Station News

The Connecticut Agricultural Experiment Station
Volume 15 Issue 2 | February 2025

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

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

JASON C. WHITE, PH.D. participated in a Teams call with staff for the Department of Consumer Protection Division of Drug Control to discuss the adult use cannabis project (January 3, 16); participated in a Teams call with Prof. Zsolt Pap from the Babeș-Bolyai University in Romania and Prof. Om Parkash Dhankher of the University of Massachusetts to discuss a joint US-Romania grant application (January 6, 13); along with **Chaoyi Deng, Ph.D.** and **Hina Ashrah, Ph.D.** met by Zoom with collaborators at Johns Hopkins University to discuss collaborative research (January 6); along with **Nubia Zuverza-Mena, Ph.D., Jingyi Zhao, Ph.D.,** and **Sara Nason, Ph.D.** participated in a Zoom meeting with collaborators at Yale University and the University of Minnesota for a joint NIEHS grant (January 7); along **Nubia Zuverza-Mena, Ph.D.** participated in a Zoom call with collaborators at Brookhaven National Laboratory to discuss submission of a workshop proposal (January 8); participated in the weekly NSF Center for Sustainable Nanotechnology (CSN) all hands call by Zoom (January 8; 15, 29); along with **Blaire Steven, Ph.D.** and **Jing Yuan, Ph.D.** met by collaborators at the University of Delaware and in Italy to discuss progress on a joint USDA grant (January 14); hosted a Zoom call with Prof. Soledad Peresin of Auburn University to discuss collaborative research (January 14); met by Teams with technical staff at Metrohm to discuss combustion ion chromatography (January 14); along with Prof. Om Parkash Dhankher met with USDA NIFA staff to discuss a Closer to Zero conference grant (January 14); met by Teams with Office of the Governor staff to discuss nominations to the Tree Protection Examination Board (January 15); participated remotely in the University of Parma, Italy, symposium entitled "Bonechar as soil improver and fertilizer, which perspective for the future?" and gave a seminar entitled "Iron-fortified hemp-derived biochar enhances PFAS immobilization in soil and reduces bioavailability to radish" (January 16); attended the Connecticut Tree Protection Association annual meeting and gave an presentation entitled "CAES 2025 Update: "Putting Science to Work for Society" (January 16); met by Zoom with colleagues at LSU and Auckland University to discuss progress on a collaborative USDA grant (January 16); participated by Zoom in a Board of Directors meeting for the International Phytotechnology Society (January 17, 21); along with **Sudhir Sharma, Ph.D.** participated in a Zoom meeting with colleagues at Columbia University to discuss progress on a collaborative USDA project (January 21); along with colleagues at Yale University and the University of Minnesota met with program staff at the Superfund Basic Research Program of the NIEHS to discuss funding opportunities (January 21); along with **Michael Last** hosted the quarterly CAES Board of Control meeting (January 22); participated in a Zoom call with colleagues at Utah State University to discuss a collaborative USDA proposal (January 23); along with **CHRISTIAN DIMKPA, PH.D. and Yi Wang, Ph.D.** met by Zoom with collaborators at Géosciences Environnement Toulouse in France to discuss an upcoming graduate student exchange (January 24); met by Zoom with colleagues at the University of Minnesota and Convergent Biosciences to discuss collaborative research (January 24); met by Zoom with colleagues at the University of Minnesota to discuss collaborative research on PFAS remediation for a 3M proposal (January 27); along with **Nubia Zuverza-Mena, Ph.D.** and **Mandeep Kaur, Ph.D.** met by Teams with colleagues at Rutgers University and the New Jersey Institute of Technology to discuss progress on a collaborative USDA project (January 27); participated by Zoom in a training for Chairs of upcoming Gordon Research Conferences (January 28); along with **Milica Pavlicevic, Ph.D.** met by Zoom with a high school student at Amity

High School regarding a science fair project (January 30); and provided testimony in front of the Environment Committee of the General Assembly at the Legislative Office Building in Hartford (January 31).

PUBLICATIONS:

1. Pavlicevic, M.; Vaidya, S., Arsenault, T., Bharadwaj, A., Musante, C., Yu, Y., Shabtai, I., Liquori, J., Hernandez-Viezcas, J.A., Oyanedel-Craver, V., Gardea-Torresdey, J.L., **White, J. C., Zuverza-Mena, N.** (2025). Upcycling plant waste: iron nanoparticles synthesized from *Cannabis sativa* enhance biomass and antioxidative properties in soybean (*Glycine max*). *Environ. Sci.: Nano.* DOI: 10.1039/D4EN01018C.

Abstract: Iron nanoparticles were phytosynthesized from biomass residues of two subspecies of Cannabis sativa (ssp. sativa and ssp. indica) and evaluated as a nanofertilizer for soybean growth. Both nanoparticles were identified as magnetite (Fe3O4) with a dry size smaller than 30 nm. The Fe3O4 nanoparticles (NPs) synthesized from ssp. indica were negatively charged (- 27.2 ± 0.2 mV) with a smaller hydrodynamic diameter (164 ± 47 nm) than those from ssp. sativa (+ 4.3 ± 0.1 mV; 1739 ± 146 nm). These differences were the result of variable composition of extracts from the two subspecies used for NP synthesis. Notably, C. sativa ssp. sativa contained a higher ratio of alcohols and mercaptans, while C. sativa ssp. indica contained more amines, ketones and organic acids. The dissolution of ions from the subspecies ssp. sativa and ssp. indica were 0.28 and 0.01% after 168 hours, respectively. When foliarly applied to soybean at 200 mg/L (6.25 ml per plant), nanoparticles from both ssp. sativa and ssp. indica increased content of chlorophylls by 142% and 115%, antioxidants by 121% and 124% and polyphenols by 177% and 106%, respectively, after 3 weeks of growth, compared to corresponding controls. However, Fe3O4 NPs synthesized from ssp. sativa increased soybean biomass by 148 % whereas nanoparticles synthesized from ssp. indica had no impact on growth. These findings highlight the impact of plant genotype on characteristics and effects of biosynthesized nanoparticles and provide novel insights for plant feedstock preferences for nanoparticle synthesis from plant waste for sustainable nano-enabled agriculture.

2. Kang, Z., Zhang, J., Wang, Y., Lu, J., Zhuang, D., Chen, S., Zheng, S., Gardea-Torresdey, J., **White, J. C.**, Zhao, L. (2025). Silica-activated redox signaling confers rice with enhanced drought resilience and grain yield. *ACS Nano* 19, 3, 3752–3763.

Abstract: Under a changing climate, enhancing crops' drought resilience is critical to maintain agricultural production and reduce food insecurity. Here, we demonstrate that seed priming amorphous silica nanoparticles (NPs)(20 mg/L) accelerated germination speed, increased seeds vigor, and promoted seedling growth under drought stress. An orthogonal approach was used to uncover the mechanisms of enhanced drought tolerance, including electron paramagnetic resonance (EPR), Fourier transform infrared spectroscopy (FTIR), metabolomics and transcriptomics. It was revealed that silica surface chemistry driven reactive oxygen species (ROS) triggered metabolic and transcriptional reprogramming in rice seeds. A number of drought-related genes, including AQPs, ELIPs, LEA, HSP, and WRKY, were activated upon SiO2NPs seed priming. In addition, 18 amino acids and 6 sugars were significantly enriched in silica primed seeds compared to hydropriming, indicating acceler-

ated mobilization of stored energy reserves. Plants cultivated from those SiO2NPs primed seeds exhibited stronger drought resistance at 35-week compared to hydropriming, indicating significant "stress memory". In these vegetative tissues, tolerance was linked to accelerated of amino acid catabolism and antioxidant anabolism. Field trials show that SiO2NPs seed priming not only increased rice grain yield by 7.77% (p=0.051) and 6.48% (p=0.066), respectively, under normal and drought conditions but also increased the grain amino acid content. These results demonstrate that a simple and cost-effective nano-seed-priming approach can convey life cycle-long drought tolerance while simultaneously increasing rice grain yield and nutrition quality, providing an effective and sustainable strategy to cultivate climate-resilient crops.

