Station News

The Connecticut Agricultural Experiment Station
Volume 10 Issue 11 November 2020

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

GRANTS RECEIVED OCTOBER 2020

"Biodegradable polymer nanocomposites for controlled release and targeted delivery of phosphorus during plant growth." **Jason C. White**, H. Fairbrother, and **Wade H. Elmer**. Awarded from USDA NIFA AFRI in January 2021 for 3 years; $480,000.

By 2050, the global population will exceed 9 billion, making maintaining global food security one of the most significant challenges we face as a species. Food production will need to increase at least 70% but importantly, year-over-year-yield increases for many crops have declined over the last four decades. Additionally, the lack of sustainability that characterizes current agriculture will confound maintaining global food security. For example, the low efficiency of nutrient delivery and utilization (10-20%) is a significant constraint, representing a drain on energy and water resources, and causing environmental damage as growers "over-apply" to adequately feed crops. Given the magnitude of this problem and acknowledging the significant work on "targeted delivery" in nanomedicine, there has been great interest in nano-enabled approaches to increase both the efficiency and targeting of nutrient delivery in agriculture.

Phosphorus use will exceed 26,000 Gg/year by 2050, although delivery efficiency is typically only 10–15%. In addition to being an unsustainable waste of resources, the excessive use of P is a threat to aquatic environments and human health. We have acquired preliminary data demonstrating the ability of biodegradable polymers amended with calcium phosphate nanoparticles to function as a tunable platform for controlled and targeted P delivery in soil. ***A biodegradable polymer-nanoparticle composite has been shown to promote plant growth as effectively as traditional fertilizers while reducing P runoff by 10-fold***. Building on this significant finding, we will develop a suite of biopolymer-nanoscale P composites able to deliver nutritionally required amounts of P to different crops in a spatially and temporally precise fashion. Moreover, this P delivery will be achieved with significantly reduced input amounts and with dramatic reductions in environmentally damaging P runoff/leachate. The long-term goal of this project is to develop a safe and sustainable biopolymer-based nanofertilizer platform for macronutrient delivery in both field and urban agriculture scenarios. Our three objectives are:

Obj. 1- Identify biodegradation rates and P leaching/retention characteristics of different biodegradable nanocomposites in different soils.

Obj. 2- Determine the viability of biopolymer-nanoscale P composites to enhance crop growth while minimizing P runoff in greenhouse-based plant studies.

Obj. 3- Validate biopolymer-nanoscale P composite performance for a range of different crops at field scale.

We will develop a suite of biodegradable polymer nanocomposites that release P at tunable rates in response to polymer biodegradation. Once material properties have been optimized, greenhouse and field trials will be conducted with crops of varying nutritional demands (lettuce, tomato, soybean, corn, wheat) to demonstrate tunable efficacy across species and soil conditions, as well as across multiple planting cycles. Although NP use in agriculture is increasing, delivery strategies that are precise and accurate both spatially and temporally remain elusive. Novel and tunable P delivery approaches such as those developed in this work have great potential to significantly improve nutrient utilization and facilitate efforts to maintain global food security. To support this work, we will establish a Center of Excellence that will deploy a unique combination of educational and dissemination strategies to engage a range of stakeholders in this project.

Gregory Bugbee, co-PI with Jens Beets and Rob Richardson from North Carolina State University, "Evaluation of effect of biotype on biology and response to herbicides of aquatic macrophyte species." Dr. Michael D. Netherland Aquatic Plant Management Graduate Student Research Grant, Aquatic Plant Management Society, to support a student at NCSU for two years who plans to visit CAES.

