Station News

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

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

JASON C. WHITE, PH.D. along with **Yi Wang, Ph.D.** participated in a Zoom call with colleagues at the University of Qatar to discuss collaborative research (May 1); participated by Teams in an Executive Board meeting of the International Phytotechnology Society (May 1); hosted a Finance Committee meeting on Zoom with the CAES Board of Control and Fuducient (May 1); travelled to the University of Aveiro in Portugal to participate in a PhD Dissertation defense (May 4-6); participated in the weekly NSF Center for Sustainable Nanotechnology (CSN) all hands call by Zoom (May 7, 14, 21, 28); spoke by Teams with Brian Scott Smith about the CAES 150th anniversary (May 7, 22); met by Zoom with colleagues at the University of Minnesota and Convergent Biosciences to discuss collaborative research (May 7, 9, 21, 27); met by Zoom with a Scientific Officer at the Bangladesh Institute of Nuclear Agriculture (BINA) to discuss nano-enabled agriculture (May 8); along with **Nubia Zuverza-Mena, Ph.D.** and **Mandeep Kaur, Ph.D.** met by Zoom with colleagues at Rutgers University and NJIT to discuss collaborative research (May 8); participated in a Zoom call with colleagues at Stony Brook University to discuss a Regional Center of Excellence on PFAS remediation (May 12); participated in an Editorial Board meeting for the new journal *Bioscience Nanotechnology* (May 13); visited Talam Biotech in Mystic to discuss potential collaborative research (May 13); along with **PHIL ARMSTRONG, PH.D.** met with Dr. Nathan Havill of USFS to discuss potential collaboration (May 14); met with Marina Youngblood of the University of California Riverside and discussed collaborative research (May 14); participated in the AgInnovation Northeast monthly conference call (May 15); was interviewed by John Voket of Connoisseur Media CT about CAES at 150 years (May 15); made welcoming comments to a group of undergraduate students from Albertus Magnus College for a tour of CAES labs and programs (May 16); met with staff from CT DCP to discuss product testing within the Adult Use Cannabis testing program (May 19); met by Teams with staff members of the Attorney General's Office to discuss an EPA grant that was terminated (May 20); was interviewed by Mary Fortune for an upcoming article about CAES at 150 years in *Connecticut Grown* (May 22); participated in the bimonthly Farmland Preservation Advisory Board meeting (May 22); participated in the ribbon cutting ceremony for the new CAES greenhouses (May 22); participated in a call with SWFT labs to discuss collaborative research (May 22); along with **Jeremiah Foley, Ph.D., Summer Weidman, Riley Doherty**, and **Madeline Watts** participated in a press conference discussing Hydrilla with Senator Richard Blumenthal (May 23); participated in a Zoom meeting with collaborators at Yale University and the University of Minnesota for a joint NIEHS grant (May 23); participated in a Teams meeting with collaborators at the University of Minnesota, Hasselt University and 3M to discuss collaborative experiments on PFAS phytoremediation (May 27, 29); and spoke by phone with Paul Johnson about an upcoming trip to Cuba (May 30).

PUBLICATIONS:

1. Tian, M., Cai, Z., Jia, W., Zhao, Z., Li, Q., Xu, X., Liang, A., Wang, S., **White, J. C.**, Ma, C., Xing, B. (2025). Nanoscale phosphorus-based agrochemicals enhance tomato and rice growth via positively modulating gene expression and the endophytic microbial community. *Environ. Sci.: Nano* 12:2603-2616.

Abstract: Nano-hydroxyapatite (nHA) has attracted increasing attention as a potential novel fertilizer. The present study investigated the effects of root exposure to four nHAs (20 nm-nHA, 60 nm-nHA, 1% Cu-nHA, and 10% Cu-nHA) on the growth and development of tomato and rice seedlings. Compared with the control, different types of 50 mg/kg nHA increased the biomass of seedlings and 20 nHA significantly promoted the growth of tomato and rice, and increased the fresh weight of the two plants by 17.2% and 29.2%, respectively. 20 nm-nHA and 1% Cu-nHA altered the diversity of plant endophytic bacterial and

fungal communities and increased the abundance of plant-associated microorganisms beneficial (including Glomeromycotina, Funneliformis, and Blastoclasiomycets). Transcriptomic analysis suggests that 20 nm-nHA and 1%Cu-nHA induced transcriptional reprogramming in seedlings. KEGG pathway analysis showed that root exposure of 20 nm-nHA and 1% Cu-nHA promoted plant hormone signal transduction pathways in tomato and rice roots and starch, and 1% Cu-nHA promoted photosynthesis and amino acid metabolism. In conclusion, root exposure to 50 mg/kg 20 nm-nHA can significantly improve crop growth, and these results provide valuable insights into the development of potential phosphorus fertilizers as a sustainable path for nano-enabled agriculture.

2. Phillips, S. G., Brake, S., Esmely-Graces Martinez, D., Eckhert, P. M., **Deng, C.**, **White, J. C.**, Peresin, M. S., Fairbrother, D. H. (2025). Tunable NPK release from surface-esterified nanocellulose-based prills. *Environ. Sci. Technol.* https://doi.org/10.1021/acs.est.5c02016.

Abstract: Polysaccharides represent an ideal delivery platform for agrochemicals due to their biodegradability, biocompatibility, and abundance. However, hydrophilicity renders native polysaccharides ineffective at controlling the release of water-soluble agrochemicals. To overcome this limitation, we used a solvent-free, vapor-phase modification strategy to generate hydrophobic shells on the surface of nanofibrillated cellulose (CNF) prills and evaluated the effects of these tunable diffusion barriers on fertilizer release behavior. Hydrophobic shells of different thicknesses were created on CNF prills by esterification with acyl chlorides of varying alkyl chain lengths, although esterification did not hinder the inherent biodegradability of the CNFs. Fertilizer release rates were largely invariable to pH and NPK loading but were tunable over 3 orders of magnitude by varying the alkyl chain length and the degree of substitution (i.e., shell thickness). However, NPK release rates did not increase monotonically with increasing shell thickness, for long-chain (6 carbons or longer) esters, increases in shell thickness beyond optimal values increased release rates; SEM revealed that this originated from the introduction of fractures to the prills which act as diffusion channels. This work demonstrates the potential of controlled surface modification to generate a mineralizable and tunable NPK release platform from naturally sourced and sustainable feedstocks.

3. Huang, C.-H., Lewis, R., **Nason, S.**, **Thomas, S.**, **Zuverza-Mena, N.**, O'Keefe, T., Tuga, B., Paredes-Beaulieu, A., Dalluge, J., **White, J. C.**, Haynes, C. (2025). Designing ultraporous mesostructured silica nanoparticles for the remediation of Per- and Polyfluoroalkyl Substances. *ACS Nano* 19, 21, 19777–19789.

Abstract: Concerns about per- and polyfluoroalkyl substances (PFAS) have been raised globally as they are bioaccumulative, highly persistent, and invoke a range of health risks. Although phytoremediation is a sustainable PFAS remediation strategy, its efficiency is highly dependent on the PFAS analyte chain length, with limited uptake and removal of longer-chain contaminants. This study aims to develop surface-modified ultraporous mesostructured silica nanoparticles (UMNs) to facilitate PFAS phytoremediation. UMNs were synthesized and functionalized to tune their hydrophobicity and surface charge to enhance UMN affinity for PFAS. Dynamic light scattering, ς-potential, and nitrogen physisorption show that the modified UMNs had similar physical characteristics. Liquid chromatography–tandem mass spectrometry (LC-MS/MS) analysis shows that positively charged UMNs have a higher affinity for PFAS than negatively charged UMNs (with 20% of perfluorooctanoic acid, or PFOA, remaining in solution vs 100% of PFOA remaining in solution, respectively). When incubated with multiple PFAS, UMNs show greater removal efficiency for longer-chain and more hydrophobic PFAS. Preliminary plant studies in soil show an increased PFOA bioconcentration when positively charged UMNs are present. Molecular dynamics simulations, which focused on interactions between the different function-

al groups on the silica surface and PFAS molecules, were completed and show the importance of the combination of hydrophobic and electrostatic interactions to drive PFAS uptake. Overall, this study highlights the potential of surface-modified UMNs to enhance the uptake of PFAS from the environmental matrix and promote phytoremediation.

4. Feng, J., Sun, Y., Rui, Y., Zhang, P., **White, J. C.**, Zhang, Y. (2025). Light-driven nitrogen fixation catalyzed by nanomaterials: link between PNF and BNF. *Environ. Res*. 279:121822.

Abstract: Photocatalytic nitrogen fixation (PNF) and biological nitrogen fixation (BNF) represent two typical strategies in the nitrogen cycle, each planning a critical role in converting atmospheric nitrogen (N2) into bioavailable forms. PNF utilizes light energy to reduce N2 into ammonia (NH3) and nitrate, while BNF relies on nitrogen-fixing microorganisms to convert N2 into NH3 via nitrogenase. Despite their divergent mechanisms, insights from natural processes of BNF are invaluable for the advancement of PNF. For instance, the structure of the FeMo cofactor—the catalytic core of nitrogenase in BNF—has inspired researchers to simulate this structure in the development of innovative photocatalysts. Notably, the excellent nitrogen fixation performance of the photocatalyst-Azotobacter hybrid system indicates that the combination of PNF and BNF has promising potential for exploration. Conversely, PNF offers novel perspectives for enhancing BNF, such as solar energy utilization and catalyst optimization. Nanotechnology further bridges these fields by enabling precise catalyst design and efficient electron delivery systems, playing a crucial role in the supply of nitrogen fertilizers for agricultural production and supporting sustainable agriculture. Ultimately, the integration of PNF and BNF are expected to establish eco-friendly solutions for global nitrogen management

5. Feculak, M., Loureiro, S., **White, J. C.**, Wu, K. C-W., Sheteiwy, M. S., Gao, Y., Oleszczuk, P., Josko, I. (2025). Engineered nanoparticle transformations: Rethinking toxicity in water. *Nano Today* 65:102804.