3. Bui, T. H., **Zuverza-Mena, N.**, Kendrick, E., **Tamez, C.**, Yadav, M., Alotaibi, S., **Nason, S.**, **Dimkpa, C.**, Deloid, G., Sadik, O., Demokritou, P., **White, J. C.** (2025). Micro-nanoscale polystyrene co-exposure impacts the uptake and translocation of arsenic and boscalid by lettuce (*Lactuca sativa*). *NanoImpact* 100541.

Abstract: The influence of micro-nanoplastics (MNPs) on the fate and effects of other pollutants present in the environment is largely unknown. This study evaluated if the exposure to MNPs (polystyrene, PS; 20 or 1000 nm) had an impact on the accumulation of arsenic and boscalid (As and Bos) in lettuce (Lactuca sativa). Under hydroponic conditions, plants were co-exposed to MNPs at 10 or 50 mg/L, and to 1 mg/L of each environmental pollutant (EP). In a soil-like media study, the exposure was to MNPs at 50 and EPs at 10 mg/kg. Phytotoxicity was enhanced by PS under both growth conditions, particularly by nanoscale PS (nPS), although impacts were less in potting mix-grown plants. Nanoscale PS had a greater impact than microscale PS (µPS) on As fate; the As translocation factor from roots to the edible shoots was increased 3-fold in plants exposed to nPS (50 mg/L) and EPs. PS dose and size had a variable impact on Bos uptake and translocation. Fluorescent microscopy analysis of lettuce co-exposed to MNPs and EPs suggests that nPS is entering the roots and translocating to the leaves, while µPS mostly remains in the roots. Pyrolysis-GC/MS showed that in solid media, the presence of EPs significantly increased the translocation of nPS to lettuce shoots from 4.43±0.53 to 46.6±9.7 mg/kg, while the concentration of µPS in the shoots remained the same regardless of the presence of EPs (ranging between 13.2±5.5 to 14.2±4.1 mg/kg). These findings demonstrate that co-exposure of MNPs with other EPs can significantly impact co-contaminant accumulation and toxicity, presenting an unknown risk to humans and other receptors.

4. Hafiz, A. M. I., Ahmadisharaf, E., Salehi, M., Farner, J., **White, J. C.,** Zeng, E. Y., Nazari, B. (2025). A review of processes and models for the export of microplastics from terrestrial to aquatic systems. *WIREs Water* https://doi.org/10.1002/wat2.70004.

Abstract: Microplastics have received increased attention due to their negative impacts on the environment and human health. To minimize these impacts, mitigation strategies that are efficient and cost-effective for a range of plausible conditions need to be developed. Models can be used to support these mitigation-related decisions. However, modeling studies related to the export of microplastics from terrestrial to aquatic systems have been limited. Here, we review such modeling studies, the trends over time and geography of focus, and discuss pertinent concepts and the underlying physical, chemical, and biological pro-

cesses. We categorize the published modeling studies, discuss their limitations, and provide recommendations for future research to fill key knowledge gaps. Future modeling efforts should focus on collecting more comprehensive field data for validation, developing continuous models over event-based, conducting experimental studies to better understand the fundamental processes, developing hybrid modeling frameworks, adopting sediment transport modeling approaches, incorporating land management practices in the models, integrating surface and sub-surface processes at the watershed scale, and utilizing advanced data-driven models like foundation models.

5. Kharaghani, D., DeLoid, G. M., **Zuverza-Mena, N.**, **Tamez, C.**, **White, J. C.**, Demokritou, P. (2025). Ingested polystyrene micro-nanoplastics increase the absorption of co-ingested arsenic and boscalid in an in vitro triculture small intestinal epithelium model. *Microplastics* 4, 4, https://doi.org/10.3390/microplastics4010004.

Abstract: Micro-nanoplastics (MNPs) are a ubiquitous environmental and food contaminant and emerging health concern. Recent studies have shown that MNPs are capable of sorbing and concentrating other environmental pollutants (EPs) present in food and environmental media. Release of sorbed EPs from ingested MNPs or intestinal barrier dysfunction could lead to increased absorption (bioavailability) of co-ingested EPs. We evaluated the interactions of a toxic element EP, arsenic (As), with 25 and 1000 nm spherical polystyrene (PS) MNPs (PS-25 and PS-1000), and their effect on intestinal sorption of arsenic, as well as the impact of As and the pesticide boscalid on uptake of PS MNPs, using an in vitro triculture small intestinal epithelium coupled with simulated 3-phase digestion. In aqueous mixtures of 100 µg/L As and 1 mg/mL PS MNPs, As sorption by MNPs was size-dependent, with PS-25 sorbing 13%, and PS-1000 sorbing only 3% of As present. The effect of PS MNPs on uptake and translocation of As in the triculture epithelium were likewise size-dependent. During 24 h exposure of tricultures to small intestinal digestas of As and PS MNPs, the presence of PS-25 increased As uptake from 0.0 ± 0.0 % to 5.8 ± 1.4 % ($p<0.001$), whereas PS-1000 had no effect, and PS-25 increased translocation of As from 5.2 ± 2.0 % to 9.8 ± 1.3 % ($p<0.05$), whereas PS-1000 had no significant effect. In addition, the presence of As and the pesticide boscalid significantly increased uptake of PS MNPs, from 10.6 ± 1.0 % to 19.5 ± 2.8 % ($p<0.01$) for PS-25 and from 4.8 ± 0.7 % to 8.5 ± 1.1 % ($p<0.01$) for PS-1000. These findings raise significant safety concerns for MNPs ingestion, particularly when co-ingested with EPs.

6. Zhao, Q., Zhang, X., Zeng, J., **White, J. C.**, Li, F., Xiong, Z., Zhang, S., Xu, Y., Wang, J., Tang, W., Wu, F., Xing, B. (2024). Mechanistic evaluation of enhanced graphene toxicity to Bacillus induced by humic acid adsorption. *Nature Comm.* 16, 184.

Abstract: The extensive application of graphene nanosheets (GNSs) has raised concerns over risks to sensitive species in the aquatic environment. The humic acid (HA) corona is traditionally considered to reduce GNSs toxicity. Here, we evaluated the effect of sorbed HA (GNSs-HA) on the toxicity of GNSs to Gram positive Bacillus tropicus. Contrary to previous data, GNSs-HA exhibited greater toxicity than bare GNSs. Multi-omics combined with sensitive bioassays and electrochemical methods demonstrated that bare GNSs disrupted oxidative phosphorylation by causing physical membrane damage. This led to the accumulation of intracellular reactive oxygen species and inhibition of ATP production, subse-

quently suppressing synthetic and metabolic processes and ultimately causing bacterial death. Conversely, GNSs-HA directly extracted electrons from bacteria and oxidized biomolecules due to HA-improved electron transfer. This finding suggests that the HA corona does not always mitigate the toxicity of engineered nanoscale pollutants (ENPs), thereby introducing uncertainty over the interaction between the environmental corona and ENPs during ecological risk evaluation.

7. Hao, Y., Ma, C., Cai, Z., **White, J. C.,** Liang, A., Xu, X., Li, H., Jia, W., Cao, Y., Han, L., Tan, Q., Chen, G., Xiao, J., Zheng, W., Pagano, L., Maestri, E., Marmiroli, M., Marmiroli, N., Zhao, J., Xing, B. (2024). Safe production of rice (*Oryza sativa*) in As (III, V)-contaminated soil: An advanced remedial strategy using micro/nanoscale bone biochar. *Environ. Sci. Technol*. https://pubs.acs.org/doi/full/10.1021/acs.est.4c05040.