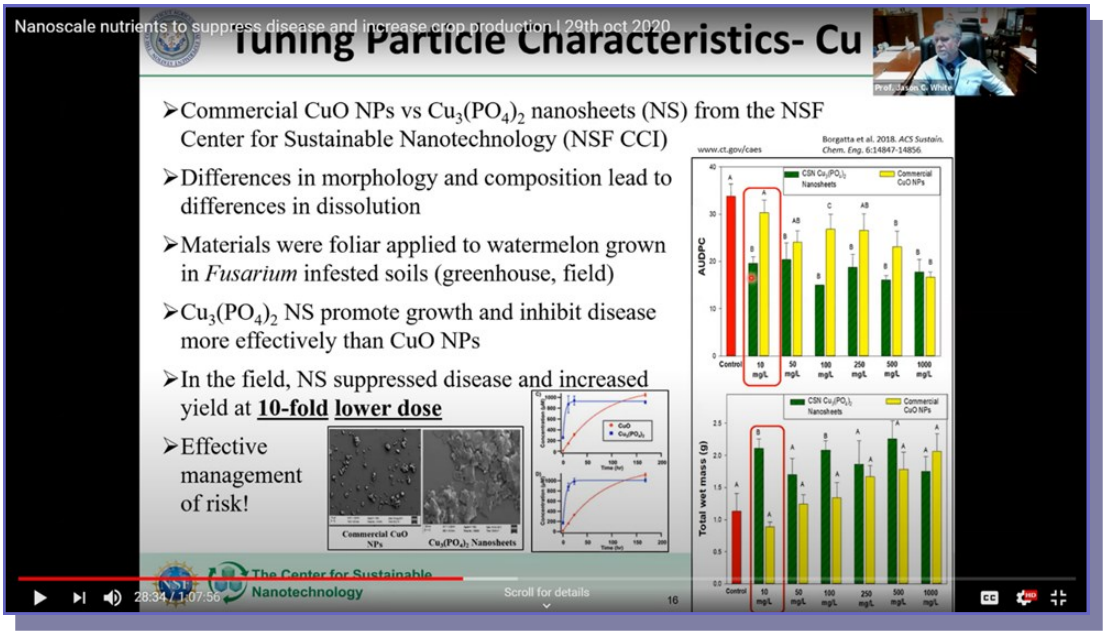
Summary. The funding will be used to study phenotype and herbicide efficacy differences in the genetically distinct strain of hydrilla in the Connecticut River using mesocosms at NC State as well as in situ. Particular emphasis will be on reducing impacts to native eel grass beds. The objectives are the following: 1) Examine phenological and biological differences between the two historically described monoecious and dioecious biotypes of hydrilla, and the newly characterized hydrilla from the Connecticut River. Observed differences in the Connecticut River biotype may provide insight into potential for spread and management options. 2) Evaluate hydrilla biotypes for post-treatment fragment viability. A more in depth understanding of the potential for hydrilla fragments to survive

and spread post-treatment would improve management as fragmentation is a common mode of reproduction for this species. 3) Identify *Vallisneria* populations with high biomass productivity and evaluate differences in response to aquatic herbicide applications on populations of *Vallisneria americana*. Populations from NC, NY, OH, SC, FL, and AL have been collected and will be tested. Populations will be evaluated to identify competitive candidate strains for use as native plantings with a high probability of establishment success.

ADMINISTRATION

DR. JASON C. WHITE participated in a teleconference call with **DR. KIRBY STAFFORD** and **DR. VICTORIA SMITH**, as well as officials at the CT DEEP, CT DoAg, and USDA APHIS regarding surveillance for the spotted lanternfly (October 2, 15, 22); had a ZOOM call with Ms. Meghan Cahill of the University of Minnesota regarding collaborative research projects and job opportunities (October 2); participated in the Department of Public Health Laboratory Preparedness monthly conference call (October 5); spoke by phone with collaborators at Harvard, LSU, and UTEP regarding a joint research Engineering Research Center Proposal on combatting global food insecurity to NSF (October 5); had a conference call with collaborators at LSU regarding collaborative research on nanoscale delivery of pesticides (October 7); participated in the weekly calls for the NSF Center for Sustainable Nanotechnology (October 7, 21, 28); participated in the CSN all faculty ZOOM call (October 8); gave a ZOOM lecture entitled "Nanoscale Amendments to Enhance Crop Growth: Unintended Consequences in the Rhizosphere and Plant Microbiome" for the Sustainable Innovation of Microbiome Applications in the Food System (SIMBA) on-line training course in Rome, Italy (45 attendees) (October 9); held a ZOOM call with **DR. WADE ELMER** and collaborators at Johns Hopkins University about a joint manuscript we are preparing (October 9, 27); participated in a Teams call with collaborators at Johns Hopkins University, the OCP Group, and the Université Polytechnique Mohammed VI (Morocco) regarding collaborative research projects (October 12); participated in a ZOOM meeting with **DR. WADE ELMER** and **DR. JATINDER AULAKH**, along with students and faculty from Greenwich High School, to discuss collaborative research projects on the nanoscale delivery of herbicides (October 13); hosted the CAES Board of Control meeting at the Valley Laboratory and met with Senator Cathy Osten to discuss the Valley Laboratory research program and renovation project (October 14); participated in an FDA LFFM webinar on FERN and secure information/data sharing (October 15); along with Analytical Chemistry staff, participated in a ZOOM call with A2LA staff regarding our upcoming ISO 17025 Accreditation 2-year assessment (October 16); along with **DR. DOUG BRACKNEY**, participated in a ZOOM call with Rep. Pat Dillon concerning CAES work on COVID-19 detection in sewage and with the SalivaDirect assay (October 19); participated in the monthly Northeast Regional Experiment Station Director's call (October 20); participated in the annual meeting of the Nanyang Technological University-Harvard University T. H. Chan School of Public Health Initiative for Sustainable Nanotechnology conference and by ZOOM gave a presentation entitled "Enhancing Cu Delivery and Seedling Development with Biodegradable, Tunable, Biopolymer-Based Nanofiber Seed Coatings" (25 attendees) (October 21); gave a lecture by ZOOM entitled "Environmental Health Science Research at the Connecticut Agricultural Experiment Station (CAES)" to the Yale University School of Public Health Department of Environmental Health Sciences Seminar Series (20 attendees) (October 21); participated in an FDA LFFM webinar on best practices for data acceptance (October 22); gave a lecture by ZOOM entitled "Sustainable Nanotechnology to Combat Global Food Insecurity" to a Sustainable Nanotechnology graduate class at the University of Maryland Baltimore County (10 attendees) (October 26); participated in an FDA LFFM training session on the FDA ORA sample receipt and data analysis portal (October 27); gave a lecture entitled "Nanoscale Nutrients to Suppress Disease and Increase Crop Yield" by ZOOM to Amity University in Noida, India (120 attendees) (October 29); hosted the monthly CAES J-1