Abstract: The burgeoning production and utilization of engineered nanoparticles (ENPs) in recent years has precipitated the intentional and inadvertent discharge of ENPs into the environment, where undergo different transformations. Extensive research has investigated the mechanisms underlying the environmental transformations of metal-based ENPs, with a focus on alterations in the properties of their transformation products. It is widely recognized that ENP-biota interactions are influenced by various ENP characteristics, such as size, shape, surface area, chemical composition, surface charge, and chemistry. As a result of transformations, changes in ENP properties are anticipated to affect biotic interactions, including cellular recognition and trafficking, thus impacting organismal responses. This hypothesis has only recently been subjected to experimental scrutiny, mainly within simplified ENP-organism systems. Major studies indicate that the acute toxicity of transformed ENPs is largely driven by the rate and yield of metal ion release, similar to pristine ENPs. However, when transformations reduce ENP dissolution, they may enhance environmental persistence, rendering other toxicity mechanisms more significant. We meticulously examine available data on the toxicity of various transformed ENPs, aiming to systematically assess the actual responses of aquatic biota concerning altered ENP properties and differing environmental factors. In this context, we highlight scenarios involving multiple ENP transformations and specific local environmental modifications. These research directions warrant further exploration, especially under real-world conditions. Such efforts will expand the database, which, through the application of modern machine learning and artificial intelligence tools, can aid in predicting the fate of ENPs released from the increasing array of nano-products.

6. Li, C., Ma, C., Shang, H., **White, J. C.**, Cai, Z., Jia, W., Cao, Y., Xue, J., Hao, Y., Han, L., McClements, D. J., Xing, B. (2025). Polystyrene nanoplastics compromise the nutritional value of radish (*Raphanus sativus* L.) https://doi.org/10.1021/acs.est.4c13894.

Abstract: The accumulation of nanoplastics (NPs) in crops has drawn global attention due to their potential exacerbation in human health through food chain transfer. The present study investigated the distribution, accumulation, and phytotoxicity of polystyrene (PS) NPs in radish and evaluated the potential risks of PS NPs to human health via a simulated INFOGEST model. PS NPs were mainly accumulated in the cortex and xylem of radish roots and primarily accumulated within the peels via direct adsorption onto tuber surfaces. Transcriptomic and metabolomic analyses revealed that exposure to PS NPs triggered plant defense systems by upregulating gene expression and metabolites involved in flavonoid biosynthesis as well as starch and sucrose metabolisms. However, the downregulation of genes associated with plant hormone signal transduction, as well as the biosynthesis of glucosinolates (the most valued compounds contributing to radish nutrition and flavor), and amino acids reduced crop yield and quality. Importantly, the investigations using a simulated INFOGEST model showed that PS NPs significantly reduced bioaccessibilities or index of nutritional quality (INQ) of amino acids and glucosinolates in the digesta of radish fruits, thereby compromising the nutritional value of radish. These findings further our understanding of the negative effects of NPs-contaminated crops on human digestive tract health.

7. Pavlicevic, M., **Zhou, J.**, **Ammirata, M. A.**, **Arsenault, T.**, **Cahill, M. S.**, Hernandez-Viezcas, J. A., Oyanedel-Craver, V., Gardea-Torresdey, J., **Dimkpa, C. O.**, **White, J. C.**, **Zuverza-Mena, N.** (2025). Manganese nanoparticles synthesized from hemp biomass waste modulate metabolic responses in soybean. *Plant Physiol. Biochem*. https://doi.org/10.1016/j.plaphy.2025.109992.

Abstract: Synthesis of nanoparticles (NPs) from plant material is a sustainable alternative to chemical synthesis. Manganese-based NPs were synthesized from the waste of two subspecies of Cannabis sativa and using two different salts (sulfate and nitrate). Nanoparticles synthesized from Cannabis sativa spp. indica were more stable (ζ = - 26.31 ± 0.49 mV and - 38.07 ± 0.33 mV) than those from ssp. sativa (ζ = - 0.77 ± 0.04 mV and - 9.89 ± 0.24 mV). Additionally, nanoparticles synthesized using sulfate were larger, but more stable than those synthesized using nitrate. The NPs' elemental composition was also different, NPs synthesized from ssp. sativa contained ~2x more sodium and less potassium than nanoparticles synthesized from ssp. indica. Nanoparticles synthesized from ssp. indica significantly increased soybean's chlorophylls content (by 120 % and 126 %, synthesized from nitrate and sulfate, respectively; compared to control) and content of antioxidants (134 % and 140 %, synthesized from nitrate and sulfate, respectively; compared to control). These increases were greater than those caused by nanoparticles synthesized from ssp. sativa (111 % and 119 % for chlorophylls and 114 % and 106 % for antioxidants, compared to the control). Nanoparticles synthesized using nitrate significantly increased polyphenols content (158 % (for nanoparticles synthesized from sativa) and 116 % (for nanoparticles synthesized from indica, compared to control) more than nanoparticles synthesized using sulfate (123 % (for nanoparticles synthesized from sativa) and 110 % (for nanoparticles synthesized from indica), compared to control). These findings can help develop the method for synthesis of manganese nanofertilizers from hemp waste by influencing selection of subspecies and salt.

8. Sakhno, Y., Vaidya, S., Nikolenko, M., **White, J. C.**, Iafisco, M., Jaisi, D. (2025). Comparative analysis of crystalline hydroxyapatite and amorphous calcium phosphate for dissolution and plant nutrition. *J. Nano. Res*. 27, 151, https://doi.org/10.1007/s11051-025-06338-7.

Abstract: The performance of fertilizers for supplying nutrients to plants depends on their dissolution characteristics in soils. Here, we compared the dissolution kinetics and compositional changes at surfaces between citrate-stabilized amorphous calcium phosphate (ACPc) and crystalline hydroxyapatite nanoparticles (HANPs) when exposed to citric and acetic acid buffers, two organic acids commonly present in root exudates. A series of complementary orthogonal characterization techniques, including FTIR, Raman, and PXRD, were combined to elucidate the evolution of the Ca/P ratio, pH change, and recrystallization of calcium phosphate. We found that changes in pH and Ca/P ratio during dissolution in HANP and ACPc were largely due to differences in the formation of surface complexes between the acids and the intra-particle migration of protons (confirmed from H2O/D2O isotope exchange). A greenhouse pot trial experiment was performed using commercial lettuce to ground-truth how these characteristics influence the plant nutrition. Results showed a higher crop yield in HANP and ACPc treatments compared to the commercial fertilizer (monocalcium phosphate (MCP)), by 20 and 33%, respectively. The major difference was in resource use efficiency (RUE), a ratio of crop yield to P lost after irrigation, which was about six times higher in HANP than commercial MCP. These outcomes correlate well with dissolution characteristics that the leaching loss of dissolved P could be a major reason for the low yield and highly diminished RUE of ACPc and MCPs compared to those of HANPs. These outcomes provided multiple reasons for the need for the development of next-generation phosphorus fertilizers that are dually capable of enhanced nutrient as well as high resource use efficiency.

9. Garcia, A., Kewir, F., Wang, Y., Astete, C., **White, J. C.**, Sabliov, C. (2025). Hydrophobic CuS nanoparticle entrapment and release from lignin-derived nanoparticles. *J. Nano. Res.* 27:149.

Abstract: Food insecurity and environmental concerns call for increasing efficiency and sustainability of current agricultural practices. Copper-based agrochemicals, widely used to protect crops from diseases, pose risks to non-target microorganisms and groundwater due to their uncontrolled application. This study addresses these challenges by developing a controlled delivery system for Cu-based agrochemicals, enhancing their efficacy and minimizing environmental impact in agricultural applications. We investigated the synthesis of CuS nanoparticles (NPs), followed by surface modification and entrapment of hydrophobic CuS NPs in engineered lignin NPs. CuS NPs exhibited a size between 8.8±1.3 and 14.7±3.3 nm, depending on the duration of the reaction, 15 to 30 min, respectively. Surface modification of CuS NPs with 1-octadecanethiol (ODT), a thiol with 18 carbons (R-SH), resulted in hydrophobic CuS NPs. FTIR revealed a layered assembly due to arranged alkyl chains on the CuS surface. Separately, two types of lignin, alkali (ALN) and sodium ligninsulfonate (SLN), were grafted with poly(lactic-co-glycolic) acid (PLGA) at 1:1 and 2:1 w/w ratios to form amphiphilic polymers, which were assembled into delivery systems for the CuS NPs. Hydrophobic CuS were successfully entrapped into LN-PLGA delivery systems to control the release of CuS under aqueous solutions. SLN-PLGA NPs were generally smaller (122 to 130 nm) compared to ALN-PLGA NPs (132–162 nm). Release of Cu and S from the ALN-PLGA delivery systems exhibited a consistent release of S at 0.49 ppm (0.6%) for 7 days while a slow dissolution of Cu of 0.02 ppm (0.02%) was observed over the same time frame. In conclusion, CuS NPs were successfully synthesized and modified, allowing their entrapment into LNP delivery systems with different properties, and controlled release over time. The lignin-based delivery systems are proposed as feasible alternatives for the efficient delivery of CuS in nanoform, utilizing an abundant biodegradable resource for improving plant health.

10. Castillo, C., Hoang, K. N. L., Alford, C., Svendahl, E., **Deng, C.**, **Wang, Y.**, Wang, Y., Hernandez, R., **White, J. C.**, Wheeler, K. E., Murphy, C. J., Giraldo, J. P. (2025). In vivo transformations of positively charged nanoparticles alter the formation and func-

tion of RuBisCO photosynthetic protein corona. *Nature Nano*. In press

Abstract: The impact of nanomaterial transformations on photosynthetic proteins remains largely unknown. We report positively charged iron oxide (Fe3O4) nanoparticles experience transformations in Arabidopsis thaliana plants in vivo that alter the formation and function of RuBisCO protein corona, a key carbon fixation enzyme. In vitro, negatively charged Fe3O4 nanoparticles impact the RuBisCO function but not their positively charged counterparts. Computational and in vitro proteomic analyses revealed that positively charged Fe3O4 nanoparticles preferentially bind to a RuBisCO small subunit that lacks active carboxylation sites. However, both positively and negatively charged nanoparticles decrease RuBisCO carboxylation activity after experiencing transformations in vivo by 3.0 and 1.7 times relative to the controls, respectively. The pH- and lipid-coating-dependent transformations that occur during nanoparticle transport across plant membranes enhance RuBisCO binding to positively charged nanoparticles affecting its distribution in chloroplasts. Elucidating the rules of how nanoparticle properties and transformations affect photosynthetic coronas is crucial for sustainable nano-enabled agriculture.