Abstract: This present study investigated effects of fine-sized pork bone biochar particles on remediating As-contaminated soil and alleviating associated phytotoxicity to rice (Oryza sativa L.) by 50-day short-term and 120-day full-life-cycle pot experiments. The addition of micro/nanoscale pork bone biochar (BC) pyrolyzed at 400 and 600 °C (BC400 and BC600) significantly increased the As-treated shoot and root fresh weight by 24.4-77.6%; while simultaneously reducing tissue As accumulation by 26.7-64.1% and increasing soil As content by 17.1-27.1% as compared to the As treatment. Microbial community analysis demonstrated that BC600 and BC400 treatments increased the proportion of plant growth-promoting microbes such as Ceratobasidium and Achromobacter by 33%-81.6% in the roots and As adsorption-associated Bacillus by 1.15-1.59-fold in the rhizosphere soil. Metabolomic profiling suggests that BC and As co-exposure triggered differentially expressed metabolites (DEMs) enriched in lipid, carbohydrate, and amino acid metabolic pathways, all of which could alleviate As-induced phytotoxicity and promote plant As tolerance. Importantly, the quality of As-treated rice grains was improved as a function of BC amendments. This study demonstrates the significant potential of BC for enhancing crop growth and minimizing the As-induced phytotoxicity to rice, and provides a framework for a promising strategy for remediating heavy metal(loid)-contaminated soil while simultaneously promoting food safety.

ANALYTICAL CHEMISTRY

Jingyi Zhou, Ph.D. attended the UConn Vegetable and Small Fruit Conference at University of Connecticut, Storrs, CT on January 7, 2025. Dr. Zhou gave a poster presentation entitled "Contaminant accumulation in crops irrigated with recycled wastewater".

Priyankar Chand, Ph.D. joined the Connecticut Agricultural Experiment Station (CAES) on January 17, 2025, as a Postdoctoral Scientist. Prior, Dr. Chand was a Postdoctoral Researcher at the University at Albany, New York, where he worked on PFAS contamination in environmental systems. He earned his Ph.D. in Environmental engineering from the Indian Institute of Technology Bombay, focusing on "Characterization, Toxicity Evaluation and Biodegradability Assessment of Oily Sludge from a Refinery and its Water-Soluble Fraction". At CAES, Dr. Chand's research focuses on two key areas of environmental science. First, he will be investigating the potential of wastewater reuse for agricultural irrigation. This project involves assessing the quality of treated wastewater, its suitability for irrigation, and its impact on soil health and crop. By studying the chemical composition of reclaimed water, Dr. Chand aims to determine its safety and sustainability as an alternative water source in agriculture, especially in regions facing water scarcity. Secondly, he will be examining the presence and effects of per- and polyfluoroalkyl substances (PFAS) in various environmental matrices, including water, food, soil and biota. Dr. Chand's role in this project involves analyzing PFAS contamination pathways, bioaccumulation in food webs, and potential risks to human and ecological health. This research is crucial for understanding how PFAS persist in the environment, their transport mechanisms, and their long-term consequences.

PUBLICATIONS:

1. Pavlicevic, M.; Vaidya, S., Arsenault, T., Bharadwaj, A., Musante, C., Yu, Y., Shabtai, I., Liquori, J., Hernandez-Viezcas, J.A., Oyanedel-Craver, V., Gardea-Torresdey, J.L., **White, J. C., Zuverza-Mena, N.** (2025). Upcycling plant waste: iron na-

noparticles synthesized from *Cannabis sativa* enhance biomass and antioxidative properties in soybean (*Glycine max*). *Environ. Sci.: Nano.* DOI: 10.1039/D4EN01018C.

Abstract: Iron nanoparticles were phytosynthesized from biomass residues of two subspecies of Cannabis sativa (ssp. sativa and ssp. indica) and evaluated as a nanofertilizer for soybean growth. Both nanoparticles were identified as magnetite (Fe3O4) with a dry size smaller than 30 nm. The Fe3O4 nanoparticles (NPs) synthesized from ssp. indica were negatively charged (- 27.2 ± 0.2 mV) with a smaller hydrodynamic diameter (164 ± 47 nm) than those from ssp. sativa (+ 4.3 ± 0.1 mV; 1739 ± 146 nm). These differences were the result of variable composition of extracts from the two subspecies used for NP synthesis. Notably, C. sativa ssp. sativa contained a higher ratio of alcohols and mercaptans, while C. sativa ssp. indica contained more amines, ketones and organic acids. The dissolution of ions from the subspecies ssp. sativa and ssp. indica were 0.28 and 0.01% after 168 hours, respectively. When foliarly applied to soybean at 200 mg/L (6.25 ml per plant), nanoparticles from both ssp. sativa and ssp. indica increased content of chlorophylls by 142% and 115%, antioxidants by 121% and 124% and polyphenols by 177% and 106%, respectively, after 3 weeks of growth, compared to corresponding controls. However, Fe3O4 NPs synthesized from ssp. sativa increased soybean biomass by 148 % whereas nanoparticles synthesized from ssp. indica had no impact on growth. These findings highlight the impact of plant genotype on characteristics and effects of biosynthesized nanoparticles and provide novel insights for plant feedstock preferences for nanoparticle synthesis from plant waste for sustainable nano-enabled agriculture.

2. Christudoss A. B., Kundu, R., **Dimkpa, C. O.**, Mukherjee, A. (2025). Aging of disposable face masks in landfill leachate poses cyto-genotoxic effects on terrestrial plant Allium cepa: An insight into the impacts of mask disposal in landfills. Plant Physiology and Biochemistry 220, 109472. DOI: 10.1016/j.plaphy.2024.109472

Abstract: The accumulation of disposable face masks (DFMs) has become a significant threat to the environment due to extensive use during the COVID-19 pandemic. In this research, we investigated the degradation of DFMs after their disposal in landfills. We replicated the potential degradation process of DFMs, including exposure to sunlight before subjecting them to synthetic landfill leachate (LL). After exposure to UV radiation, all three layers of the DFMs displayed surface abrasions and fractures, becoming less stable with increased UV exposure duration, indicating an aging process. Changes in the surface morphology of the DFMs and carbonyl index after UV exposure confirmed this aging process. DFM aging in LL accelerated by 11% compared to deionized (DI) water after 28 days. Different analytical techniques, including microscopy, FT-IR, Raman spectroscopy, and ICP-MS were used to detect microplastics and metals in the leachates. The microfibers collected from the leachates were primarily made of polypropylene, and the abundance of smaller microfibers (<40 μm) increased with the aging time of DFMs in leachate. Additionally, this study examines the toxicity of UV-weathered DFM leachates collected at different periods on *Allium cepa*, a model terrestrial plant. Leachates from DFM aged in landfill caused 15% more harm to *A. cepa* root cells due to increased oxidative stress (66%) compared to leachates aged in DI water. Additionally, DFM leachates aged in landfills showed a 29% increase in heavy metal content over time compared to those aged in DI water, potentially leading to significant phytotoxicity. In summary, this report highlights the impact of disposing DFMs in landfills and their biological effects on a model plant.

3. Bui, T. H., **Zuverza-Mena, N.**, Kendrick, E., **Tamez, C.**, Yadav, M., Alotaibi, S., **Nason, S.**, **Dimkpa, C.**, Deloid, G., Sadik, O., Demokritou, P., **White, J. C.** (2025). Micro-nanoscale polystyrene co-exposure impacts the uptake and translocation of arsenic and boscalid by lettuce (*Lactuca sativa*). *NanoImpact* 100541. DOI: 10.1016/j.impact.2025.100541

Abstract: The influence of micro-nanoplastics (MNPs) on the fate and effects of other pollutants present in the environment is largely unknown. This study evaluated if the exposure to MNPs (polystyrene, PS; 20 or 1000 nm) had an impact on the accumulation of arsenic and boscalid (As and Bos) in lettuce (Lactuca sativa). Under hydroponic conditions, plants were co-exposed to MNPs at 10 or 50 mg/L, and to 1 mg/L of each environmental pollutant (EP). In a soil-like media study, the exposure was to MNPs at 50 and EPs at 10 mg/kg. Phytotoxicity was enhanced by PS under both growth conditions, particularly by nanoscale PS (nPS), although impacts were less in potting mix-grown plants. Nanoscale PS had a greater impact than microscale PS (µPS) on As fate; the As translocation factor from roots to the edible shoots was increased 3-fold in plants exposed to nPS (50 mg/L) and EPs. PS dose and size had a variable impact on Bos uptake and translocation. Fluorescent microscopy analysis of lettuce co-exposed to MNPs and EPs suggests that nPS is entering the roots and translocating to the leaves, while µPS mostly remains in the roots. Pyrolysis-GC/MS showed that in solid media, the presence of EPs significantly increased the translocation of nPS to lettuce shoots from 4.43±0.53 to 46.6±9.7 mg/kg, while the concentration of µPS in the shoots remained the same regardless of the presence of EPs (ranging between 13.2±5.5 to 14.2±4.1 mg/kg). These findings demonstrate that co-exposure of MNPs with other EPs can significantly impact co-contaminant accumulation and toxicity, presenting an unknown risk to humans and other receptors.