Visa meeting (October 30); and participated in a Yale School of Public Health symposium on 1,4-dioxane (October 30).



Jason C. White, PhD giving a lecture by ZOOM to faculty and students at Amity University in Noida, India.

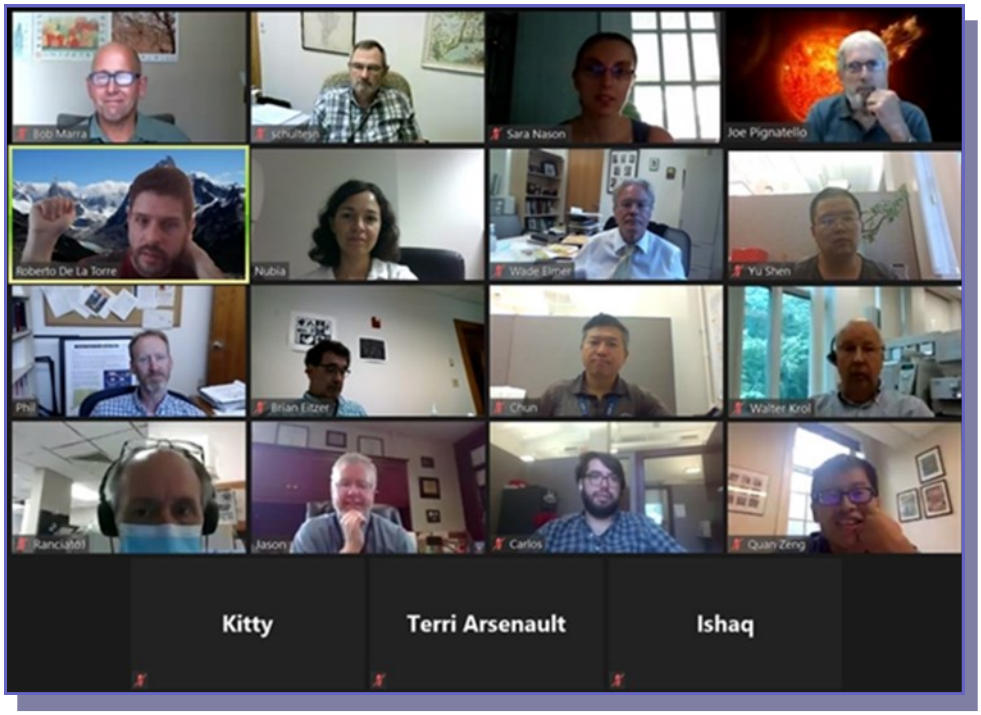
ANALYTICAL CHEMISTRY

DR. BRIAN EITZER attended the FDA webinars on data acceptance (October 22), sample receipt training (October 27), and the FERN website (October 29), all of which are related to our grant under the new Laboratory Flexible Funding Model.

DR. CHRISTINA ROBB attended the FDA presentation "Best Practices for Data Acceptance" (October 22); was introduced to the *Journal of Liquid Chromatography* Editorial Staff of which she is a member of the Editorial Board and an Associate Editor for review (October 6); moderated/attended the following Eastern Analytical Symposium (EAS) short courses in the capacity of Short Course Committee Chair: "Characterization of Biologics by HPLC, CE and Mass Spectrometry" (October 12-13), "An Introduction to High Resolution Mass Spectrometry for Qualitative and Quantitative Analysis" (October 22-23), and "Intact and Top-Down Protein Analysis by Mass Spectrometry" (October 29-30); and participated in a range of committee meetings for the EAS including program (October 22) and long-range planning (October 6, 19).