Dr. Jason C. White at a PhD Dissertation defense at the University of Aveiro in Aveiro Portugal.

Ribbon cutting ceremony for the new CAES greenhouses in New Haven.

ANALYTICAL CHEMISTRY

NUBIA ZUVERZA-MENA, PH.D. presented at the Society of Environmental Toxicology and Chemistry (SETAC) 35th Europe annual meeting the talk "Micro-nanoscale polystyrene and polyvinyl chloride co-exposure impacts the uptake and translocation of toxic elements and pesticides by lettuce and wheat (Vienna, Austria, May 15); hosted Wyatt Shallis, a Joseph A. Foran High School senior, for an internship in the Analytical Chemistry Dept. (May 6- June 6); attended internal group meetings with **Sara Nason, Ph.D., Jingyi Zhou, Ph.D.** and **Priyankar Chand, Ph.D.** on studies to profiling of wastewater under different weather conditions for irrigation purposes; along with **Sara Nason, Ph.D.** and **Jingyi Zhou, Ph.D.** participated online in the monthly meeting with collaborators from a project to enhance PFAS phytoremediation; and also supported the analysis of samples to measure total nitrogen for external collaborators.

YOULMIN LEE, a senior at Amity High School, completed her 4-week internship, during which time she collaborated with **Milica Pavlicevic, Ph.D.** and **JASON WHITE, PH.D.** to learn how to synthesize nanoparticles from plant residue and studied the interaction of "green" nanoparticles with the plants.

PUBLICATIONS:

1. **Muthuramalingam, R.**, **da Silva, W.L.**, Hernandez-Viezcas, J.A., Oyanedel-Craver, V., Gardea-Torresdey, J.L., **Dimkpa, C.O.**, **White, J.C.**, and **Zuverza-Mena, N.** (2025). A multi-nutrient nanocomposite enhances UV stress tolerance and modulates nutrient accumulation in lettuce. *Environmental Science: Nano*. DOI: 10.1039/D5EN00154D

Abstract: This study introduces a novel multielement (Zn–Mg–Mn–Fe) nanocomposite that serves both as a UV-protective agent and a nutrient delivery system for Lactuca sativa (lettuce). Plants were grown indoors in a potting soil-like mix, under artificial lighting (from light emitting diodes, LEDs) or under LED + UV radiation to simulate excessive sunlight exposure (light stress). Lettuce was treated with foliar applications of the nanocomposite at 100 mg L−1, 200 mg L−1, and 300 mg L−1, with 1 mL applied per plant during the fifth week of growth (a total of 0.1, 0.2 or 0.3 mg of the composite respectively per plant). Plants were exposed to UV radiation (360–400 nm) for 10 hours daily over two weeks. The 300 mg L−1 treatment significantly enhanced photosynthetic efficiency and plant growth, increasing chlorophyll content (66.7% ± 3.5), leaf area (45% ± 2.1), and dry biomass (43.68% ± 1.8) compared to untreated and ionic controls. It also mitigated UV-induced stress, reducing UV-induced damage scores by 73% compared to controls and lowering stress markers, with flavonoid production reduced to 30.5% ± 2.3 of control levels and SOD activity reduced to 25.8% ± 1.8 of control levels. The composite's-controlled nutrient release mechanism facilitated rapid Mg uptake (220 mg kg−1 dry weight in leaves within 4 days) and sustained delivery of Zn, Mn, and Fe over a 7–10-day period. Long-term nutrient uptake analysis showed increases in Mn (55.3% ± 3.2), Mg (47.8% ± 2.7), and Fe (62.5% ± 4.1). Enhanced P (28.5% ± 2.2) and K (35.7% ± 3.1) accumulation further boosted the nutritional quality of edible tissues. Additionally, the nanocomposite demonstrated the unique ability to convert harmful UV radiation into visible light, providing dual benefits of UV protection and enhanced photosynthetic activity. These findings highlight the potential of this multi-functional nanocomposite as a sustainable solution to improve crop resilience, optimize nutrient delivery, and combat environmental stress in agricultural systems.

2. Irewale, A.T., Elemike, E.E., **Aikpokpodion, P.E.**, **Muthuramalingam, R.T., Dimkpa, C.O.,** Oguzie, E.E. (2024). Morphological and chemical profiling of biochar derived from Water Hyacinth towards bio-nanofertilizer development. *RSC Sustainability*. DOI: 10.1039/D5SU00052A

Abstract: Since the early 21st century, biochar (BC) has garnered attention for its agricultural and environmental applications. Water hyacinth (WH; *Eichhornia crassipes*), an invasive aquatic weed, has emerged as a promising feedstock for BC production due to its rapid growth and nutrient accumulation properties. However, studies on nano-nutrient fortification of WH-derived BC and the molecular dynamics of nutrient sorption remain limited. This study prepared BC from WH leaf (D1) and stem (D2) biomasses, achieving yields of 31% and 34%, respectively, under pyrolysis at 600 °C. Furnace residence times of 15–60 minutes were evaluated, with optimal carbonization occurring at ≥30 minutes. SEM and FTIR analyses revealed highly porous structures with functional groups, including –COOH, –OH, C = C, and –S = O, predominantly in D1. The BC was alkaline (pH 10.7), with liming capacities of 14.76–28.94% $cc_{eq.}$, zeta potentials of −34 to −38 mV, and particle sizes of 146–583 nm. The 30 minute BC exhibited high nitrogen (34 550 ppm), phosphorus (56 ppm), and potassium (609 ppm) availability, alongside water-holding capacities of 1.58–2.26 g g^{-1}. This study highlights the unexploited potential of WH as a sustainable resource towards nano-enabled biofertilizer development, offering a solution for managing the plant's invasive spread, while simultaneously improving soil nutrient management and contributing to atmospheric carbon sequestration, with positive implications for climate change mitigation.

3. Pavlicevic, M., Zhou, J., Ammirata, M., Arsenault, T., Cahill, M., Hernandez-Viezcas, J.A., Oyanedel-Craver, V., Gardea-Torresdey, J.L., **Dimkpa, C. O., White, J. C., and Zuverza-Mena, N.** (2025). Manganese nanoparticles synthesized from hemp biomass waste modulate metabolic responses in soybean. *Plant Physiology and Biochemistry, 225*, 109992. DOI: 10.1016/j.plaphy.2025.109992

Abstract: Synthesis of nanoparticles (NPs) from plant material is a sustainable alternative to chemical synthesis. Manganese-based NPs were synthesized from the waste of two subspecies of *Cannabis sativa* and using two different salts (sulfate and nitrate). Nanoparticles synthesized from *Cannabis sativa* spp. indica were more stable (ζ = - 26.31 ± 0.49 mV and - 38.07 ± 0.33 mV) than those from ssp. *sativa* (ζ = - 0.77 ± 0.04 mV and - 9.89 ± 0.24 mV). Additionally, nanoparticles synthesized using sulfate were larger, but more stable than those synthesized using nitrate. The NPs' elemental composition was also different, NPs synthesized from ssp. sativa contained ~2x more sodium and less potassium than nanoparticles synthesized from ssp. *indica*. Nanoparticles synthesized from ssp. *indica* significantly increased soybean's chlorophylls content (by 120 % and 126 %, synthesized from nitrate and sulfate, respectively; compared to control) and content of antioxidants (134 % and 140 %, synthesized from nitrate and sulfate, respectively; compared to control). These increases were greater than those caused by nanoparticles synthesized from ssp. *sativa* (111 % and 119 % for chlorophylls and 114 % and 106 % for antioxidants, compared to the control). Nanoparticles synthesized using nitrate significantly increased polyphenols content (158 % (for nanoparticles synthesized from sativa) and 116 % (for nanoparticles synthesized from indica, compared to control) more than nanoparticles synthesized using sulfate (123 % (for nanoparticles synthesized from sativa) and 110 % (for nanoparticles synthesized from indica), compared to control). These findings can help develop the method for synthesis of manganese nanofertilizers from hemp waste by influencing selection of subspecies and salt.

4. Christudoss, A.C., Sah, K.K., Vikram, R., Giri, S., Viswanathan, D., **Dimkpa, C.O.**, Mukherjee, A. (2025). Tailoring the synthesis route of reduced graphene oxide and its

toxicological effects on *Allium cepa* L. ACS Omega. DOI: 10.1021/acsomega.5c01919

Abstract: The synthesis and use of reduced graphene oxide (RGO) have increased recently due to its numerous applications in drug delivery systems, regenerative medicine, fertilizers, antibacterial agents, and biosensors. Consequently, large quantities of RGO are deposited in the environment through industrial wastewater or agricultural products, whereupon they are liable to contaminate farming lands and soils in general. In this work, RGO was synthesized using two different reducing agents, namely, sodium borohydride (conventional reductant; RGO-I) and sucrose, (green reductant; RGO-II) and characterized using various microscopic and spectroscopic techniques. Subsequently, onion roots were exposed to RGO at different concentrations (1, 10, and 100 mg L^{-1}) and various toxicity assessments were performed. The toxicity of RGO increased potentially as a function of the concentration. Notably at 100 mg L^{-1}, RGO-I exhibited a maximum of 48% phytotoxicity with significant ($p < 0.001$) genotoxic effects, while RGO-II exhibited a 21% reduction in cell viability with no significant ($p > 0.05$) genotoxic effects. The findings from this study demonstrated the potential benefits of synthesizing RGO through safer and more sustainable methods to improve agricultural applications.

ENTOMOLOGY

PHILIP ARMSTRONG, SC.D. spoke to a reporters from the Harford Courant (May 13), WTIC (May 20), and News Channel 3 (May 29) about the Asian Tiger Mosquito in Connecticut. Met with Dr. Min Huang of Connecticut Department of Energy and Environmental Protection to discuss a collaborative project on eastern equine encephalitis virus (May 16). Met with Karen Wolujewicz of Connecticut Department of Public Health to discuss funding opportunities through the Climate Health Initiative (May 16). Met with Dr. Chantal Vogels of Yale University to discuss a collaborative project on Powassan virus transmission (May 28).

ANGELA BRANSFIELD participated via Zoom in Yale University's Biosafety Committee meeting (May 15); was inducted into the Alpha Omega chapter of the public health honorary society Delta Omega in Boston, MA (May 15); graduated from Tufts University with a Master of Public Health in Epidemiology and Biostatistics (May 18); and conducted BSL-3 Laboratory training for two new personnel (May 27-28).