ENTOMOLOGY

PHILIP ARMSTRONG, SC.D. met with collaborators at Texas Tech University for a NIH proposal on EEE virus forecasting models (January 3); met with other members of the Connecticut Mosquito Management Program from CT DPH, DEEP, DoAg, and UCONN to update the West Nile virus Response Plan (January 17); met with the director and manager of the Northeast Regional Center for Excellence in Vector-Borne Diseases program to discuss the Year 3 plans (January 27)

TIA M. BLEVINS attended the 102nd Annual Meeting for the CTPA (Connecticut Tree Protective Association) in Plantsville, CT (January 16); networked with members of Connecticut's green industry at the annual Winter Symposium of the CNLA (Connecticut Nursery & Landscape Association) in Plantsville, CT (January 22).

ANGELA BRANSFIELD participated via Zoom in Yale University's BSL-3 Subcommittee meeting (January 9); participated in a CAES DEI meeting (January 13); participated via Zoom in Yale University's Biosafety Committee meeting (January 16).

KATHERINE DUGAS gave a talk on common bed bug myths, bed bug biology, and bed bug prevention strategies for the Y's Men Club of Meriden at the Meriden YMCA, (30 adults) (January 21)

KELSEY E. FISHER, PH.D. met with the Pollinator Advisory Committee to discuss CT SWAP Priority Actions, monarch butterfly proposed threated status, and potential new legislature on pesticide restrictions (January 3); presented a poster on potential Bt resistance in European corn borer in CT and collected farmer surveys to gain knowledge of Bt use in CT (January 7); presented about CAES internship opportunities at the New Haven Promise Internship and Career Fair (January 9); met and brainstormed with Erik Dopman (Tufts University) and Brad Coates (USDA-ARS-CICGRU) about collaborative opportunities (January 10); attended the USFWS Monarch Butterfly Public Meeting #1 on the threated status proposal (January 14); attended and presented at the Multistate NC245: Ecology and Management of Arthropods in Corn meeting in Pensacola, FL (January 21-23); provided an oral presentation on potential European corn borer resistance to Bt CT at the 2025 University of Connecticut Extension Corn Research Education Program (virtual; January 30); provided a research update on potential European corn borer resistance to Bt CT at the Canadian Corn Pest Coalition (CCPC) meeting (virtual; January 31);met with Laurence Still and Emily Bick (University of Wisconsin) about a collaborative project on corn pest insect feeding behavior (January 31).

MEGAN LINSKE, PH.D. participated in a meeting with collaborators from Banfield Bio, Inc. and Centers for Disease Control and Prevention (CDC) Division of Vector-Borne Diseases to discuss acquisition of new research project and funding (January 7, 14, & 28); hosted the Wildlife Society Leadership Institute Committee meeting as Chairperson (January 9); participated in a meeting with members of the Women and Family Life Center (Guilford, CT) to develop a Girls STEM program (Jan 10); gave an invited lecture titled "Systemic Acaricidal Treatment of White-footed mice (*Peromyscus leucopus)* Against Juvenile Blacklegged Ticks (*Ixodes scapularis*) in Connecticut" at the Rodents and Tickborne Diseases Management working group meeting (January 13); participated in the Host-Targeted Tick Control

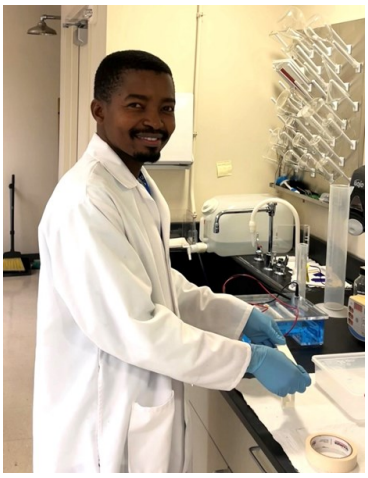
Evaluation strategic planning meeting (January 15); participated in a planning meeting with Maine Medical Center Research Institute to discuss advanced in host-targeted tick control research on the Isle of Haute, ME (January 22).

GOUDARZ MOLAEI, PH.D. visited the CDC laboratories in Atlanta, GA, discussed research projects of mutual interest, especially rickettsial pathogens with CDC scientists, and took training on the use of MLDI-TOF for tick species identification and associated pathogen screening (January 6-10); met with Dr. Paul Wolujewicz of Quinnipiac University to discuss progress on the joint project, "Nanopore-based metagenomics for tick-borne pathogen screening" (January 21); met with Dr. Fabian Menges of the Chemical and Biophysical Instrumentation Center at Yale University to discuss the MALDI TOF project for tick species identification and pathogen screening (January 23); as a member of the leadership team for the Northeast Regional Center for Excellence in Vector-Borne Diseases met (virtual) with the director and manager of the program to discuss the NEVBD-TEC Year 3 plans (January 27); and attended a meeting (virtual) with members of the Centers for Excellence in Vector-Borne Diseases in the US to discuss tick bite prevention (January 27).

RAFFAELA NASTRI attended the 102nd annual meeting of the Connecticut Tree Protective Association (CTPA) held in Plantsville, CT (January 16); attended the annual winter symposium of the Connecticut Nursery and Landscape Association (CNLA) held in Plantsville, CT (January 22).

VICTORIA L. SMITH, PH.D. attended the 102nd Annual Meeting of the CT Tree Protective Association, held at the Aqua-Turf in Plantsville, CT (January 16); attended the annual Winter Symposium of the CT Nursery and Landscape Association, held at the Aqua-Turf in Plantsville, CT (January 22).

PAULA WOLF participated in the American Beekeeping Federation, Apiary Inspectors of America Conference & American Bee Research Conference in Reno, NV (January 5 –12); attended the CT Tree Protective Association Annual Meeting held in Plantsville, CT (January 16); attended the CT Nursery & Landscape Association's annual Winter Symposium in Plantsville, CT (January 22); spoke at The Back Yard Beekeepers Association's Bee School about the State Apiary Program and the Importance of Honey Bee Registration (36 attendees) (January 27).



NEW STUDENTS, STAFF, AND VOLUNTEERS:

Jonathan Karisa, Ph.D. joined the Department of Entomology on January 13, 2025, as a Postdoctoral Scientist at CAES. He earned his MSc. in Public Health in 2018 from Pwani University, Kenya and his Ph.D. in Medical entomology in 2024 from the Open University, UK. His doctoral research focused on using MALDI-TOF MS as a cost effective and high throughput approach for entomological surveillance, specifically for species and sibling species identification, blood meal host identification, parasite screening and parity status determination or age grading in main malaria vectors. His research interests are in vector-pathogen-vertebrate host network and interactions including the

ecology and behavior of mosquitoes and other arthropods, disease transmission dynamics, characterization of insecticide resistance profiles and control of vector-borne diseases. He has been undertaking entomological surveillance research to understand the transmission dynamics on malaria and arboviruses along the Kenyan coast. He has also been involved in evaluating the effectiveness of novel vector control interventions including two BOHEMIA (Broad One Health Endectocide-based Malaria Intervention in Africa) clinical trials in Kenya and Mozambique that evaluated the utility of mass drug administration of ivermectin to reduce malaria transmission by administering to humans and livestock. At CAES, he will be working on the development of enhanced mosquito trapping and testing methods for EEE virus surveillance

PUBLICATIONS:

1. Bagger, M. S., Hagadorn, K. A., **Misencik, M. J**., Arent, S., McMillan, J. R., and **Gloria-Soria, A**. (2025). Filarial parasite infection prevalence in field-caught mosquitoes from Connecticut, USA. *Journal of Medical Entomology*. tjaf004. DOI: 10.1093/jme/tjaf004.

