), partial translation elongation factor 1-alpha (*TEF1-α*), calmodulin (*CAL*), beta-tubulin (*TUB*), and histone H3 (*HIS*) genes were amplified with pri-

mers ITS1/ITS4 (White et al. 1990), EF1-728F/EF1-986R, CAL228F/CAL737R (Carbone and Kohn 1999), βt2a/βt2b, and CYLH3F/H3-1b (Crous et al. 2004; Glass and Donaldson 1995). The sequences were deposited into GenBank (acc. nos. for isolate SH161: OK326730 for ITS, OK413403 to OK413406 for *TUB*, *CAL*, *HIS*, and *TEF1-α*; and for isolate SH181: OK331347 for ITS, OK413407 to OK413410 for *TUB*, *CAL*, *HIS*, and *TEF1-α*). A BLAST search of SH161 showed high similarities with sequences of *Diaporthe eres* (AR5193) (KJ210529 [ITS], identities = 438/512 [94%]; KJ420850 [*HIS*], identities = 466/472 [99%]; KJ210550 [*TEF1-α*], identities = 345/350 [99%]; KJ434999 [*CAL*], identities = 344/345 [99%]; KJ420799 [*TUB*], identities = 508/517 [98%]). BLAST results of SH181 are listed in supplementary materials. Maximum likelihood and Bayesian posterior probability analyses using IQtree v. 1.6.8 and MrBayes v. 3.2.6 with the concatenated sequences placed SH161 and SH181 in the clade of *D. eres.* Based on the multilocus phylogeny and morphology, two isolates were identified as *D. eres.* Pathogenicity was tested on 1-year-old cuttings of *V. odoratissimum* var. *awabuki* in the greenhouse. Healthy leaves were wounded with a sterile needle, then inoculated with 5-mm plugs from the edge of two isolate cultures. PDA plugs were used for controls. Three plants were used for each treatment, and three leaves of each plant were inoculated. Each plant was covered with a plastic bag, and sterilized water was sprayed into the bags twice daily to maintain humidity and kept in a greenhouse at day/night temperatures of 25 ± 2/16 ± 2°C. Three days after inoculation, the inoculated leaves had lesions similar to those in the field. The controls remained healthy. *D. eres* was reisolated from inoculated leaves. No fungus was isolated from controls. *D. eres* was reported from *Viburnum lantana* in Austria (Dissanayake et al. 2017; Udayanga et al. 2014). Also, it was reported from *V. odoratissimum* and *V. tinus* in Ukraine (Dudka et al. 2004). This is the first report of *D. eres* causing *V. odoratissimum* var. *awabuki* leaf spots in China. This finding will provide an effective basis for developing control strategies for the disease.

3. Zhang, M.-Y., **Li, D.-W.**, and Zhu, L.-H. (2023). Leaf spots of *Salix babylonica* caused by *Colletotrichum gloeosporioides* and *C. siamense* newly reported in China. *Plant Disease*, *107*(4), 1233. DOI: 10.1094/PDIS-07-22-1584-PDN