JAMIE CANTONI gave an invited presentation for the Prospect Land Trust Annual Dinner/ Meeting titled "What Makes Them Tick? Getting to Know Your Not-So-Friendly Neighborhood Parasitic Arachnid" (30 attendees; May 4); along with **Megan Linske, Ph.D., Scott Williams Ph.D., Jessica Brown, Ph.D.,** and **Natalie Bailey**, visited Yale-owned Horse Island off Branford, CT to set up monitoring equipment to observe host species dynamics and sample ticks. (May 16).

KELSEY E. FISHER, PH.D. met and brainstormed with Erik Dopman (Tuffs University) and Brad Coates (USDA-ARS-CICGRU) about collaborative opportunities (May 1, 14, 20, 30); met with monarch research collaborators to discuss and plan a response to the Fish and Wildlife Service restriction to collection and rearing to 250 monarch individuals under endangered species listing (May 1); met with Dr. Sarah Lawson at Quinnipiac University, Tracy Zarrillo, and Caleb Bryan about collaborations and grant opportunities (May 1, 15, 22); met with Joshua Sullivan about designing a pollinator garden that will serve as a research site at Christ the Good Shepard Lutheran Church (May 7); presented during the 2025 NAPPC Bombus and Lepidoptera virtual grantee webinar (May 7; 50 attendees); served as an external examiner for a MS student in the University of Guelph's Entomology Department (May 23); met with Grace Kenney at the Slate School about using the meadow on the school's property for monarch butterfly research (May 23); presenting "Monarch butterfly, biology, ecology, and conservation" for the Enfield Garden Club (May 28; 45 attendees); met with Laura King about using the Catherine Violet Hubbard Animal Sanctuary as a monarch butterfly and bumblebee research site (May 29).

ANDREA GLORIA-SORIA, PH.D. presented the virtual seminar "Mosquito Genomics for Vector Control" at the New England Center of Excellence for Vector Borne Diseases (NewVec) Work-in-Progress seminar series. May 21 (22 attendees).

MEGAN LINSKE, PH.D., participated in a collaborative visit with **SCOTT WILLIAMS, PH.D.** (Department of Environmental Science and Forestry) to South Uist, Scotland, to discuss integrated tick management strategies with representatives from the University of Glasgow, University of Liverpool, NHS Western Isles, and members of the local community (May 30–June 9; 20 attendees); conducted fieldwork on Horse Island to assess tick density and diversity and implemented a rodent-targeted treatment approach in collaboration with Dr. Natalie Mastic (Yale Peabody Museum), **SCOTT WILLIAMS, PH.D., Jessica Brown, Ph.D., Natalie Bailey, Carlin Eswarakumar**, and **Thomas Larkin** (Department of Environmental Science and Forestry) and **Jamie Cantoni** (Department of Entomology (May 16); participated in a collaborative meeting with Isaac Larbi Osew and Dr. Vanessa Ezenwa (Yale University Department of Ecology and Evolutionary Biology) and **SCOTT WILLIAMS, ,**

PH.D. (Department of Environmental Science and Forestry) to review recent analyses of integrated tick management data from a USDA-funded study (May 20); joined a progress call with staff from the Centers for Disease Control and Prevention's Division of Vector-Borne Diseases to discuss ongoing integrated tick management and seasonal spray initiatives (May 21); co-hosted the introductory call for the Wildlife Society Leadership Institute Class of 2025, covering program expectations, training opportunities, and the annual meeting schedule (May 23); delivered an invited lecture on tick taxonomy and identification at the Northeast Regional Center of Excellence in Vector-Borne Diseases and the Training and Evaluation Center Vector Biology Bootcamp at Cornell University (May 28–30; 30 attendees).

CHRIS MAIER, PH.D. displayed insect and other invertebrate fossils from significant collecting localities in the United States at a meeting of the New Haven Mineral Club in North Branford (May 12, 30 attendees).

GOUDARZ MOLAEI, PH.D. was interviewed on the status of ticks and tick-borne pathogens in Connecticut by WTNH Channel 8 and NBC Connecticut (May 1), Channel 3 and Fox 61 (May 5), Hearst Connecticut Media Group (May 6), Connecticut News Junkies (May 14), Eyewitness News 3, NBC Connecticut, Hartford Courant, and News 12 Networks – Connecticut (May 27), WTNH Channel 8 and NBC Connecticut (May 28), and WFSB | Eyewitness News 3 (May 29); met and discussed the progress on the joint project, "Tick-Borne Pathogen Metagenomics" with Dr. Paul Wolujewicz of Quinnipiac University (May 2); conducted tick survey in Bridgeport, Connecticut based on the invitation by the town authorities (May 8); met with Dr. Cecilia Sorensen, MD,
Director, Global Consortium on Climate and Health Education, Columbia University, and Associate Professor, Department of Environmental Health Sciences, Mailman School of Public Health and Department of Emergency Medicine, Columbia University Irving Medical Center, to discuss collaborations on research and training on climate change and public health including vector-borne diseases (May 12); attended the monthly meeting of the longhorned tick, *Haemaphysalis longicornis*, discussed the current status of this invasive tick species in the US, and provided Connecticut updates (May 12); attended a meeting with Dr. Min Huang of Connecticut Department of Energy and Environmental Protection and University of Connecticut, **PHILIP ARMSTRONG, PH.D., Douglas Brackney, Ph.D.,** and **Jonathan Karisa, Ph.D.** of the CAES to discuss the potential of a collaborative project on eastern equine encephalitis virus and the role of avian species as reservoir hosts (May 16); conducted a tick survey on Charles Island in Milford, CT (May 20); and met and discussed with BMMCA/WEED/ Pesticide Management Program and Wildlife Division, Connecticut Department of Energy & Environmental Protection as well as **Nubia Zuverza Mena, Ph.D.** Nubia Zuverza Mena and **Raja Muthuramalingam, Ph.D.** of the CAES to discuss evaluation of a novel formulation of nano-pesticide against the invasive longhorned ticks in Connecticut (May 23).

CLAIRE RUTLEDGE, PH.D. volunteered as scorekeeper at the Connecticut Tree Protective Association's Connecticut Tree Climbing Competition in Woodbury, CT (May 3, 50 climbers and volunteers); participated in the monthly, national MRP-APHIS Spotted Lanternfly science call (May 8, 35 participants); presented talk 'Invasive insects in Connecticut' to the Evergreen Country Gardeners, Glastonbury CT (May 14; 25 attendees), served as an external examiner for a PH.D. student in the University of Connecticut's Department of Plant Sciences and Landscape Architecture.

JOHN SHEPARD spoke the Mosquito Trapping and Arbovirus Surveillance Program about to 2 groups of FFA Students (May 1), a group visiting the Dept. of Analytical Chemistry (May 1), and a group from Albertus Magnus College (May 16); attended the Milford Heath Department's "Mosquito Kick-Off" event and spoke about the Mosquito Trapping and Arbovirus Surveillance Program and to reporters from Fox61 and NBC CT; participated (by Zoom) in a Board of Directors meeting of the Northeastern Mosquito Control Association (May 14); was interviewed about the Asian Tiger Mosquito (*Aedes albopictus*) in CT by reporter Melissa

Cooney from NBC CT (May 20) and reporter Lilli Iannella from CT Insider (May 21); presented "Taxonomic Identification of Female Mosquitoes" and co-organized a Mosquito Identification Workshop for attendees on the Vector Biology Boot Camp, sponsored by the NEVBD -TEC program held at Cornell University (May 30).

PAULA WOLF met with beekeepers and distributed information about honey bee registration at the following honey bee package pickup days – A & Z Apiaries (May 2nd), Mike's Beehives (May 3rd), Cedar Lane Apiaries (in conjunction with the Rhode Island Inspector, Tyler Herzwig) (May 4th), Mike's Beehives (May10th), gave an invited presentation about honey bees to attendees of the Simsbury Sustainability Fair (May 3rd; 18 attendees), gave a talk titled "The Buzz About Honey Bees: Pollination, Honey, and Protecting Our Pollinators" to the Mountain Valley Garden Club (May 4th; 25 attendees), taught three sessions about honey bees and pollination to all of the kindergarten classes at the International School at Dundee (May 7th, 60 students),
participated in Connecticut Beekeepers Association's Bee Talks, a virtual Q&A session for beekeepers (May 8th; 43 attendees), taught four sessions about honey bees and their life cycle to the 1st and 2nd grade classes at the International School at Dundee (May 7th, 120 students), was interviewed on the status of honey bees in Connecticut by Live Connecticut for National Pollinator Week (May 19th).

TRACY ZARRILLO met with Dr. Sarah Lawson of Quinnipiac University, **Kelsey Fisher, Ph.D.**, and **Caleb Bryan, Ph.D.** to discuss grant opportunities (May 1, 15, 22); met with Joshua Sullivan of Christ the Good Shepard Lutheran Church to discuss a plan to install a pollinator meadow and vegetable garden (May 14); was interviewed by Jordan Fenster from the Hearst Connecticut Media group about native bees in Connecticut (May 28); met with **Kelsey Fisher, Ph.D.** to discuss grant opportunities (May 29).

PUBLICATIONS:

1. Desiato, J., Chan, G., Palmeri, M., **Cantoni, J. L., Cozens, D. W., Linske, M. A., Brackney, D. E., Stafford, K. C.**, & Banach, D. B. (2025). Using geospatial analysis to describe the association between active tick surveillance data and clinical cases of anaplasmosis in Connecticut. *Journal of Medical Entomology*. DOI: 10.1093/jme/tjaf055

Abstract: Anaplasmosis is a vector-borne disease caused by the bacterium *Anaplasma phagocytophilum* and is vectored by *Ixodes scapularis* ticks primarily in the northeastern United States. The Connecticut Department of Public Health designated anaplasmosis a state-wide reportable disease in 2008 and a large increase in cases was witnessed in Connecticut between 2014 and 2019. This study used clinical cases of anaplasmosis reported to the Connecticut Department of Public Health and *A. phagocytophilum* prevalence data in questing *I. scapularis* to understand emerging geographic disease hotspots and evaluate potential association between human and *I. scapularis* infections. Human incidence rates were calculated per 100,000 people by county. *I. scapularis* infection prevalence was calculated as an acarological risk index using active tick surveillance data from the Connecticut Agricultural Experiment Station. The potential association between incidence rates and acarological risk index was analyzed using Spearman Rank correlation. From 2019 to 2020, 420 human cases of anaplasmosis were reported and 148 *A. phagocytophilum*-infected *I. scapularis* were identified in Connecticut and a significant positive correlation was identified between acarological risk index and incidence rates. Active tick surveillance is a helpful tool for identifying geographic areas with increased risk of anaplasmosis and can be useful in guiding public health interventions to prevent cases before they occur while also identifying potential locations where underreporting may occur.