Abstract: Filarial nematodes are parasitic roundworms transmitted by mosquitoes that can cause morbidity and mortality for their human and animal hosts. The filariae community, specifically infection prevalence of heartworm, *Dirofilaria immitis* (Filarioidea: Onchocercidae) (Leidy), and its primary mosquito vector species, has not been described in Connecticut since 1977. In light of the recent invasion and establishment of an important filariasis vector, *Aedes albopictus* (Diptera: Culicidae) (Skuse), we used molecular-based sequencing methods to identify filarial species infecting field-caught mosquitoes in Connecticut, United States. The filarial parasites identified include *D. immitis*, *Aproctella* sp., and *Setaria* sp. (Filarioidea: Setariidae). The total minimum infection rate for *D. immitis* for all mosquito species tested in 2020 was 0.97 [0.56 to 1.56] and in 2021 was 1.48 [0.93 to 2.24]. *Aedes albopictus* had the highest infection prevalence compared to other species during both years. We determined a low but persistent mosquito infection prevalence for *D. immitis* and suggest that *Ae. albopictus* is likely to be the primary vector in the region. *Aproctella* sp. and *Setaria* sp. had lower burdens compared to *D. immitis*. Persistent mosquito infection with filarial parasites, particularly in invasive species, poses a risk to veterinary and public health.

ENVIRONMENTAL SCIENCE & FORESTRY

SCOTT C. WILLIAMS, PH.D. participated in a collaborative Zoom call with members of Banfield Biologic NIH SBIR-funded tick repellent fabric team (January 7); participated in a collaborative Zoom call about host-target tick management strategies for rodents with representatives from the Northeast and Midwest Centers for Excellence in Vector-Borne and Zoonotic Diseases (January 13); participated in a Zoom meeting with BanfieldBio on a recently funded CDC grant looking at effectiveness of botanical formulations in managing ticks in peridomestic habitats (January 14); gave invited lecture on experimental systemic acaricide delivery to white-tailed deer in a joint meeting of the Northeast and New England Centers for Excellence in Vector-Borne and Zoonotic Diseases (49 participants) (January 15); participated in a Zoom call with collaborators from MaineHealth and White Buffalo, Inc. on the deer component of a CDC-funded integrated tick management project (January 22); participated in a Zoom meeting with BanfieldBio on a recently funded CDC grant looking at effectiveness of botanical formulations in managing ticks in peridomestic habitats (January 28); participated in the first meeting of the newly formed CAES Office of Forest Health (January 30).

JOSEPH P. BARSKY as Chair, ran the quarterly meeting of the New England Society of American Foresters Board of Directors (January 14); attended the Connecticut Tree Protective Association Annual Meeting (January 16); participated in the 2025 Annual NESAF Winter Meeting Planning Committee meeting (January 27, virtual).

JESSICA E. BROWN, PH.D. participated in a meeting with colleagues from University of Kentucky, University of Georgia, and the USDA-ARS to discuss a collaborative publication about One Health and community science (January 23); as Northeast Section Chair, participated in a meeting of The Wildlife Society's Conservation Affairs Network (January 23).

GREGORY J. BUGBEE interviewed by Ed Mahoney of the Hartford Courant on hydrilla in the Connecticut River (January 1); gave an invited talk entitled "Connecticut River Update: The Spread Continues" at the Northeast Aquatic Plant Management Society Conference in Saratoga Springs, NY (150 attendees) (January 9); via teleconference, updated the CT DEEP/UCONN Aquatic Invasive Species Workgroup on CAES work on CT River hydrilla (January 13); participated at the National Aquatic Nuisance Species Task Force meeting (January 21); took part in the United States Army Corps of Engineers CT River hydrilla demonstration project and Massachusetts hydrilla expansion workgroup meetings (January 15, 23); gave an invited talk entitled "Composting" to the Perennial Planters Garden Club at the Lutz Museum in Manchester (40 attendees) (January 27).

RILEY S. DOHERTY attended the Northeast Aquatic Plant Management Society conference in Saratoga Springs, NY (January 7-9); participated in the quarterly CT DEEP Aquatic Invasive Species meeting (January 13); participated in the CAES DEI Committee meeting (January 13); participated in the Connecticut Federation of Lakes Board of Directors meeting (January 15); coordinated the DEI Events subcommittee meeting (January 27); met with the NJ DEP to discuss how the CT AIS Web App was created (January 29); participated in virtual meetings with the US Army Corps of Engineers to discuss the CT River Hydrilla project (January 15, 29).

JEREMIAH R. FOLEY, IV, PH.D. attended the Northeastern Aquatic Plant Society meeting and presented a talk titled "The Potential for Classical Biological Control of Connecticut River Hydrilla" in Saratoga Springs, NY (260 attendees) (January 7–9); presented an invited talk titled "Ripples of Invasion: Understanding the Spread and Impact of Aquatic Invasive Species" to the Connecticut Entomological Society in the Jones Auditorium (12 attendees) (January 17); presented research update to the Connecticut Agricultural Experiment Station's Board of Control (January 22); engaged with overseas collaborators to discuss research direc-

tions for the biological control of hydrilla in the Connecticut River (January 28).

SUSANNA KERIÖ, D.SC. attended calls to discuss re-submission of a collaborative NSF grant proposal on oak adaptation led by Dr. Tara Trammell (University of Delaware) with a team of scientists from USFS, CUNY, and John Hopkins University (January 13-15); attended a call to plan the CT Urban Forest Council's (CUFC) conference in collaboration with Tree Warden's Association of CT (TWAC), CT Tree Protective Association (CTPA), and Connecticut College (January 14); gave a webinar on "Chestnuts as Food" to an undergraduate class at Middlebury College in Vermont (14 attendees) (January 16); attended the CTPA Winter meeting (January 16); visited Connecticut College to plan the CUFC conference with TWAC and CTPA (January 24); attended the CUFC's Executive Committee Meeting (January 28).

SARA L. NASON, PH.D. met virtually with high school students to discuss science fair projects (January 6, 22); met virtually with colleagues and students from the University of Minnesota (Dr. Christy Haynes, Riley Lewis, and Cheng-Hsin Huang) and CAES (**JASON WHITE, PH.D.**, **Nubia Zuverza-Mena, Ph.D., Jingyi Zhou, Ph.D.**) to discuss an ongoing funded collaboration on nanomaterial enhancement of PFAS phytoremediation (January 7); as Chair, led virtual meetings for the Best Practices for Non-Targeted Analysis working group (January 7, 8, 14, 21); met virtually with Dr. Rob Heimer from Yale to discuss a pending NIH grant on monitoring illicit drug use in Connecticut (January 10); represented the Best Practices for Non -Targeted Analysis working group at inter-organization meetings (virtual) with the Metabolomics Quality Control Consortium, the Metabolomics Society, and others to discuss collaboration opportunities (January 16, 22); met virtually with Emily Sigman (Dartmouth) to discuss an ongoing project on PFAS in maple syrup (January 16); met virtually with Melissa Creamer from NIH and Dr. Rob Heimer from Yale to discuss the potential funding of a pending NIH grant on monitoring illicit drug use in Connecticut (January 16); hosted a visit and tour for a high school student working on a science fair project in collaboration with CAES (January 23); met virtually with Dr. Thivanka Ariyarathna from Rowan University to discuss upcoming work on a funded project on PFAS in marine food webs (January 30); met virtually with Dr. Sara Thomas, a former CAES postdoc, to discuss progress on her former work on PFAS degradation (January 31).