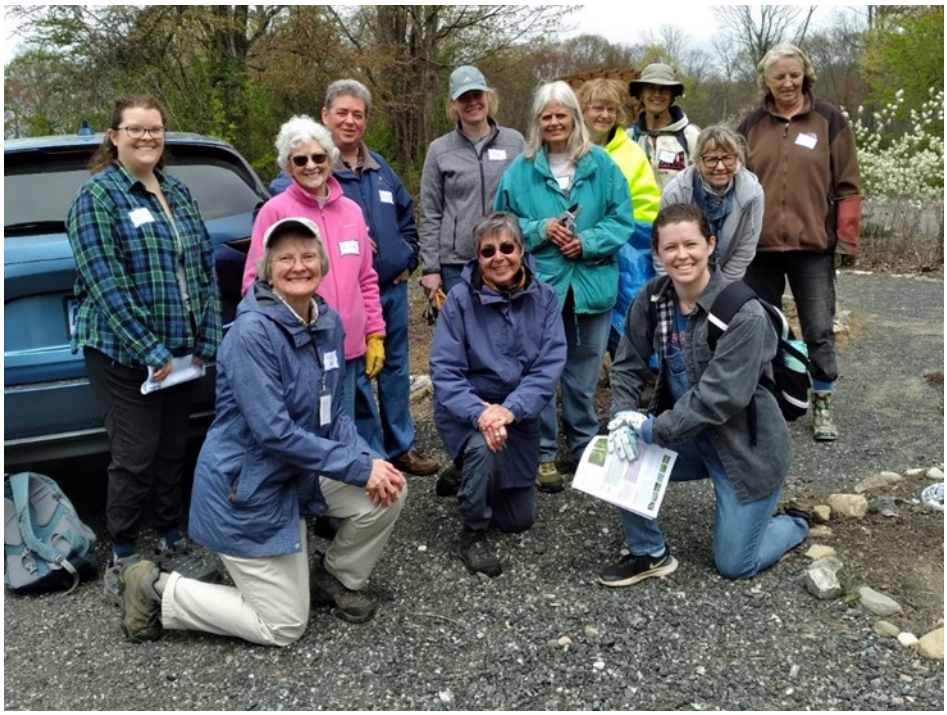
Abstract: *Salix babylonica* L. shows a great potential for restoration of contaminated water and soils and has a high ornamental value (Li et al. 2015). In mid-October 2021, a leaf spot disease, with an incidence of approximately 61%, occurred on leaves of 25-year-old *S. babylonica* on the campus of Nanjing Forestry University. On average, 65% of the leaves per tree were infected. Symptoms began as dark brown, irregular spots, and the centers were grayish white. The spots gradually enlarged with time. Fresh specimens were collected from three trees (10 leaves/tree). Small tissue pieces cut from lesion margins were surface sterilized (Mao et al. 2021), plated on potato dextrose agar (PDA), and incubated at 25°C. Three representative isolates (NL1-7, NL1-10, and NL1-13) were obtained and deposited in the China Forestry Culture Collection Center. The colonies of three isolates were white, grayish white at the center. The conidia of three isolates were one celled, straight, subcylindrical, hyaline, smooth, and 14.6 to 18.6 × 4.3 to 6.7 µm, 13.8 to 16.7 × 4.7 to 6.0 µm, and 12.1 to 16.9 × 5.4 to 7.5 µm (n = 50) for NL1-7, NL1-10, and NL1-13, respectively. The conidiophores of NL1-7 were hyaline to pale brown, septate, and branched, 18.9 to 48.0 µm (n = 50). Appressoria were one celled, ellipsoidal, brown or dark brown, thick walled. The conidiophores and appressoria of the other two isolates were almost identical to NL1-7. Based on morphological characteristics, the three isolates matched the *Colletotrichum gloeosporioides* species complex (Weir et al. 2012). DNA of the three isolates was extracted. The internal transcribed spacer region (ITS), actin (*ACT*), calmodulin (*CAL*), chitin synthase (*CHS-1*), glyceraldehyde-3-phosphate dehydrogenase (*GAPDH*), and β-tubulin 2 (*TUB2*) loci were amplified using the primer pairs ITS1/ITS4, ACT-512F/ACT-783R, CL1C/CL2C, CHS-79F/CHS-354R, GDF1/GDR1, and T1/Bt2b, respectively (Weir et al. 2012). The sequences were deposited in GenBank (accession nos. ON870951 and ON858477 to ON858481 for NL1-7; ON908707 and ON858482 to ON858486 for NL1-10;

ON870949 and ON858487 to ON858491 for NL1-13). BLAST results showed that the ITS, *ACT*, *CAL*, *CHS-1*, *GAPDH*, and *TUB2* sequences of NL1-7 were identical to *C. gloeosporioides* at a high level (>99%). The sequences of NL1-10 and NL1-13 were consistent with *C. siamense* at a high level (>99%). Maximum likelihood and Bayesian inference analyses using IQtree v. 1.6.8 and MrBayes v. 3.2.6 with the concatenated sequences (ITS, *ACT*, *CAL*, *CHS-1*, *GAPDH*, and *TUB2*) placed NL1-7 in the clade of *C. gloeosporioides* sensu stricto and NL1-10 and NL1-13 in the clade of *C. siamense*. To confirm their pathogenicity, 10 leaves/seedling of nine healthy 3-year-old seedlings were wounded with a sterile needle and inoculated with 10 µl of conidial suspension (10^6 conidia/ml) of the three isolates. Three control plants were treated with sterile water. Seedlings were covered with plastic bags after inoculation and kept in a greenhouse at 25 ± 2°C and RH 80%. Within 7 days, all inoculated leaves showed lesions similar to those in the field, and controls were asymptomatic. *C. gloeosporioides* s.s. and *C. siamense* were reisolated from the infected tissues. It was reported that *Colletotrichum* species can cause many plant diseases, for example, *C. acutatum* causes twig canker (Swain et al. 2012), and *C. salicis* causes willow anthracnose (Okorski et al. 2018). However, some *Colletotrichum* species are endophytic (Martin and Peter 2021) and may only become pathogenic under the right conditions. This is the first report of *C. gloeosporioides* s.s. and *C. siamense* causing leaf spots on *S. babylonica* in the world. These data will help select appropriate strategies for managing this disease and further studies on the pathogen and host.