2. Molaei, G., Mohapatra, A. R., **Khalil, N.**, **Cozens, D.**, and Bonilla, D. (2025). *Ehrlichia chaffeensis* DNA in *Haemaphysalis longicornis* Ticks, Connecticut, USA. *Emerging Infectious Diseases* Jun;31(6):1260–1262. doi: 10.3201/eid3106.250034

Abstract: Informed by passive tick surveillance, we collected questing *Haemaphysalis longicornis* ticks from southwestern Connecticut, USA. Of 445 ticks tested by PCR, 3 nymphs were positive: 1 for *Ehrlichia chaffeensis* and 2 for *Borrelia burgdorferi*. This finding highlights the enduring public health challenges of invasive ticks and associated pathogens.

DEPARTMENTAL NEWS:

Collaborative Tick Management Work in Scotland

Megan Linske, Ph.D. and **SCOTT WILLIAMS, PH.D.** were recently invited to South Uist, Scotland, to share expertise and collaborate on integrated tick management strategies for the region. Their visit included participation in a multi-stakeholder meeting at the University of Glasgow with Dr. Lucy Gilbert (University of Glasgow), Dr. Caroline Millins and Mr. Aaron Sambrook (University of Liverpool), and Mrs. Isabell MacGinnes (NHS Western Isles). The group discussed the latest research in tick ecology, focusing on *Ixodes ricinus* and the concerning rise in *Borrelia* infection rates and Lyme disease cases across the Western Isles.

While in South Uist, Megan and Scott supported the initiation of Mr. Sambrook's PhD project, which examines tick infestation rates in fenced versus unfenced residential yards. Fieldwork was conducted to help establish baseline data for the study.

They also met with Stòras Uibhist Estate Manager John Gillies to explore the potential for future applications of systemic treatments aimed at reducing tick populations on key host species.

Community engagement was a critical component of the visit. Megan and Scott participated in a public drop-in session, followed by a community meeting at Stoneybridge Hall, where they delivered a presentation titled *"Novel Application of Systemic Acaricides to Control Ticks on Key Host Species."* The event drew 20 attendees and provided an opportunity to answer local questions and share insights on managing tick-borne disease risks.

This collaborative effort represents a meaningful step toward integrated, community-informed tick control strategies in South Uist and reflects the growing importance of international cooperation in managing vector-borne disease.

Dr. Scott Williams presenting on deer-targeted systemic approaches for tick control to South Uist community members at Stoneybridge Hall.

Dr. Megan Linske presenting on rodent-targeted systemic approaches for tick control to South Uist community members at Stoneybridge Hall.

From left to right: Mr. Aaron Sambrook, Dr. Caroline Millins, and Dr. Megan Linske sampling for ticks in a fenced yard in South Uist.

From left to right: Mrs. Isabell MacInnes (NHS Western Isles), Dr. Caroline Millins (University of Liverpool), Mr. Aaron Sambrook (University of Liverpool), Dr. Megan Linske (CAES Department of Entomology), and Dr. Scott Williams (CAES Department of Environmental Science and Forestry) in South Uist.

ENVIRONMENTAL SCIENCE & FORESTRY

SCOTT C. WILLIAMS, PH.D. met with Dr. Lucy Gilbert, Senior Research Fellow of Ecology and Environmental Change about her work with ticks and host ecology in the United Kingdom (Glasgow, Scotland) (May 1); spent the day in the field on the island of South Uist, Scotland with Dr. Caroline Millins, Senior Lecturer in One Health, University of Liverpool and her Ph.D. student Aaron Sambrook investigating the impact of red deer exclusion on *Ixodes ricinus* (castor bean tick/sheep tick) abundances in peridomestic habitats (May 6); gave invited lecture on systemic acaricidal treatment of tick hosts in a public forum on the island of South Uist, Scotland with Dr. Caroline Millins, Ph.D. student Aaron Sambrook, and Isabell MacInnes, Health Protection and Screening Nurse Specialist (25 attendees) (May 7); participated in a meeting with BanfieldBio, Inc. on a collaborative NIH SBIR grant investigating tick repellent formulations to be integrated into fabrics (May 13); had a discussion over Zoom with members of the BanfieldBio team on coordinating field distribution of granular tick repellent (May 15); met with Dr. Vanessa Ezenwa and Ph.D. student Isaac Osew from Yale University's Department of Ecology and Evolutionary Biology on a collaborative project modeling effectiveness of integrated tick management strategies in peridomestic habitats (May 20); participated in a meeting with staff from the CDC Division of Vector-Borne Diseases on progress made on a funded integrated tick management project (May 21); met with Dr. Andrew Li from USDA-Agricultural Research Service on progress on an integrated tick management manuscript (May 22).

NATALIE BAILEY participated in a Zoom call with BanfieldBio to discuss the development of a botanical acaricide (May 6, 20); participated in a collaborative Zoom call with members of Banfield Biologic NIH SBIR-funded tick repellent fabric team (May 13).

JOSEPH P. BARSKY served as a judge for the 2025 Agriscience Fair held at CAES (May 1); participated in the Society of American Foresters House of Society Delegates Meeting (May 2); participated in the Society of American Foresters Mid-Year Leadership Brief (May 27); organized the Safe Driving Workshop at CAES (May 30).

JESSICA E. BROWN, PH.D. was certified as an Associate Wildlife Biologist with The Wildlife Society (May 8); participated in a collaborative meeting with colleagues from Yale University and the USDA Agricultural Research Service to discuss data analysis for an integrated tick management study (May 21); participated in the first meeting of the Leadership Institute class of 2025 with The Wildlife Society to discuss the curriculum for the 6-month course (May 23).

GREGORY J. BUGBEE judged Future Farmers of America Science Fair in the Jones Auditorium and gave a tour of the CAES soil testing laboratory to contestants (25 attendees) (May 1); gave an invited talk entitled "Aquatic Plant Management Options for Lochwood Lake" at the Henry Carter Hull Public Library in Clinton (30 attendees) (May 12); interviewed by Ed Mahoney of the Hartford Courant on "Hydrilla in the CT River" (May 15); interviewed by Kevin Gaiss of NBC CT TV on "Hydrilla in the CT River" (May 16); spoke on soil testing and invasive aquatic plants as part of a CAES tour by students from Albertus Magnus College (25 attendees) (May 16); via teleconference provided guidance at United States Army Corps of Engineers CT River hydrilla demonstration project and Massachusetts hydrilla expansion workgroup meetings (May 7, 19, 21).

RILEY S. DOHERTY led tours of the Station for high schoolers participating in the Future Farmers of America science fair (40 students) (May 1); participated in the Twin Lakes Pre-Season Scientific Review Meeting in Salisbury (May 7); participated in the Connecticut Federation of Lakes (CFL) board meeting (May 7); presented at the CFL annual meeting (50 attendees) (May 17); attended Senator Blumenthal's press conference on US Army Corps of En-

gineers funding for northern hydrilla research (May 23); attended the spring Northeast Arc User Group conference at Eastern Connecticut State University (May 28).

JEREMIAH R. FOLEY, IV, PH.D. participated in the Twin Lakes Pre-Season Scientific Review Meeting in Salisbury (May 7); gave an invited presentation titled "Potential for Biological Control of CT River Hydrilla" to the Connecticut Federation of Lakes (45 attendees) (May 17); participated in a teleconference with Patricia Young, Program Director of the Eightmile River Watershed, to explore funding opportunities to support research aimed at understanding how to protect two threatened and endangered wetland plant species from hydrilla encroachment and herbicide treatments (May 19); attended Senator Blumenthal's press conference on U.S. Army Corps of Engineers funding for Connecticut River hydrilla (May 23).

SUSANNA KERIÖ, D.SC. Attended a call with The American Chestnut Foundation (TACF) staff and members of the TACF CT Chapter to discuss collaboration on chestnut research in Connecticut (May 8); gave a talk titled "Right Tree for Right Place" to Brookfield Garden Club (20 attendees) (May 15); attended the Connecticut Urban Forest Council's meeting as Executive Board Member (May 20); phenotyped 1,500 white oak and chestnut oak seedlings in collaboration with United States Forest Service scientists for a research project on assisted migration established through the Urban Silvicultural Network (May 9, May 16, and May 23).

SARA L. NASON, PH.D. met virtually with Bryan Berger and Michael Timko (University of Virginia), Fred Corey (Mi'kmaq Nation), Chelli Stanley (Upland Grassroots, and Katie Richards (Maine PFAS Labs), and others to discuss EPA funded collaborative work on PFAS (May 2) and the cancellation of our EPA grant (May 14, 21, 28); as Chair, led virtual meetings for the Best Practices for Non-Targeted Analysis working group (May 5, 6, 15, 20); was interviewed by Brian Scott Smith about a new CAES program providing free analysis of PFAS in farm soils (May 7) and about the cancelation of an EPA grant funding PFAS research (May 22); met with Alex Aksenov (UConn) and **Raees Ahmad** to discuss collaborative work using molecular networking techniques (May 14); met with Jon Sobus, Heather Whitehead, Nate Charest (US EPA) and **Raees Ahmad** to discuss collaboration on a quantitative non-targeted analysis project (May 20); met with Rob Heimer (Yale) to discuss a newly funded project on drugs of abuse (May 28); met with Thivanka Ariyarathna to discuss collaborative work on PFAS in marine food webs and an upcoming NSF proposal (May 30).

BLAIRE STEVEN, PH.D. participated as a committee member of the joint meeting of the Connecticut Valley and Northeast Branch of the American Society of Microbiology (ASM) joint branch meeting hosted at Worcester State University (Worcester, MA) (April 25); participated in a Zoom call with the Dartmouth NIH INBRE program to discuss a joint venture between INBRE and the CT Valley Branch of the ASM (May 15).