ITAMAR SHABTAI, PH.D. met with a colleague at Yale University to discuss future collaboration (January 11); met with a colleague from Hebrew University of Jerusalem to discuss a joint workshop (January 9, 29); attended with **Alice Zhou, Ph.D.,** a project kickoff meeting funded through the Environmental Molecular Sciences Laboratory Exploratory Project Program (January 28); held a Zoom meeting with staff scientists from Argonne National Laboratory to discuss a joint grant proposal (January 29); met with collaborators from the Environmental Molecular Sciences Laboratory to discuss an ongoing project (January 29); attended with **Blaire Steven, Ph.D.** and collaborators from UConn, a project kick off meeting funded by the Environmental Protection Agency (January 30).

ELISABETH B. WARD, PH.D. participated in the Master Woodland Managers monthly partner meeting (January 7); participated in the Forest Ecosystem Monitoring Cooperative monthly state partner meeting (January 9); presented an invited talk on Tree Stressors in Connecticut for the Guilford Land Conservation Trust (January 9) (97 participants); served as a reviewer for the USDA Forest Service Bipartisan Infrastructure Law Invasive Species High Priority Regional Projects grant (January 10); met with partners from Urban Resources Initiative, Yale School of the Environment, City of New Haven, and Friends of Quarry Park to select sites in New Haven parks to establish forest restoration treatments in response to beech leaf disease (BLD) (January 27); participated in the Forest Health Committee meeting for the Northeastern Forest Fire Protection Compact (January 28); organized meeting with Helen Poulos, PhD. (Wesleyan University) and Jonathon Gewirtzman (Yale University) along with **Susanna Keriö, D.Sc.** to discuss project assessing non-structural carbohydrate responses to BLD (January 29); met with Mark Bradford, Ph.D. and Shangshi Lui, Ph.D. (Yale University)

to discuss project on tree mycorrhizal associations and soil carbon persistence (January 29); led first quarterly CAES Office of Forest Health meeting (January 30).

SUMMER WEIDMAN led the pesticide recertification process for the Northeast Aquatic Plant Management Society (NEAPMS) annual conference in Saratoga Springs, NY (85 applicators) (January 7-9); participated in the virtual Aquatic Invasive Species (AIS) quarterly meeting with CT DEEP and UConn (January 13); participated in the CAES DEI Committee meeting (January 13); participated in the NEAPMS Board of Directors virtual meeting (January 16); led the Northeast Aquatic Nuisance Species Panel virtual CT Hydrilla Group meeting (January 21); participated in the CAES DEI Professional Development & Education Subcommittee meeting (January 27); gave guidance to the New Jersey Department of Environmental Protection on the creation of an aquatic invasive species database (January 29); participated in virtual meetings with the US Army Corps of Engineers to discuss CT River Hydrilla (January 15, 29); participated in the virtual NEAPMS Scholarship Committee meeting (January 31).

LEIGH J. WHITTINGHILL, PH.D. assisted with planning and running the University of Connecticut Extension Vegetable and Small Fruit Growers' Conference (UConn Storrs) and coordinated posters for research updates from CAES scientists (January 7); met with Jean-Paul LaMarche and others from Greenskies Clean Energy to discuss potential agrivoltaics work at one of their solar farm sites (January 22).

YINGXUE (CHARLIE) YU, PH.D. presented an oral presentation "Biodegradable Plastic Mulch: A Sustainable Alternative to Polyethylene Mulch" at the 2025 W4188 Multi-State Hatch Meeting at the Desert Research Institute in Las Vegas, NV (50 attendees) (January 2–3); attended the workshop "Vadose Zone Journal Editorial Board Training" (January 29).

PUBLICATIONS:

1. Puttamreddy, S., Ramesh, S. B., Nippatlapalli, N., **Allabakshi, S. M.** (2024). Per-and poly fluorinated substances: The poison in our waters-A call to action for India's aquatic future. *J. Environ. Chem. Engin. 13*, 115114. DOI: 10.1016/j.jece.2024.115114

Abstract: In recent years, there has been a surge in environmental concerns stemming from per- and polyfluorinated substances, which are a diverse group of chemicals posing potential risks to human health and the environment, prompting global attention. Experts worldwide have convened to critically assess emerging data on these substances, encompassing their chemistry, fate, transport, exposure, and toxicity. Notably, perfluorooctanoic acid and perfluorosulfonic acid are amongst the most prevalent forms, prompting health advisories in various countries, including the United States of America, Germany, and other European nations. More than □5000 PFAS are used in the market for various applications. However, comprehensive data essential for both prospective and retrospective risk assessments remain lacking for most of these substances, with no regulatory standards established for these substances, leaving the extent of human exposure in India uncertain. Also, recent studies show that short- and long-chain PFAS have polluted major Indian rivers like the Ganges, Yamuna, Cauvery, and Krishna. This review consolidates research on per- and polyfluorinated substances (PFAS) in India, including their occurrence, sources, and concentrations. It highlights uncertainties in regulatory policies and proposes strategies to address gaps and assess health risks. Recommendations include enhancing monitoring programs, developing regulatory guidelines, and advancing treatment technologies, with a focus on integrating conventional and innovative methods through interdisciplinary approaches.

2. Allabakshi, S. M., Srikar, P. S. N. S. R., Gangwar, R. K., Maliyekkal, S. M. (2025). Nonthermal plasma technology for degradation of dyes in wastewater. *Innovative and Hy-*

brid Advanced Oxidation Processes for Water Treatment, Chapter 10: 255–278. Elsevier, ISBN 9780443141003. DOI: 10.1016/B978-0-443-14100-3.00001-6.

Abstract: Dyes and pigments are complex organic molecules used extensively in textiles, plastic, paper, leather, wood, printing, rubber, and cosmetics industries. Discharging untreated and partially treated dye wastewater is a significant cause of concern in the water sector. Advanced oxidation processes (AOPs) are promising technology in degrading and mineralizing complex organic molecules, including dyes in wastewater. The AOPs rely on the in-situ generation of a plethora of reactive chemical species, including but not limited to $^{\bullet}OH$, H_2O_2, $^{\bullet}O$, O_3, $^{\bullet}HO_2$, and $^{\bullet}O_2^-$. However, the need for chemical addition, pH sensitivity, catalyst fouling, and incomplete mineralization limit the use of many AOPs in wastewater treatment. Plasma technology is an emerging AOP attractive due to its controlled capacity to generate reactive chemical species and sludge-free operation. Nonthermal plasma is more attractive in wastewater treatment due to its ability to operate at room temperature, ease of operation, and higher energy efficiency. However, more effort is needed to make the system commercially viable for mass applications like wastewater treatment. Energy-efficient and easy-to-scale-up reactor design and plasma parameter optimization are crucial in realizing the practical utility of the plasma reactors. This chapter reviews the application of nonthermal plasma in wastewater treatment, especially dye removal in wastewater. The chapter describes the topics, including plasma chemistry and water interaction, recent developments in conventional and hybrid plasma reactors, and degradation pathways. The current challenges and prospects of plasma-based technology in treating dye wastewater are discussed.

3. Allabakshi, S. M., Srikar, P. S. N. S. R., Nippatlapalli, N. (2025). Electrical discharge: A chemical-free advanced oxidation process for removing aqueous contaminants of emerging concern. *Innovative and Hybrid Advanced Oxidation Processes for Water Treatment*, Chapter 11: 279–297. Elsevier, ISBN 9780443141003. DOI: 10.1016/B978-0-443-14100-3.00004-1

Abstract: Water resources and societal well-being are facing significant threats due to the increasing use of organic pollutants such as dyes, pharmaceutical compounds, per-polyfluorinated substances, endocrine disruptors, and other contaminants of emerging concern (CECs). CECs are chemical compounds yet to be regulated and can be a threat to nature in the coming years. Even trace concentrations of CECs in water bodies can hamper achieving water quality objectives due to their potential toxicity to humans and other living organisms. Various treatment technologies are currently employed to treat CECs from aqueous solutions, which include adsorption, membrane separation, electrochemical degradation, photocatalysis, and other advanced oxidation processes (AOPs). A majority of these methods remove pollutants partially. However, AOPs, specifically electrical discharges, are promising among these technologies. Electrical discharge-based oxidation is an advanced process capable of mineralizing complex organic molecules in water and wastewater. Electrical discharges in water generate ions (H^+, H_3O^+, HO_2^-, OH^-), molecular species (H_2, O_2, H_2O_2), and reactive radicals ($O^{\cdot}$, $H^{\cdot}$, $OH^{\cdot}$, $O_2^{\cdot}$). The interaction of these species and the target pollutants results in the degradation of the pollutants. However, developing an energy-efficient and scalable electrical discharge system is critical for successful implementation. Several factors can influence the electrical discharge system, including operating parameters, reactor configuration, and feed water composition. This chapter reviews various laboratory and field-scale electrical discharge reactors and their application in removing CECs in water and wastewater. The influence of operational

and environmental parameters, reactor geometries, and feed solution composition on removing CECs in an aqueous medium will be discussed. Besides, the recently developed electrical discharge-based reactors will be compared with conventional AOPs regarding their potential to remove aqueous CECs.