MS. KITTY PRAPAYOTIN-RIVEROS assisted with the production of the CAES Seminar "PFAS Management in Connecticut and Beyond" (October 14), assisted with the production of the CAES Seminar "Pollinator Pathways and The Green Corridor: Improving Biodiversity on Protected Land in Our Own Yards!" (October 21), assisted with the production of the CAES Seminar "Discovery of a New Diaporthe Pathogen Affecting Hops in Connecticut" (October 28); and participated in the Sample Analysis Data Exchange - IT Implementation Phase Meeting on WebEx to discuss the NFSDX (National Food Safety Data Exchange) phase II Sample Data Elements Mapping File (October 6, 20).

Dr. Roberto De La Torre-Roche left the Station during the month. He is exploring new horizons as a Chemist at the Forensic Chemistry Center (FCC) from the Food and Drug Administration (FDA) in Ohio. During his stay at CAES as a postdoctoral and research scientist, he not only published in journals of a high impact factor, but was a mentor for undergraduates and guide for postdoctoral fellows and visiting scientists. We thank him for his contributions to the Station and wish him the best continuing a successful career. Below is a screenshot of Roberto's farewell held on ZOOM.



ENTOMOLOGY

DR. KIRBY C. STAFFORD III presented a webinar for NE-IPM on the role of leaf litter and climate factors on the expansion, survival, and vegetative management of blacklegged and lone star ticks (35 participants) (October 7); with **DR. GOUDARZ MOLAEI**, participated in the GC3 Public Health and Safety Working Group public session (October 7); was interviewed about spotted lanternfly by Christopher Arnott, Hartford Courant (October 16); and participated via ZOOM in the fall 2020 annual advisory board meeting for the Midwest Center of Excellence Vector-Borne Diseases (October 23).

DR. MEGAN LINSKE assisted in vegetation surveys with **DR. SCOTT WILLIAMS**, Mr. Michael Gregonis (DEEP Wildlife Division), and Mr. Andy Hubbard (MDC Forester) at MDC's Barkhamsted Reservoir property (October 1); participated in the Northeast Section of the Wildlife Society Executive Committee Fall Meeting as President-Elect and Chair of the Workshop Committee (October 7); participated in the Northeast Regional Center for Excellence in Vector-Borne Diseases training seminar as a trainee (October 19); and participated in a planning call with Bedoukian, Inc., to discuss potential tick repellent preliminary trials (October 28).

DR. GALE E. RIDGE was interviewed about spotted lanternfly by Harlan Levy for an article for the Journal Inquirer (October 19); and was interviewed about a career in science in the podcast "Science Yourself" by Gustavo Requena Santos, which was translated into Spanish and Portuguese (October 22).

DR. CLAIRE E. RUTLEDGE gave an on-line lecture on insects that attack trees to the Con-

necticut Tree Warden's School (35 adult attendees) (October 1).

DR. VICTORIA L. SMITH participated via Zoom in a meeting of the Yale Biosafety Committee (22 participants) (October 15); was interviewed about spotted lanternfly by Chris Arnott of the Hartford Courant (October 16); was interviewed about spotted lanternfly by Brendan Crowley of the CT Examiner (October 26); and participated via Teams in a meeting of the US Forest Service Northeastern Area Forest Cooperators, with a presentation on CT forest health conditions (35 participants) (October 27-29).

DR. KIMBERLY A. STONER presented a guest lecture on pollination to a Yale undergraduate class, "The Ecology of Food," taught by Dr. Linda Puth (16 participants) (October 7); gave a talk about pollinator habitat and bees at the opening of a new butterfly garden at the corner of Eastern and Hemingway Streets in New Haven (26 participants, 9 under 18 years of age) (October 18); and hosted Mary Ellen Lemay as a speaker in the CAES Seminar Series, presenting, "Pollinator Pathways and The Green Corridor: Improving Biodiversity on Protected Land in Our Own Yards" (October 21).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO participated in a virtual conference with collaborators from the University of Maryland and GeoSyntec on a SERDP grant project (October 9); co-presented a virtual talk entitled "Dynamic Interactions Between Sorption and Biodegradation: Implications for Long-Term Performance of Activated Carbon-Based Technology for In Situ Groundwater Remediation of Chlorinated Solvents" before the Technical Review Board of SERDP (October 14); met virtually with collaborators from the University of California, Davis, on a USDA grant project (October 23); met virtually with collaborators from Villanova University, Pacific Northwest National Laboratory, and Oregon Health and Science University on a SERDP grant project (October 26); and gave a virtual seminar entitled "Interactions of Organic Compounds with Natural and Human-Made Pyrogenic Carbonaceous Materials—Sorption, Reaction, Catalysis" in the Department of Civil and Environmental Engineering, University of Nevada, Reno.