4. Si, Y.-Z., **Li, D.-W.** and Zhu, L.-H. (2023). First Report of *Diaporthe eres* and *D. unshiuensis* causing leaf spots on *Sapindus mukorossi* in China. *Plant Disease*, *107*(4), 1224. DOI: 10.1094/PDIS-05-22-1176-PDN

Abstract: *Sapindus mukorossi* Gaertn., commonly known as soapberry, is widely cultivated in Southern China as a landscaping tree. In June 2019, a foliar disease with an incidence of ~60% on trees was observed in the soapberry germplasm repository, Jianning, Sanming, Fujian, China. The symptoms initially appeared as irregular small yellow spots, while the center of the lesions became dark brown with time. Fragments (3 to 4 mm^2) from lesion margins were sterilized and cultured based on Wang et al. (2021). Two isolates (FJ1 and FJ21) were obtained with the following morphological characteristics on PDA: (i) FJ1: Conidiogenous cells were 9.7 to 25.0 × 1.5 to 2.2 µm (n = 20). Alpha conidia were 6.1 to 8.3 × 2.2 to 3.0 µm (n = 30), aseptate, hyaline, smooth, ellipsoidal. Beta conidia were 28.3 to 38.2 × 1.3 to 1.7 µm (n = 30), hyaline, smooth, curved to hooked. Conidial drops were milky colored. (ii) FJ21: Pycnidia were dark brown, 280 to 843 µm (n = 30) in diameter, globose, or irregular on alfalfa stems. Conidiophores were hyaline, cylindrical, smooth, and slightly tapered to the apex, 17.4 to 35.4 × 1.5 to 2.6 µm (n = 20). Conidiogenous cells were 14.7 to 29.7 × 1.4 to 2.6 µm (n = 20). Alpha conidia were 5.6 to 7.1 × 2.4 to 3.4 µm (n = 30), hyaline, smooth, ellipsoidal or clavate, aseptate, biguttulate. Beta conidia were not observed. Conidial drops were yellow. The morphological characteristics of FJ1 and FJ21 were similar to those of *Diaporthe* spp. (Gomes et al. 2013). DNA of two isolates was extracted, and the internal transcribed spacer region (ITS) and partial sequences of translation elongation factor 1-alpha (*TEF1-α*), calmodulin (*CAL*), β-tubulin (*TUB*), and histone H3 (*HIS*) genes were amplified with primers ITS1/ITS4 (White et al. 1990), EF1-728F/EF1-986R, CAL228F/CAL737R (Carbone and Kohn 1999), βt2a/βt2b, and CYLH3F/H3-1b (Crous et al. 2004; Glass and Donaldson 1995), respectively. The sequences were deposited in GenBank (accession nos. MW585608 and MW768905 to MW768908 for FJ1; MT755625 and MT776728 to MT776731 for FJ21). The BLASTn results showed that the ITS, *TEF1-α*, *TUB*, *HIS*, and *CAL* sequences of FJ1 were 100, 99, 98, 98, and 99% identical to those of *D. eres* (NR144923, KJ210550, KJ420799, KJ420850, and KJ434999, respectively). For FJ21, BLASTing with the same loci showed 100, 100, 100, 99, and 100% similarity with those of *D. unshiuensis* (MH121530, MH121572, MH121607 MH121488, and MH121448, respectively). Phylogenetic analyses with the concatenated sequences placed FJ1 and FJ21 in the clades of *D. eres* and *D. unshiuensis*, respectively. Pathogenici-

ty tests were performed by wounding leaves of 2-year-old soapberry seedlings with a sterile needle. The leaves were inoculated with *D. eres* and *D. unshiuensis* isolates, with 10 µl of conidial suspensions (10^6 conidia/ml). Three plants were used for each treatment, and the leaves of each plant were inoculated. The control was treated with 10 µl of sterile water. The plants were kept in a greenhouse (RH > 80%, 25 ± 2°C). In 5 days, all inoculated leaves showed lesions similar to the field symptoms. Controls were asymptomatic. *D. eres* and *D. unshiuensis* were reisolated from the diseased leaves. No fungus was isolated from the control. Previously, *D. biconispora* and *D. sapindicola* were reported as the causal agents of disease on soapberry (Si et al. 2021, 2022), but this is the first report of *D. eres* and *D. unshiuensis* causing leaf spots on *S. mukorossi* in China. These data will help develop effective strategies for managing this disease.