4. Kharbush, J., Rahman, R., Pearson, A., **Zhou, A**. (2025). Nitrogen stable isotope patterns in free and protein-bound amino acids of the anoxygenic phototroph, *Rhodopseudomonas palustris*. *Organic Geochemistry*. DOI: 10.1016/j.orggeochem.2025.104945

Abstract: Compound-specific isotope analysis of amino acids (AAs) can reveal the sources and transformations of nitrogen in ecological and environmental studies. However, there is limited information on microbial patterns of ^{15}N distributions in AAs and the intracellular biochemical processes that determine these patterns. This leads to gaps in understanding the underlying mechanisms that determine the ^{15}N content of key N-containing biomarkers. Here we measured $\delta^{15}N$ values of both free and protein-bound amino acids in metabolically flexible *Rhodopseudomonas palustris* grown photomixotrophically under anoxic conditions. Patterns of ^{15}N distribution in protein-bound amino acids of *R. palustris* resemble aerobic phototrophs, implying these microbial groups may be indistinguishable in environmental samples. Intriguingly, free amino acids consistently are *ca*. 5 ‰ enriched in ^{15}N relative to protein-bound amino acids; this pattern may provide a new window to understanding intracellular fractionating processes during metabolite recycling and protein synthesis.

5. Nason, S. L., McCord, J., Feng, Y., Sobus, J., Fisher, C. M., Marfil-Vega, R., Phillips, A. L., Johnson, G., Sloop, J., Bayen, S., Mutlu, E., Batt, A. L., Nahan, K. (2025). Communicating with stakeholders to identify high-impact research directions for non-targeted analysis. *Analytical Chemistry*. DOI:10.1021/acs.analchem.4c04801.

Abstract: Non-targeted analysis (NTA) using high-resolution mass spectrometry without defined chemical targets has the potential to expand and improve chemical monitoring in many fields. Despite rapid advancements within the research community, NTA methods and data remain underutilized by many potential beneficiaries. To better understand barriers toward widespread adoption, the Best Practices for Non-Targeted Analysis (BP4NTA) working group conducted focus group meetings and follow-up surveys with scientists (n = 61) from various sectors (e.g., drinking water utilities, epidemiologists, n = 9) where NTA is expected to provide future value. Meeting participants included producers and end-users of NTA data with a wide range of familiarity with NTA methods and outputs. Discussions focused on identifying specific barriers that limit adoption and on setting NTA product development priorities. Stated priorities fell into four major categories: 1) education and training materials; 2) QA/QC frameworks and study design guidance; 3) accessible compound databases and libraries; and 4) NTA data linkages with chemical fate and toxicity information. Based on participant feedback, this manuscript proposes research directions, such as standardization of training materials, that BP4NTA and other institutions can pursue to expand NTA use in various application scenarios and decision contexts.

6. Azam N., Corbelli, L., Lincoln, E., **Thomas, S.**, **Jones, J.**, **Nason, S. L.**, **White, J. C.**, Lewis, R., Haynes, C. L. (2025). Phytotoxicity and phytoremediation potential of *Lemna minor* exposed to perfluorooctanoic acid. *Frontiers in Plant Science*. DOI: 10.3389/fpls.2024.1493896.

Abstract: Perfluorooctanoic acid (PFOA) is one of the highly toxic compounds which was phased out of application in consumer products in 2015 due to its harmful effects on human and environmental health. However, this chemical was in use for many years and is still found in water resources. This study focuses on the physiological response of duckweed (Lemna minor) exposed to PFOA so as to determine phytotoxicity and the potential of this aquatic species to remove PFOA from the environment. A time-dependent phytotoxicity assay showed that exposure to 0.1 µg/L PFOA for 14 days resulted in the loss of chlorophyll pigment and 15 -25% more chlorosis than in controls. Although exposure to PFOA for seven days resulted in chlorosis, no significant impact on physiological parameters such as photosynthetic pigment or anthocyanin content were detected. The analysis of cellular size on day zero and seven of the experiment showed that the control group showed significantly larger cell size after seven days (213 ± 6.5 µm²) compared with the day zero group (186 ± 18 µm²), while the size of the PFOA exposed group (198 ± 13 µm²) did not change significantly after seven days compared with the day zero group. The nuclear size increased significantly by 13% upon exposure to PFOA compared with the controls ($\rho < 0.0001$). The concentration of essential elements K, Cu, Fe, Mn, Zn, Mo were reduced in L. minor exposed to PFOA compared with the controls by 39.6, 33.4, 42.1, 35.2, 31.9, 40.2%, respectively. Additionally, PFOA accumulated in L. minor fronds and roots with an average bioaccumulation factor of 56 ± 7. Overall, while some symptoms of toxicity were observed, this study shows that L. minor can tolerate up to 0.1 µg/L PFOA, a commonly found concentrations in water bodies, and can remove PFOA from water. This study provides invaluable information regarding the phototoxicity impacts of PFOA on aquatic species and the potential for aquatic phytoremediation of PFOA.

PLANT PATHOLOGY AND ECOLOGY

YONGHAO LI, PH.D. participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (7 adults) (January 8); gave a talk titled "Diseases of Bonsai Plants" to the Bonsai Society of Great New Haven (24 adults) (January 14); with Felicia Millett and Rose Hiskes, staffed the Station Booth at the CTPA Winter Meeting (January 16); staffed the Station Booth at the CNLA Winter Meeting (January 22); gave a talk titled "Common Vegetable Diseases and Management" to the Wethersfield Men's Club (15 adults) (January 27); gave a lecture titled "Important and Common Disease Problems in the Industry" for the SiteOne Universities in Darian (120 Adults) (January 28); gave a lecture titled "Important and Common Disease Problems in the Industry" for the SiteOne Universities in Berlin (80 adults) (January 29)

ROBERT MARRA, PH.D. gave a presentation on his beech leaf disease research to the International Programs Division of the U.S. Forest Service (via Teams) (January 7); attended the CTPA Winter Meeting (January 16); participated in the monthly meeting of the APS Divisional Forum Representatives (January 28).

FELICIA MILLETT staffed the CAES booth with **Rose Hiskes** at the UConn Vegetable and Small Fruit Conference (January 7); participated in the NEPDN monthly meeting (15 adults) (January 9); participated in the NPDN Professional Development Committee monthly meeting (9 adults) (January 9); and staffed the CAES booth with **Yonghao Li, Ph.D.** at the CTPS Winter Meeting (January 16).

QUAN ZENG, PH.D. taught a guest lecture, "Novel strategies of managing bacterial plant diseases," to a group of graduate students of the Plant Bacteriology class at Michigan State University (via Zoom, 16 adults) (January 30).

PUBLICATIONS:

1. **Pavlicevic, M.; Vaidya, S., Arsenault, T., Bharadwaj, A., Musante, C., Yu, Y., Shabtai, I., Liquori, J.,** Hernandez-Viezcas, J.A., Oyanedel-Craver, V., Gardea-Torresdey, J.L., **White, J. C., Zuverza-Mena, N.** (2025). Upcycling plant waste: iron nanoparticles synthesized from *Cannabis sativa* enhance biomass and antioxidative properties in soybean (*Glycine max*). *Environ. Sci.: Nano.* DOI: 10.1039/D4EN01018C.