DR. PHILIP ARMSTRONG gave a talk entitled "Update on EEE Virus: An Emerging Mosquito-Borne Virus of Public Health Concern" at the Pennsylvania Mosquito Control Association Virtual Conference (October 8).

DR. DOUG BRACKNEY was interviewed about the increase in SARS-CoV-2 levels in New Haven sewage sludge by NBC Connecticut (October 28).

MR. GREGORY BUGBEE spoke on "Invasive Aquatic Plants Threaten Cedar Lake" at a virtual Town of Chester public meeting (22 participants) (October 1); gave a talk entitled "Hydrilla Invades the Connecticut River" at a virtual Connecticut Invasive Plant Group Symposium (approx. 100 participants) (October 7); and spoke on "Hydrilla in the Connecticut River" at a virtual meeting of the Connecticut River Coastal Conservation District (approx. 12 participants) (October 19).

DR. GOUDARZ MOLAEI was interviewed about tick activity in 2020 and the recent discoveries of the invasive ticks in Connecticut by the Republican-American (October 7).

DR. SARA NASON participated in calls for the Benchmarking and Publications for Non-Targeted Analysis Working Group (October 1, 6, 22); virtually coached students at the Sound School on science fair projects (October 1, 23, 27); and presented a poster entitled "Measuring PFAS and Assessing Phytoremediation at the Former Loring Air Force Base – A Community Based Project" at the virtual Conference, PFAS in Our World (October 13-14).

MR. JOHN SHEPARD provided an update about the Connecticut Mosquito Trapping and Arbovirus Surveillance Program to virtual meetings of the Northeast Arbovirus Surveillance Situational Awareness (20 attendees each) (October 1, 15); and attended a virtual Board Meeting of the Northeastern Mosquito Control Association (12 attendees) (October 23).

DR. CHARLES VOSSBRINCK gave the virtual lecture entitled "Three evolutionary and ecological considerations for the Microsporidia" at a retreat for the laboratory of a former collaborator, Prof. Jonas Brandun, Department of Molecular Medicine, University of Umea, Sweden (15 attendees) (October 14).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD spoke with Nick Biemiller (Forest Conservation Director) and Brent Rudolph (Director of Conservation Policy) of Ruffed Grouse Society & American Woodcock Society about forest management and carbon (October 5); was interviewed about the effect of this year's drought on tree growth and forest health by Brendan Crowley of the Connecticut Examiner (October 6); participated in a conference call with state and private foresters to discuss forest management and carbon storage/ sequestration (October 8); provided requested comments on Connecticut forest management policy to DEEP Deputy Commissioner Mason Trumble, State Senator Kevin Witkos, State Representative John Hampton, Simsbury town officials, DEEP staff, and others at Stratton Brook State Park (14 attendees) (October 16); participated in a New England Forest Foundation, Exemplary Forestry – North Central and Transition Hardwoods Advisory Committee Meeting (October 16); presented "Deer, Invasives, Residual Density and Forest Regeneration" for the U.S. Fish & Wildlife Service, Forest Ecology and Management Webinar Series (170 attendees) (October 20); participated in a Connecticut Invasive Plant Council meeting (October 20); participated in an NESAF 2021 planning committee meeting (October 22); attended a virtual CT NRCS 12-TOL Tech Team Meeting to discuss research priorities (October 22); organized and spoke at a Carbon and Multiple-Use Forest Management in Southern New England workshop (81 attendees with another 18 on ZOOM) (October 27); and spoke on "Oak Resiliency - Why and How" at the Increasing Resiliency in Southern New England's Oak Forests on LS2-7 Concurrent Panel Discussion at the virtual 2020 Society of American Foresters National Convention (24 attendees) (October 31).

DR. ABIGAIL A. MAYNARD spoke on "New Crops for Connecticut" to the Wethersfield Garden Club (21 adult attendees) (October 5).

DR. SUSANNA KERIÖ attended the New England Society of American Foresters annual meeting (October 27); met with Jane Seymour from CT DEEP to inspect diseased butternut trees, and to visit a chestnut restoration site in the Belding Wildlife Management Area in Vernon (October 28); and attended the Society of American Foresters virtual National Convention (October 29-31).