Ms. Rose Hiskes conducted a Connecticut Invasive Plant Working Group (CIPWG) Invasive Plant Walk and Cut in Hebron, (12 attendees) (April 22)

JOURNAL ARTICLES APPROVED APRIL 2023

Huston, N. C., **Brackney, D. E.** and Pyle, A. M. West Nile virus harbors essential riboregulatory elements with conserved and host-specific functional roles. *Cell Host & Microbe.*

Aulakh, J. S. Postemergence herbicide tank-mixes for summer weed management. *The Real Tree Line*.

Aulakh, J. S. Wild buckwheat identification and management in Christmas trees. *The Real Tree Line*.

Holcomba, K. M., **Khalil, N.**, **Cozens, D. W.**, **Cantoni, J.**, **Brackney, D. E.**, **Linske, M. A.**, **Williams, S. C.**, **Molaei, G.**, and Eisen, R. J. Comparison of acarological risk metrics derived from active and passive surveillance and their concordance with tick-borne disease incidence. *Ticks and Tick-borne Diseases*.

Li, H., Wan, Y., **Li, D.-W.**, and Zhu, L.-H. *Colletotrichum nanjingense* sp. nov. and *C. gloeosporioides* causing leaf tip blight on *Jasminum mesnyi* in China. *Plant Disease*.

Peterson, N. D. L., Pecori, F., Luchi, N., Migliorini, D., Santini, A., Kyle, K., **Rutledge, C.**, Sallé, A. and Cleary, M. Development of novel LAMP and qPCR assays for rapid and specific identification of Bronze birch borer (*Agrilus anxius*). *Environmental DNA*.

Quinn, N. F., Petrice, T. R., Schmude, J. M., Poland, T. M., Bauer, L. S., **Rutledge, C. E.**, Van Driesche, R. G., Elkinton, J. S. II, and Duan, J. J. Post-release assessment of *Oobius agrili* establishment and impacts in Michigan and the Northeastern United States. *Journal of Economic Entomology*.

Stafford, K. C. III, **Molaei, G.**, **Williams, S. C.**, and Mertins, J. W. Introduction of the ectoparasite *Rhipicephalus pulchellus* (Ixodida: Ixodidae) into Connecticut with a human traveler from Tanzania, and a review of its importation records into the United States. *Journal of Medical Entomology*.

Fan, K., Qi, Y.-K., Fu, L., Li, L., Liu, X.-H., Qu, J.-L., **Li, D.-W.** and Wang, Q.-H. Identification and fungicide screening of fungal species associated with walnut anthracnose in Shaanxi and Liaoning provinces, China. *Horticultural Plant Journal*.

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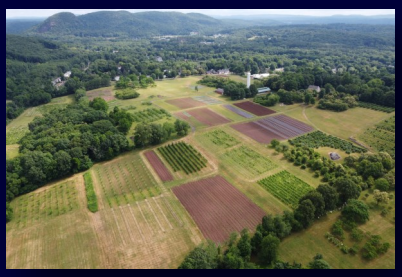
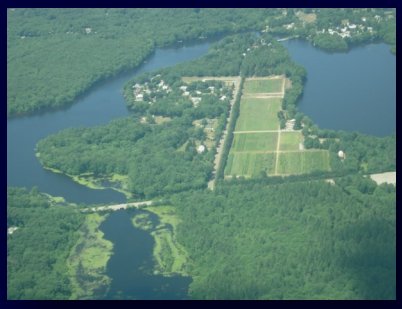
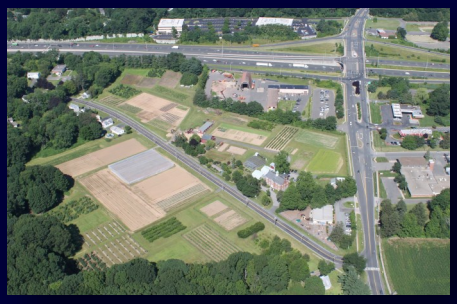


Lockwood Farm, Hamden



Griswold Research Center, Griswold



Valley Laboratory, Windsor

The Connecticut Agricultural Experiment Station

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