JEFFREY S. WARD, PH.D. (Emeritus) met with Billy Gridley (Head Steward) and Bill Tilles in Norfolk to discuss management options on the Aton Forest Preserve (May 13); participated in a Great Mountain Forest Trustees meeting in Norfolk (May 31).

MADELINE WATTS attended an in-person preseason review meeting for East Twin Lake (May 7); participated in a virtual meeting with collaborators at the University of Florida Center for Aquatic Invasive Plants (UF CAIP) to review results of a co-study (May 15); attended a virtual meeting with the US Army Corps of Engineers and the DEEP Natural Diversity Database to discuss rare plant populations in Hamburg Cove (May 19); participated in the Army Corps' virtual CT River Hydrilla Demonstration Project stakeholder meeting (May 21); attended Senator Blumenthal's press conference about Army Corps funding for CT River Hydrilla management (May 23); joined a follow up virtual meeting with collaborators at the UF CAIP to plan a future follow-up study (May 27).

SUMMER WEIDMAN participated in the Twin Lakes Pre-Season Scientific Review Meet-

ing in Salisbury (May 7); tabled at the Seeqanamâhsak (Spring Fish) Event hosted by the Alliance for the Mystic River Watershed in Ledyard (May 10); participated in the virtual Plant Science Day planning committee meeting (May 12); provided a tour stop for Albertus Magnus students (May 16); tabled at Connecticut Envirothon (May 22); attended Senator Blumenthal's press conference on US Army Corps of Engineering funding for CT River hydrilla (May 23); with **Madison Manke**, attended the Spring Northeast Arc Users Group conference at Eastern Connecticut State University (May 26).

LEIGH J. WHITTINGHILL, PH.D. awarded the Experiment Station Associates Early Career Scientist Award (April 22); judged the CT Agriculture Science and Technology Education Agriscience fair hosted in Jones Auditorium (May 1); ran a workshop "Creating Accessible Presentations" presented by the CAES Postdoctoral Associate and DEI Committee (21 attendees) (May 2); seasonal **Sofia Shubin** presented a poster titled "The effect of increasing fertilizer applications on the yield of collards using cut-and-come-again harvesting" on work done in the Whittinghill lab at the Southern Connecticut State University Biology Research Symposium (May 2); attended a meeting of the CT Council on Soil and Water Conservation Soil Health Committee to discuss work on the Developed and Recreational lands chapter of the Soil Health Plan (May 12).

YINGXUE (CHARLIE) YU, PH.D. chaired the session "Occurrence, Fate, and Remediation of Natural and Engineered Particles and PFAS in Aquatic and Terrestrial Systems" in the Hydrology Division at the European Geosciences Union Annual Conference in Vienna, Austria (100 attendees) (May 1); attended the webinar "Critical Zone Science in the United States through NSF's Critical Zone Collaborative Network and DOE's Watershed Function Science Area" from the Hydrology Session of American Geophysics Union (May 13).

PUBLICATIONS:

1. Huang, C. H., Lewis, R., **Thomas, S.**, Tang, Z., **Jones**, **J.**, **Nason**, **S., Zuverza-Mena, N.**, Piskulich, Z. A., O'Keefe, T. L., Tuga, B., Paredes-Beaulieu, A., Vasiliou, V., Cui, Q., Dalluge, J. J., **White, J. C.**, Haynes, C. L. (2025). Designing ultraporous mesostructured silica nanoparticles for the remediation of per- and polyfluoroalkyl substances. *ACS Nano*. 19, 21, 19777–19789. DOI: 10.1021/acsnano.5c02008

2. The Editor's Choice award of the Canadian Journal of Forest Research was given to the recent article "Excluding deer browse increases stump sprouting success and height growth following regeneration harvests" authored by **Drs. Jeffrey Ward** and **Elisabeth Ward**, and **Joseph Barsky**. A link to the announcement and paper can be found at https://cdnsciencepub.com/do/10.1139/news.2025.05.22.01/full/.

NEW SEASONAL STAFF:

JULIA CELIO is a Master's Student in the Biomedical Sciences program at Quinnipiac University. In February-May 2025, she worked as an intern in **Susanna Keriö, Ds.C.'s** lab focusing on mycorrhizal colonization in urban maple roots. In May, Julia started as a seasonal assistant to work on a project that investigates the impact of mycorrhizal inoculation on tree health and transplant shock in landscape trees. Julia is interested in human pathology and she is eager to develop her skills in histology, microscopy, and molecular biology. Julia has her roots in Italy and she enjoys traveling.

CARLIN ESWARAKUMAR is a UConn graduate with a BS in Ecology and Evolutionary Biology with a minor in Animal Science. At UConn, she worked as a field technician assisting in bird banding for Dr. Chris Elphick's Lab. She has been working at the station as a seasonal research assistant since Feb 2024, first working on urban tree health with **Susanna Keriö, Ds.C.** and then joining the tick team and sticking around since, assisting **DRS. SCOTT WILLIAMS** and **Megan Linske**. Carlin plans on going to graduate school to continue research in ecology and wildlife conservation, but until then will go birding, herping, or taking her (shoulder-hugging) bearded dragon and labrador on hikes!

KAVYA SREE GUNNALA is working under **Itamar Shabtai, Ph.D.** on the project examining how soil moisture influences root exudate composition and biogeochemical cycling in the rhizosphere. She recently completed her masters in environmental science at the University of New Haven. Her interests include environmental chemistry, sustainable agriculture, and pollution control.

JACK HATAJIK recently graduated from The Forest School at the Yale School of the Environment, where he received a Master of Forest Science degree. At Yale, Jack collaborated with **Elisabeth Ward, Ph.D., Claire Rutledge, Ph.D.,** and researchers from The Forest School on a long-term project evaluating the impacts of emerald ash borer infestation on forest groundstory composition and soil nutrient cycling across Connecticut. Prior to his graduate studies, Jack received a Bachelor of Science in Ecology and Evolution as well as Film and Media Studies from the University of Pittsburgh in Pittsburgh, PA where he calls home. In his free time, Jack loves to watch movies, discover new music, and explore the woods. He is working with **Joseph P. Barsky** and **Elisabeth Ward** this summer to study the effects of slash walls on tree regeneration and Beech Leaf Disease on tree growth and mortality.

ABE HAXHI is welcomed as a seasonal assistant. Abe lives in Hamden and is majoring in Biology/Anthropology at Grinnell College in Grinnell, Iowa. He expects to graduate next May. Abe will be performing soil fertility tests and assisting with aquatic plant surveys. He brings considerable skills to the Office of Aquatic Invasive Species including being an avid fisherman, an Emergency Medical Technician, and an expert in small motor repair.

THOMAS LARKIN-WELLS graduated from the University of Connecticut in December 2022 with a Bachelor's in Biology and minors in Ecology & Evolutionary Biology and Anthropology. He was drawn to The Connecticut Agricultural Experiment Station by his passion for the environment and desire to learn more about the ecosystems around him. He enjoys spending his free time gardening, cooking, and reading fantasy novels.

MADISON MANKE is working with the Office of Aquatic Invasive Species as a Seasonal Research Assistant. She graduated from the University of New Haven in May of 2024 with a Bachelor's in Marine Biology and a minor in Environmental Science. She has always felt passionate about saving and helping the environment, which led her to The Connecticut Agricultural Experiment Station. She has a special interest in learning more about geographical information systems and species identification. In her free time, she enjoys spending time outside by going on hikes and to the beach as well as spending time with family and friends.

ELIZABETH MARBLE is a rising senior in biotechnology at Southern Connecticut State University. She is working with **Itamar Shabtai, Ph.D.** on a 13C labeled litter incubation project to analyze how plant-derived carbon contributes to carbon storage. She loves to bike on the Canal Trail, eat cookies, and listen to audiobooks!

Senator Blumenthal's press conference on US Army Corps of Engineers (USACE) funding for CT River Hydrilla. (Left to Right) Justin Davis, Acting Deputy Director of the CT DEEP; U.S. Senator Richard Blumenthal; **JEREMIAH FOLEY IV, PH.D.**; **SUMMER WEIDMAN**; **MADELINE WATTS**; **RILEY DOHERTY**; Rhea Drozdenko, River Steward for the Connecticut River Conservancy; **JASON WHITE, PH.D.**

PLANT PATHOLOGY AND ECOLOGY

LINDSAY TRIPLETT, PH.D. presented an invited seminar to the UCONN department of Plant Science and Landscape Architecture, titled "Hunting for healthy plants: Roles of predatory protists in the phytobiome" (May 2, 24 adults) presented welcoming remarks and a CAES 150th commemorative coin to the New Haven Garden Club (May 5, 48 adults), met with members of the rhizosphere predators working group (May 9, 12 adults), presented welcoming remarks and a commemorative coin to a meeting of the Governing Board of the Federated Garden Clubs of Connecticut (May 15, 27 adults); hosted virtual visitor from the University of Geneva, Switzerland: Dr. Lucas Moraes Ceseti, who spoke to PPE staff and students on molecular interactions between plant pathogenic bacteria and protists (May 16, 11 adults), hosted an informational lunch for mentors in the 2025 Plant Health Fellows program (May 19, 14 adults), and was interviewed by Mary Fortune from Livability Media on the CAES 150th anniversary (May 23).

WASHINGTON DA SILVA, PH.D. presented at the Yale Plant Molecular Biology Seminar Series titled "all Things Considered: Leveraging RNAi and Nanotechnology for Plant Pathogen Control (April 28, 19 Adults), presented an invited seminar to the Department of Plant Pathology at Universidade Federal de Viçosa (UFV), titled "all Things Considered: Leveraging RNAi and Nanotechnology for Plant Pathogen Control (May 5, 55 Adults).

YONGHAO LI, PH.D. participated in the National Plant Diagnostic Network Online Communication & Web Portal Committee meeting via Zoom (May 14, 7 adults); presented "Principle of Organic Gardening" Oxford Garden Club in Oxford (May 27, 12 adults).

ROBERT MARRA, PH.D. attended a book launch and reading of "Talk To The Trees," by Professor Marguerite Holloway, of Columbia University, at Book Culture bookstore, New York City [a chapter on beech leaf disease features Marra's research] (60 adults)(May 13); presented a talk titled "Beech leaf disease – Background, Biology, and Insights from Japan," for the Vermont Forest Health Information Meeting, via MS Teams (50 adults) (May 21); participated in the monthly meeting of Divisional Forum Representatives of the American Phytopathological Society, via Zoom (8 adults)(May 27).