DR. SCOTT C. WILLIAMS participated, as Immediate Past-President, in the Northeast Section of the Wildlife Society Executive Committee Fall Meeting (October 7); participated in a conference call for the Editorial Advisory Board for The Wildlife Society's publication, The Wildlife Professional (October 8); and participated in a planning call with Bedoukian, Inc., to discuss potential tick repellent preliminary trials (October 28).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER attended USDA NIFA plan of work briefings via ZOOM (October 7, 28); met with Mr. John Trudeau, a high school student at Greenwich High School (GHS); Mr. Andrew Bramante, a GHS instructor; **DR. JATINDER AULAKH**, and **DR. JASON WHITE** to discuss a research project (October 13); attended a meeting of the CAES Board of Control at the Valley Laboratory (October 14); met with the UConn Plant Science Dept. Head Search committee via ZOOM (October 16, 27); attended a 5-hour CHRO/CWCSEO Foundation Training course via ZOOM (October 21); attended a ZOOM call with the APS Foundation Board subcommittee (October 28); attended a ZOOM call with APS Press Editors (October 28); and presented a talk entitled "Nanotechnology and Plant Pathology" to Dr Zeev Rosenzweig's class on Sustainable Nanotechnology of University of Maryland Baltimore County (9 attendees) (October 30).

DR. YONGHAO LI presented "Tree Diseases" for the Connecticut Tree Warden School via ZOOM (38 adults) (October 1); and participated in the National Plant Diagnostic Network Online Communication and Web portal Committee Meeting via ZOOM (9 adults) (October 14).

DR. ROBERT E. MARRA participated in a Beech Leaf Disease Working Group ZOOM meeting with collaborators from Ohio, West Virginia, Ontario (CA), New York, USDA-ARS, and the US Forest Service (35 participants) (October 21).

DR. NEIL SCHULTES attended an executive meeting for the Quinnipiac Chapter of Sigma Xi via ZOOM (October 2); attended the annual New England, New York and Canadian Fruit Pest Management Workshop via ZOOM (October 19); attended the 63rd CAES Institutional Animal Care and Use Committee meeting via ZOOM (75 participants) (October 22); and presented two lectures in a three-lecture series on "Genetically Modified Plants in Agriculture" in a Yale Course Scie 031 "Current Topics in Science" (13 students) (October 23, 30).

DR. LINDSAY TRIPLETT led and chaired the annual meeting of the APHIS Widely Prevalent Bacterial Diseases committee to discussed initiatives to update the list of widely prevalent bacterial diseases for each state (13 participants) (October 15); and organized and moderated a virtual workshop entitled "Know Your Roots: Introduction to Root Phenotyping for Plant Pathologists" as part of the extended activities of Plant Health 2020, the Annual Meeting of the American Phytopathological Society, which featured Dr. Larry York of the Noble Research Institute who demonstrated how to properly acquire and analyze scanned root images using the free program Rhizovision Explorer. The workshop recording will soon be available to meeting registrants at the site: https://www.apsnet.org/meetings/mtngwshops/phworkshops/Pages/Know-Your-Roots-Workshops.aspx (39 participants) (October 20).

DR. QUAN ZENG served on a grant review panel for a competitive research program of a U.S. federal agency (October 13-16); and participated in the 82nd New England, New York & Canadian Fruit Pest Management Workshop and presented "Pathogen Entry Points and Colonization of *Erwinia amylovora* on Apple Leaves" (72 participants) (October 19).

VALLEY LABORATORY

DR. CAROLE CHEAH was interviewed about the importance of weather data and diversity of hemlock sites at Great Mountain Forest to her hemlock research by Mary Neill for an article for the Great Mountain Forest October Newsletter (September 21); and was interviewed about managing threats of hemlock woolly adelgid to a unique relic eastern hemlock stand by Josh Levesque for an article on the conservation of Alabama hemlocks (October 14).

MS. ROSE HISKES co-chaired virtual Connecticut Invasive Plant Working Group symposium planning committee ZOOM meetings (October 6); and presented "Managing Autumn Olive: A Homeowner's Perspective" and moderated the Aquatic Invasives Breakout Session at the virtual CIPWG Invasive Plant Symposium (380 attendees) (October 7).

DR. JAMES LAMONDIA participated in an SCRI Grant project outreach planning ZOOM meeting (October 2); participated in a Saunders Bros. Nursery Virtual Boxwood Field Day (October 8); and spoke about nematode management research results at the virtu-

DEPARTMENTAL RESEARCH UPDATES OCTOBER 2020

Alexander, C. R., **Regan B. Huntley**, **Neil P. Schultes**, and G. S. Mourad. 2020. Functional characterization of the adenine transporter EaAdeP from the fire blight pathogen *Erwinia amylovora* and its effect on disease establishment in apples and pears. *FEMS Microbiol* https://doi.org/10.1093/femsle/fnaa173

Abstract – *Erwinia amylovora* is the causal agent of fire blight, an economically important disease of apples and pears. As part of the infection process, *E. amylovora* propagates on different plant tissues each with distinct nutrient environments. Here, the biochemical properties of the *E. amylovora* adenine permease (EaAdeP) are investigated. Heterologous expression of *EaAdeP* in nucleobase transporter-deficient *E. coli* strains, coupled with radiolabel uptake studies reveal that EaAdeP is a high affinity adenine transporter with a K_m of 0.43 ± 0.09 mM. Both *E. coli* and *E. amylovora* carrying extra copies of *EaAdeP* are sensitive to growth on the toxic analog 8-azaadenine. *EaAdeP* is expressed during immature pear fruit infection. Immature pear and apple fruit virulence assays reveal that an *E. amylovora ΔadeP::Cam*^{r} mutant is still able to cause disease symptoms however with growth at a lower level, indicating that adenine is utilized in disease establishment.