Abstract: Iron nanoparticles were phytosynthesized from biomass residues of two subspecies of Cannabis sativa (ssp. sativa and ssp. indica) and evaluated as a nanofertilizer for soybean growth. Both nanoparticles were identified as magnetite (Fe3O4) with a dry size smaller than 30 nm. The Fe3O4 nanoparticles (NPs) synthesized from ssp. indica were negatively charged (- 27.2 ± 0.2 mV) with a smaller hydrodynamic diameter (164 ± 47 nm) than those from ssp. sativa (+ 4.3 ± 0.1 mV; 1739 ± 146 nm). These differences were the result of variable composition of extracts from the two subspecies used for NP synthesis. Notably, C. sativa ssp. sativa contained a higher ratio of alcohols and mercaptans, while C. sativa ssp. indica contained more amines, ketones and organic acids. The dissolution of ions from the subspecies ssp. sativa and ssp. indica were 0.28 and 0.01% after 168 hours, respectively. When foliarly applied to soybean at 200 mg/L (6.25 ml per plant), nanoparticles from both ssp. sativa and ssp. indica

soybean at 200 mg/L (6.25 ml per plant), nanoparticles from both ssp. sativa and ssp. indica increased content of chlorophylls by 142% and 115%, antioxidants by 121% and 124% and polyphenols by 177% and 106%, respectively, after 3 weeks of growth, compared to corresponding controls. However, Fe_3O_4 NPs synthesized from ssp. sativa increased soybean biomass by 148 % whereas nanoparticles synthesized from ssp. indica had no impact on growth. These findings highlight the impact of plant genotype on characteristics and effects of biosynthesized nanoparticles and provide novel insights for plant feedstock preferences for nanoparticle synthesis from plant waste for sustainable nano-enabled agriculture.

2. Li, Y. (2025). Alternaria Leaf Spot of Brassicas. CAES Fact Sheet. https://portal.ct.gov/-/media/caes/publications/alternaria-leaf-spot-of-brassicas-final.pdf?rev=907e388a61d84a9faa273c7e552e8568.

OTHER DEPARTMENTAL NEWS:

Members of the PPE department gathered in the Johnson-Horsfall atrium for a reception to wish farewell and good luck to Dr. Stephen Taerum, who has served in the Triplett Lab as postdoctoral researcher from 2019-2025. Stephen will be greatly missed!

VALLEY LABORATORY

JATINDER S AULAKH, PH.D. presented a poster entitled "Control of Glyphosate-Resistant Palmer amaranth Populations from New York and Connecticut held at Annapolis, MD (January 7); and reviewed a manuscript entitled "Nonsynthetic Herbicides for Turfgrass: Assessing Frequency of Consumer Information and Regional Performance for Annual Bluegrass (*Poa annua* L.) Control" for the international turfgrass society Research Journal (January 7); and published a manuscript entitled "Confirmation of glyphosate-resistant waterhemp (*Amaranthus tuberculatus*) in New York" in the Weed Technology Journal (January 15); and submitted an abstract entitled "Characterization and Management of Glyphosate-Resistant Waterhemp from New York and Connecticut" for oral presentation at the Weed Science Society Meeting to be held in Vancouver, Canada (January 20); and submitted a manuscript entitled "Glyphosate resistance and EPSPS gene amplification confirmed in a waterhemp (*Amaranthus tuberculatus*) biotype from Connecticut" Agrosystems, Geosciences, and Environment Journal (January 22).

CAROLE CHEAH, PH.D. gave a presentation on protecting our hemlock trees for the Traprock Ridge Land Conservancy Nature Lecture Series (16 attendees) (January 8).

RICHARD COWLES, PH.D. presented "Ethylene-blocking materials to enhance needle retention in balsam firs," to the Atlantic Christmas Tree Research Association, (Zoom meeting, 15 participants) (January 24). He discussed "Deer repellents and beech leaf disease," for two meetings hosted by SiteOne Landscaping in Darien, (120 attendees) (January 28) and in Berlin (80 attendees) (January 29). His discovery that milkfat is an effective deer repellent was featured on CT Public Radio (Morning Edition) (February 3).

PUBLICATIONS:

1. Chen, Y. - L., Peng, B. - Y., Wan, Y., **Li, D. - W.**, and Zhu, L. - H. (2025). Identification and characterization of *Alternaria* spp. causing leaf blotch on *Salix matsudana*: a study from Rudong city, China. *Crop Protection* 188, 107014. DOI: 10.1016/j.cropro.2024.107014

Abstract: *Salix matsudana* Koidz. is a popular ornamental tree in China and extensively cultured throughout Asia. It is renowned for its remarkable adaptability to challenging conditions, high biomass, rapid growth, and flood tolerances. In October 2022, a leaf blotch disease was observed in Rudong City, Jiangsu, China. This disease significantly impacted the ornamental and ecological value of the host tree. Fungal isolates, obtained from symptomatic leaves, were confirmed to be pathogenic to *S. matsudana* following pathogenicity tests. Phylogenetic analysis using seven loci (ITS, SSU, RPB2, LSU, ALTα-1, TEF1-α and GAPDH) and morphological characterization of the nine isolates revealed that they belonged to *Alternaria alternata*, *Alternaria arborescens*, and *Alternaria koreana*. This study represents the first study of Alternaria causing leaf blotch in *S. matsudana*. It provides valuable insights for disease management and enhances our understanding of *Alternaria* species diversity in China.

2. Kumar, V.; **Aulakh, J.**, Stanyard, M., Hunter, M., Brown, B., Sosnoskie, L., Jhala, A. J. (2025). Confirmation of glyphosate-resistant waterhemp (*Amaranthus tuberculatus*) in New York. *Weed Technology*, 2025, 1–19. DOI: 10.1017/wet.2024.104

Abstract: Waterhemp has become a serious management challenge for New York (NY) field crop growers. Two putative glyphosate-resistant (GR) waterhemp populations (NY1 and NY2) were collected in 2023 from two soybean fields in Seneca County, NY. The objectives of this research were to (1) confirm and characterize the level of glyphosate re-

sistance in waterhemp populations from NY relative to a known glyphosate-susceptible Nebraska (NE_SUS) population and (2) evaluate the efficacy of various postemergence (POST) herbicides for GR waterhemp control. Based on the shoot dry weight reductions (GR50 values) in a dose-response study, the NY1 and NY2 populations exhibited 5.6- to 8.3-fold resistance to glyphosate compared with the NE_SUS population. In a separate study, POST herbicides such as dicamba, glufosinate, lactofen, and 2,4-D applied alone or in a mixture with glyphosate or glufosinate had provided 89% to 99% control and ≥ 97% shoot dry weight reduction of NY1 and NY2 populations 21 days after treatment (DAT). Greater than 98% control of the NE_SUS population was achieved with tested POST herbicides, except mesotrione (62% control). Furthermore, atrazine, chlorimuron + thifensulfuron, and mesotrione were the least effective in controlling NY1 and NY2 populations (42% to 59% control and 50% to 67% shoot dry weight reductions, respectively). These results confirm the first report of GR waterhemp in NY. Growers should adopt effective alternative POST herbicides tested in this study to manage GR waterhemp.

JOURNAL ARTICLES APPROVED JANUARY 2025

Allabakshi, S. M., Srikar, P. S. N. S. R., & Nippatlapalli, N. Electrical discharge: A chemical-free advanced oxidation process for removing aqueous contaminants of emerging concern. *Book Chapter (Elsevier)*.

Allabakshi, S. M., Srikar, P. S. N. S. R., Gangwar, R. K., & Maliyekkal, S. M. Nonthermal plasma technology for degradation of dyes in wastewater. *Book Chapter (Elsevier)*.

Brown J. E., **Linske, M. A.**, DeNicola, A. J., DeNicola, V. L., Boulanger, J.R., **Tamez, C.**, **Williams, S. C.** Oral delivery of the systemic acaricide moxidectin to a confined white-tailed deer (Odocoileus virginianus) (Artiodactyla: Cervidae) herd parasitized by Ixodes scapularis (Ixodida: Ixodidae). *Journal of Medical Entomology*.

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