NEIL SCHULTES, PH.D. described his research to undergraduate Biology students from Albertus Magnus College who are interested in internship opportunities (May 16,12 adults).
Felicia Millett hosted the PDIO lab stop for the Future Farmers of America Agriscience tour (May 1, 30 students); hosted the PDIO lab stop for visitors from Analytical Chemistry (May 1, 10 adults); presented 'Growing Annuals from Seed' Webinar for Mothers Out Front (May 2, 30 adults); presented 'Growing Mountain Laurels in Connecticut' for the Branford Garden Club (May 6, 15 adults); participated in the NEPDN monthly meeting (May 8, 18 adults); presented 'Pruning Woody Plants in the Landscape' for the North Haven Garden Club (May 8, 22 adults); presented "Growing Mountain Laurels in Connecticut" to the Perennial Planters Garden Club in Manchester (May 19, 26 adults); hosted the NPDN Proficiency Committee monthly meeting (May 20, 4 adults); presented "Introduction to Invasive Plants" to the Daytime Gardeners Club of North Haven (May 27, 18 adults, 3 children); and presented "Growing Mountain Laurels in Connecticut" to the Essex Library (May 29, 10 adults).

QUAN ZENG, PH.D. hosted a virtual meeting with eight organic apple growers from the Northeast for pest management trials along with staff members from San Group and afe Inc (May 9th), presented a talk about apples and apple breeding and disease resistance to 3rd graders at Orange Public School (May 15, 70 children and 4 adults), presented "Inside the Orchard: A Virtual Journey Into the Life of an Apple" to members of Mothers Out Front (May 20, 30 adults).

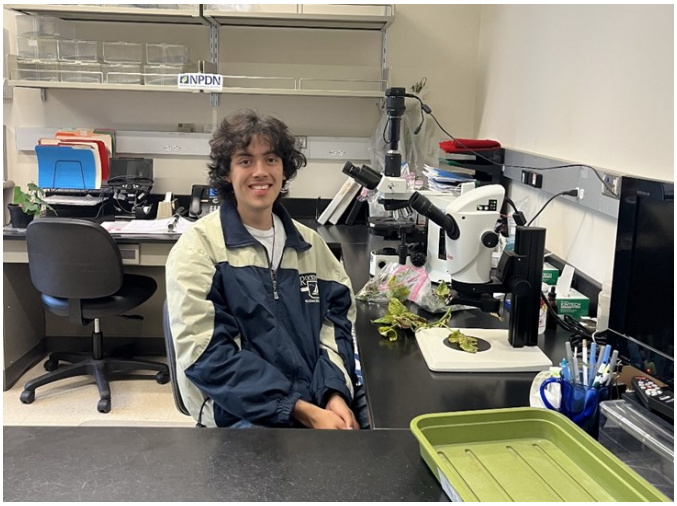
GRANTS AWARDED:

Drs. Ravikumar Patel, Lindsay Triplett, and **Blaire Steven** have received a grant from the Joint Genome Institute (JGI) to investigate the role of plant signaling molecules in plant–protist–bacteria interactions. The award provides several sequencing services from JGI (roughly $30,000 in value). This project extends from a past Magnarelli award and investigates how phytohormones, especially auxin (IAA), mediate interactions among plants, protists, and rhizosphere bacteria. Using model plant Arabidopsis, grown in EcoFAB devices, we will assess the metabolic and transcriptomic responses of plants, IAA-producing bacteria, and the IAA-responsive protist *Colpoda* sp.

Quan Zeng, Ph.D. received additional funding ($519,618) for the phase II of a previously funded proposal "Improving Fruit Safety of Blossom Protect for Organic Fire Blight Management in the East" through USDA-NIFA-ORG.

NEW STUDENTS, STAFF, AND VOLUNTEERS:

Sebastian Bernal is a rising junior at the University of Connecticut who has previously worked with CAES at Lockwood Farms and at UConn in Dr. Sydney Everhart's Lab. He joined the Plant Disease Information Office on May 16th, 2025, as a Seasonal Research Assistant and is seeking a better understanding of possible career paths in plant pathology as well as real world experience in the field of diagnostics.



PUBLICATIONS:

1. Cui, Y. J., Wang, C. G., Dai, Y. C., Liu, S., Ren, Y. H., **Schultes, N. P.**, Kaishian, P. O., **Paine, E.**, Yuan, Y., **Li, D. W.** and Zhao, H., (2025). Phylogeny, divergence times, and biogeography of the phytopathogenic fungal genus Phaeolus (Basidiomycota, Polyporales). *Journal of Systematics and Evolution*, p.250509.

Abstract: The genus *Phaeolus* holds significant economic and ecological value as an important pathogen of conifer trees. Although species diversity within this genus has been described in recent years, there were limited studies of its origin, evolution, and biogeography. In this study, we collected new specimens from China and USA, and reconstructed the phylogeny, divergence times, and biogeography of *Phaeolus* based on ITS and nLSU sequences. Phylogenetic analyses identified two new species, *Phaeolus himalayanus* and *Phaeolus occidentiamericanus*, one new combination, *Phaeolus hispidoides*, one synonym, *Phaeolus fragilis* (treated as *P. schweinitzii*), and one new record from China, *Phaeolus sharmae*. *Phaeolus himalayanus* is characterized by pileate, imbricate basidiomata, round to irregular pores of 2-3 per mm, abundant gloeoplerous hyphae, mango-shaped to ellipsoid basidiospores (5.5-7 × 4-4.5 µm), and distribution in Xizang of China. *Phaeolus occidentiamericanus* is characterized by pileate, imbricate basidiomata, round to irregular pores 2-3 of per mm, mango-shaped to ellipsoid basidiospores (6.5-7.8 × 4-5 µm), and distribution in the western USA. Molecular clock analyses indicated that the genus *Phaeolus* likely originated in the Late Cretaceous, with species divergence occurring between 9-71 Mya. Ancestral state reconstruction suggested that the genus originated in the Himalaya-Hengduan Mountains region and subsequently dispersed to Europe and North America. The earliest host trees of *Phaeolus* were probably *Abies* and *Pinus*, with all known species capable of growing on *Pinus*, demonstrating a strong host trees

preference. Additionally, a key of the genus *Phaeolus* is added. This study provides a crucial foundation in pathogen control and ecological conservation of this genus in the future.

2. Corso, G., **Triplett, L. R.** and Gage, D. (2025). *Neuromorpha vorax*: a previously unculturable cosmopolitan protist with an unexpectedly complex life cycle belonging to Glissomonadida Clade-U/Group-TE. *MBio* 0:e00848-25. DOI: 10.1128/mbio.00848-25

Abstract: Soil protists are increasingly recognized as common members of complex communities that associate with plant root systems, though their contributions to these communities and to the plant host remain obscure. Members of Clade-U/Group-TE are cosmopolitan soil protists and often among the most abundant protists associated with plant roots. Here, we describe the isolation, culturing, and characterization of *Neuromorpha vorax*, a member of the previously uncultured Clade-U/Group-TE branch of the order Glissomonadida. *N. vorax* grew readily when provided bacteriophage lysate as a food source. This allowed us to grow large numbers of the organisms from single-cell isolates and provided ideal conditions for following transitions from one morphology to another. *N. vorax*, like most glissomonads, has a small, flagellated gliding form, but it also displays a wide range of other morphologies, including a crawling form, small and large trophozoites with multiple long filopodia, small and large resting cysts, and clusters of large dividing cells, and cannibalistic feeding behaviors. Given the small size of most glissomonads, it may be that other members of this important group, known from environmental surveys but currently uncultured, might also be readily grown on bacteriophage lysates. In addition, given an abundant food source and clear viewing by microscopy, glissomonads and other small protists may be found to have life cycles and behaviors that are more complex than is currently appreciated.
Importance: Protists from the Clade-U/Group-TE cluster of glissomonads are widespread and abundant colonizers of plant roots. Despite being known for over 30 years, they have remained uncultured. We show that these protists can be easily cultured using an unusual food source, viral lysates of bacteria. This culturing method allows growth of high numbers of these organisms and reveals that they have an unexpectedly complex lifecycle that includes community feeding and cannibalism. Some other currently unculturable protists can perhaps be grown with these methods, and many of these may also show unexpectedly complex lifecycles. The growth of eukaryotes on virus lysates raises the possibility that viruses in soil may directly contribute to the growth (and not just death) of eukaryotes in soil and root-associated communities.

DEPARTMENTAL NEWS:

Raquel Rocha, Ph.D., and her husband, Martonio Ponte, are filled with joy as they welcome their beautiful baby boy, Matthew Felipe Rocha-Ponte, born on May 1st, 2025. Mom, Dad, and little Matthew are settling in at home and are all doing well.

JATINDER S AULAKH, PH.D. published a manuscript entitled "Glyphosate resistance and EPSPS gene amplification confirmed in a waterhemp (Amaranthus tuberculatus) biotype from Connecticut" (May 10, 2025).

CAROLE CHEAH, PH.D. was interviewed by Dee Saloman on hemlock woolly adelgid biological control for the Lakeville Journal, April 10; guided hemlock woolly adelgid hemlock property assessments with members of the Traprock Ridge Land Conservancy May 7 (1); Roaring Brook Nature Center, Canton May 8 (2); Cornwall Land Conservancy May 13 (2); Simsbury town parks and open space May 14 (2); implemented Partnership Wild and Scenic River releases of the HWA biocontrol agent *Sasajiscymnus tsugae* at Tunxis State Forest May 19; American Legion State Forest May 20; Stratton Brook State Park, Simsbury May 22; together with volunteers, released at Tanager Hill Preserve, Simsbury Land Trust May 20 (1); Ethel Walker Woods and Town Forest Park, Town of Simsbury May 21 (3); Werner Woods, Nepaug State Forest and the Roaring Brook Nature Center May 23 (1); released at Hartland Pond, a private lake association May 12 (1); released with members of Avalonia Land Conservancy at the Hoffman Evergreen Preserve, North Stonington May 16 (3); gave an overview of hemlock woolly adelgid biocontrol program in Connecticut to staff from Manchester Community College for their visit to the Valley Laboratory, May 28 (8)

RICHARD COWLES, PH.D. presented "Deer repellents," to the Dun Land Woods Garden Club, Bloomfield, May 7 (12 participants). He discussed "Exotic invasive insect pests" for the UMass virtual seminar series on urban arboriculture, May 8 (249 participants).