Castroagudin, V. L., J. Weiland, F. Baysal-Gurel, M. Cubeta, M. Daughtrey, N. Gauthier, **James LaMondia**, D. Luster, F. Peduto-Hand, N. Shishkoff, J. Williams-Woodward, X. Yang, N. LeBlanc, and J. Crouch. 2020. One clonal lineage of *Calonectria pseudonaviculata* is primarily responsible for the boxwood blight epidemic in the United States. *Phytopathology* 110(11):1845-1853.

Abstract - Boxwood blight caused by *Calonectria pseudonaviculata* and *C. henricotiae* is destroying cultivated and native boxwood worldwide, with profound negative economic impacts on the horticulture industry. First documented in the United States in 2011, the disease has now occurred in 30 states. Previous research showed that global *C. pseudonaviculata* populations prior to 2014 had a clonal structure, and only the MAT1-2 idiomorph was observed. In this study, we examined *C. pseudonaviculata* genetic diversity and population structure in the United States after 2014, following the expansion of the disease across the country over the past 5 years. Two hundred eighteen isolates from 21 states were genotyped by sequencing 11 simple sequence repeat (SSR) loci and by MAT1 idiomorph typing. All isolates presented *C. pseudonaviculata*-specific alleles, indicating that *C. henricotiae* is still absent in the U.S. states sampled. The presence of only the MAT1-2 idiomorph and gametic linkage disequilibrium suggests the prevalence of asexual reproduction. The contemporary *C. pseudonaviculata* population is characterized by a clonal structure and composed of 13 multilocus genotypes (SSR-MLGs) unevenly distributed across the United States. These SSR-MLGs grouped into two clonal lineages (CLs). The predominant lineage CL2 (93% of isolates) is the primary contributor to U.S. disease expansion. The contemporary U.S. *C. pseudonaviculata* population is not geographically subdivided and not genetically differentiated from the U.S. population prior to 2014, but is significantly differentiated from the main European population, which is largely composed of CL1. Our findings provide insights into the boxwood blight epidemic that are critical for disease management and breeding of resistant boxwood cultivars.

Camp, A. A., W. C. Williams, **Brian D. Eitzer**, R. W. Koethe, and D. M. Lehmann. 2020. Effects of the neonicotinoid acetamiprid in syrup on *Bombus impatiens* (Hymenoptera: Apidae) microcolony development. *PLOS ONE* 15(10):e0241111.

Abstract - Worldwide, many pollinator populations are in decline. Population reductions have been documented for the agriculturally important honey bee (A*pis mellifera*), and other bee species such as bumble bees that are also critical for pollinating crops and natural landscapes. A variety of factors contribute to the observed population reductions, including exposure to agrochemicals. In recent decades, neonicotinoid pesticide use has dramatically increased, as have concerns regarding the safety of these chemicals for pollinator health. Here we assessed the toxicity of the neonicotinoid acetamiprid to the bumble bee *Bombus impatiens*, a species commercially available for use in agricultural settings in North America. Using the microcolony model, we examined nest growth, development and subsequent nest productivity as measured by drone production. We found that high concentrations of acetamiprid in syrup (11,300 µg/L) significantly impacted nest growth and development, and ultimately drone production, and exposure to 1,130 µg/L acetamiprid also significantly decreased drone production. The no observable adverse effect level was 113 µg/L. Overall, acetamiprid delivered in syrup can negatively impact *B. impatiens* nest development and productivity, however only at concentrations above which would be expected in the environment when used according to label rates.

Cui, Zhouqi, **Regan B. Huntley**, **Quan Zeng**, and **Blaire Steven.** 2020. Temporal and spatial dynamics in the apple flower microbiome in the presence of the phytopathogen *Erwinia amylovora*. *ISME Journal*; https://doi.org/10.1038/s41396-020-00784-y.