PUBLICATIONS:

1. Qin, Hao-Long; Yi Ren, Huang, J.-H., Ren, J.-L. Yang, J., He, J., **Li, D.-W.** and Huang. L. (2025). *Phlebia formosana* strain SMF410-5-1 and *Auricularia cornea* strain ME1-1 display potential in wood degradation and forest waste reutilization. *Forests* 16, 795. https://doi.org/10.3390/f16050795

Abstract: Wood waste, primarily composed of lignin, cellulose, and hemicellulose, which is typically disposed of through burning and crushing, poses environmental challenges. However, conventional wood waste disposal methods present critical limitations, such as environmental pollution and resource waste. To develop sustainable processing strategies to dispose wood waste, we identified two fungal isolates, SMF410-5-1 and ME1-1, from decayed wood trunks, demonstrating high lignocellulose-degrading enzyme activities, including laccase (Lac, 125.7 U/mL), manganese peroxidase (MnP, 89.3 U/mL), and lignin peroxidase (LiP, 67.9 U/mL). Isolates of ME1-1 and SMF410-5-1 both exhibited superior poplar lignin degradation, while SMF410-5-1 excelled in coniferous wood weight losses, which reached 19.7% for pine after 180 days post inoculation. Moreover, biochemical analyses revealed that isolates of ME1-1 and SMF410-5-1 accelerated the degradation by producing various lignocellulose-degrading enzymes to hydrolyze wood waste. In addition, through multi-locus phylogenetic analysis using sequences of the internal transcribed spacer (*ITS*), large subunit ribosomal RNA (*LSU*), and RNA polymerase II second largest subunit (*RPB2*), SMF410-5-1 and ME1-1 were identified as *Phlebia formosana* and *Auricularia cornea*, respectively. This study provides novel insights into fungal-driven biodegradation, offering eco-friendly solutions for forest waste recycling and supporting circular bioeconomy strategies.

2. Bai, Yu-Qing, Hui Li, Yu Wan, **De-Wei Li**, Li-Hua Zhu (2025) *Colletotrichum gloeosporioides*, a novel causal agent of *Magnolia* × *soulangeana* leaf blotch. *Crop Protection* 195, 107262 https://doi.org/10.1016/j.cropro.2025.107262

Abstract: *Magnolia* × *soulangeana* Soul.-Bod. is a small arbor with ecological, economic and ornamental value. In October 2022, a serious outbreak of a foliar disease was recorded in Nanjing Forestry University, Jiangsu Province, with an incidence rate of 73 %. The diseased leaves showed curved, desiccated, and brown necrotic lesions. Five representative fungal isolates (YL 1-1, YL 1–2, YL 1–4, YL 1–5, and YL 1–6) were isolated from leaves exhibiting symptoms. The isolates were confirmed as *Colletotrichum gloeosporioides* through morphological and multi-locus phylogenetic approaches. Pathogenicity was confirmed through conidia suspension inoculation and fulfillment of Koch's postulates. This represents the first documentation of *C. gloeosporioides* as the pathogen responsible for leaf blotch on *M.* × *soulangeana* in China and worldwide.

3. Aulakh, J.; Kumar, V., Nathaniel, W., Price, A.J., Jhala, A.J. (2025). Glyphosate resistance and EPSPS gene amplification confirmed in a waterhemp (Amaranthus tuberculatus) biotype from Connecticut. Agrosystems, Geosciences, and Environment. Available online at: https://doi.org/10.1002/agg2.70120

Abstract: Waterhemp (Amaranthus tuberculatus) is an economically important broadleaf weed that threatens corn and soybean production across the United States. A waterhemp biotype (CT_Res [resistant biotype from Connecticut]) surviving multiple glyphosate applications was identified from a corn field in Connecticut (CT). Greenhouse and laboratory studies were conducted to (1) confirm glyphosate resistance in CT_Res waterhemp biotype and (2) investigate if the glyphosate resistance in CT_Res biotype is due to target-site-based mechanism. Dose-response studies indicated that CT_Res biotype was 5.8-fold more resistant to glyphosate compared to a known susceptible biotype (NE_Sus) from Nebraska. No point mutation was detected at Pro102 or Thr106 positions in the EPSPS gene of the CT_Res biotype. The quantitative polymerase chain reaction assays revealed that one of the three CT_Res waterhemp plants had 3.5-fold higher EPSPS gene copy number (relative to the housekeeping CPS gene), whereas the other two plants did not reveal EPSPS gene amplification. Obviously, the EPSPS gene amplification partially explains glyphosate resistance in newly identified glyphosate-resistant waterhemp biotype from CT, indicating that alternative mechanisms might exist. This research reports the first case of glyphosate resistance and EPSPS gene amplification in waterhemp from Connecticut and highlights the need for adoption of diversified weed control strategies to prevent its further spread.

JOURNAL ARTICLES APPROVED MAY 2025

Ahmed, T.; Noman, M.; Qi, Y.; Gardea-Torresdey, J. L.; **White, J. C.**; Qi, X. Sunlight-activated T6P precursor: a potent biostimulant for smart agriculture. *Trends in Plant Science*.

Bransfield, A. B., Jahanfar, S., Pearman, S. Association Between Adverse Childhood Experiences and Chronic Arthritis and Related Musculoskeletal Diseases in U.S. Adults. *American Journal of Public Health*.

Bugbee, G. J., **Stebbins, S. E.,** and **Manke, M.** Lake Housatonic Aquatic Plant Survey Report 2024. *Station Bulletin*.

Chen, L.; Chang, N.; Liu, H.; Li, T.; Qiu, T.; Huang, F.; **White, J. C.**; Fang, L. Differential impacts of conventional and biodegradable microplastics on cadmium toxicity and transfer in a soil-earthworm-lettuce system. *Soil Biology and Biochemistry*.

Cheng, C.; Zhang, Q.; Jia, C.; Agathokleous, E.; Wang, Q.; Lu, Y.; He, Y.; **White, J. C.**; He, J.; Zhu, X.; Zhou, D. Transient electrothermal decomposition of soil microplastics. *Nature*.

Cowles, R. S., Faubert, H, **Marra, R. E.** Updated beech leaf disease biology and management. *CAES Fact Sheet*.

Doherty, R. S., Stebbins, S. E., Bugbee, G. J. Pachaug Pond, Aquatic Plant Survey Report 2024. *Station Bulletin*.

Feng, J.; Sun, Y.; Rui, Y.; Zhang, P.; **White, J. C.**; Zhang, Y. Light-driven nitrogen fixation catalyzed by nanomaterials: link between PNF and BNF. *Environmental Research*.

Kong, M.; Jing, H.; Yang, J.; Liu, X.; Shen, Y.; **White, J. C.** Size-dependent protection by magnetite nanoparticles against Fusarium graminearum in rice (Oryza sativa): ROS-mediated antifungal activity and enhanced host immunity. *Environmental Science Nano*.

Liang, M.; Lv, Q.-X.; Zhu, L.-B.; Zhu, C.-Y.; Huang, H.; Han, J. G.; Lu, H.-Y.; Li, H.; Shen, Y.; Huang, X.-Y.; **White, J. C.**; Zhoa, F. J.; Wang, P. Nano-biochar decreases the availability and accumulation of cadmium in rice grain through an enhanced voltaic cell effect. *Journal of Hazardous Materials*.

Mashlawi, A. M., Balcazar, D., Abuelmaali, S. A., Albeshr, M. F,, Sallam, M. F., Al-Mekhlafi, H. M., Walton, C. and **Gloria-Soria, A.** Introgression and adaptation in Aedes aegypti mosquitoes from Saudi Arabia. *Molecular Ecology*.

Saarman, N., Graybeal, K., Seeley, T., Calhoun, E., Jenkinsa, E., De Lima Moraes, A., Faiman, R., Markle, H., Pellegrini, R., Arent, S., **Gloria-Soria, A.** Northward expansion in distribution of Culex quinquefasciatus and Culex pipiens hybrids across mid-latitudes of North America. *One Health*.

Stebbins, S. E., Watts, M., Bugbee, G. J. Amos Lake, Preston, CT Aquatic Plant Survey Re-

port 2024. *Station Bulletin*.

Sun, X.; Yang, R.; Ji, J.; **White, J. C.**; Shen, Y. Spatial distribution and environmental factors controlling microplastic pollution along a river-sea continuum in the South Yellow Sea, China. *Journal of Hazardous Materials*.

Tarvin-Imeokparia, J.; Abejoye, A.; Vega, I.; Mendoza, M. A. A.; Moses, C.; Durno, M.; **Cahill, M. S.**; **Dimkpa, C.**; **White, J. C.**; Durocher, S.; Pettit, F.; Meyering, M.; Jacobs, J. M.; Ponce, M. S. B.; Heiden, N. Application of the Shinohara Method to grow lettuce, swiss chard, and peppers in a simplified deep flow technique hydroponic system. *MethodsX*.

Tian, M.; Cai, Z.; Jia, W.; Zhao, Z.; Li, Q.; Xu, X.; Liang, A.; Wang, S.; **White, J. C.**; Ma, C.; Xing, B. Nanoscale phosphorus-based agrochemicals enhance tomato and rice growth via positively modulating gene expression and the endophytic microbial community. *Environmental Science: Nano*.

Xu, S.; Ding, Z.; Xu, Q.; **White, J. C.**; **Li, Y.** Selenium nanoparticles enable tomato recovery wilt disease and enhance nutritional content through endophyte and metabolome modulation. *ACS Nano*.

Zahid, T., **Yu, Y.**, Flury, M., Chowdhury, I. Fate and Transport of Secondary Polypropylene Nanoscale Plastics: Aggregation, Deposition and Remobilization. *Water Research*.

Zhang, K., Castañeda-Ruiz, R. F., Guardiola, Y. G., Scott, J. A., **Schultes, N.**, **Paine, E.**, **Li, D.-W.** Phylogeny and morphology of Inifatiella nectandrae and Scolecobasidiella tropicalis. *New Zealand Journal of Botany*.

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