Abstract - Plant microbiomes have important roles in plant health and productivity. However, despite flowers being directly linked to reproductive outcomes, little is known about the microbiomes of flowers and their potential interaction with pathogen infection. Here, we investigated the temporal spatial dynamics of the apple stigma microbiome when challenged with a phytopathogen *Erwinia amylovora*, the causal agent of fire blight disease. We profiled the microbiome from the stigmas of individual flowers, greatly increasing the resolution at which we can characterize shifts in the composition of the microbiome. Individual flowers harbored unique microbiomes at the operational taxonomic unit level. However, taxonomic analysis of community succession showed a population gradually dominated by bacteria within the families Enterobacteriaceae and Pseudomonadaceae. Flowers inoculated with *E. amylovora* established large populations of the phytopathogen, with pathogen-specific gene counts of >3.0 × 107 in 90% of the flowers. Yet, only 42% of inoculated flowers later developed fire blight symptoms. This reveals that pathogen abundance on the stigma is not sufficient to predict disease outcome. Our data demonstrate that apple flowers represent an excellent model in which to characterize how plant microbiomes establish, develop, and correlate with biological processes such as disease progression in an experimentally tractable plant organ.

De La Torre-Roche, Roberto, J. Cantu, **Carlos Tamez**, **Nubia Zuverza-Mena**, H. Hamdi, **Wade H. Elmer**, J. Gardea-Torresdey, and **Jason C. White**. 2020. Seed biofortification by engineered nanomaterials: A pathway to alleviate malnutrition? *J. Agric. Food Chem.* 10.1021/acs.jafc.0c04881.

Abstract - Micronutrient deficiencies in global food chains are a significant cause of ill health around the world, particularly in developing countries. Agriculture is the primary source of nutrients required for sound health and as the population has continued to grow, the agricultural sector has come under pressure to improve crop production, both in terms of quantity and quality, to meet the global demands for food security. The use of engineered nanomaterials (ENM) has emerged as a promising technology to sustainably improve the efficiency of current agricultural practices, as well as overall crop productivity. One promising approach that has begun to receive attention is to utilize ENM as seed treatments to biofortify agricultural crop production and quality. This review highlights the current state of the science for this approach, as well as critical knowledge gaps and research needs that must be overcome to optimize the sustainable application of nano-enabled seed fortification approaches.

Khalil, Noelle and **Fiona Quigley**. 2020. Persisting challenge of ticks and tick-borne diseases in Connecticut, *The Real Tree Line*, Newsletter of the Connecticut Christmas Tree Growers Association, Fall 2020, pp. 22-23.

Abstract - Tick-borne diseases are increasingly impacting the health of residents in Connecticut as native populations of ticks continue to rise and multiple invasive species become established in the state. Of the nearly 15 tick species reported in Connecticut, the blacklegged tick, American dog tick, and lone star tick are of particular importance, with blacklegged ticks constituting greater than 80% of ticks found in the state. In addition, Connecticut has experienced in recent years the introduction of invasive ticks of medical and veterinary importance. Tick control and bite prevention remain important measures for preventing tick-borne diseases.

Koelmel, Jeremy P., Matthew K. Paige, Juan J. Aristizabal-Henao, Nicole M. Robey, **Sara L. Nason**, Paul J. Stelben, Yang Li, Nicholas M. Kroeger, Michael P. Napolitano, Tina Savvaides, Vasilis Vasiliou, Pawel Rostkowski, Timothy J. Garrett, Elizabeth Lin, Chris Deigl, Karl Jobst, Timothy G. Townsend, Krystal J. Godri Pollitt, and John A. Bowden. 2020. Toward comprehensive per- and polyfluoroalkyl substances annotation using FluoroMatch software and intelligent high-resolution tandem mass spectrometry acquisition. *Analytical Chemistry* 92(16):11186–11194; https://doi.org/10.1021/acs.analchem.0c01591.

Abstract - Thousands of per- and polyfluoroalkyl substances (PFAS) exist in the environment and pose a potential health hazard. Suspect and nontarget screening with liquid chromatography (LC)–high-resolution tandem mass spectrometry (HRMS/MS) can be used for comprehensive characterization of PFAS. To date, no automated open source PFAS data analysis software exists to mine these extensive data sets. We introduce FluoroMatch, which automates file conversion, chromatographic peak picking, blank feature filtering, PFAS annotation based on precursor and fragment masses, and annotation ranking. The software library currently contains ~7,000 PFAS fragmentation patterns based on rules derived from standards and literature, and the software automates a process for users to add additional compounds. The use of intelligent data-acquisition methods (iterative exclusion) nearly doubled the number of annotations. The software application is demonstrated by characterizing PFAS in landfill leachate as well as in leachate foam generated to concentrate the compounds for remediation purposes. FluoroMatch had wide coverage, returning 27 PFAS annotations for landfill leachate samples, explaining 71% of the all-ion fragmentation (CF2)n related fragments. By improving the throughput and coverage of PFAS annotation, FluoroMatch will accelerate the discovery of PFAS posing significant human risk.

Jia, W.; **Ma, C.**; Yin, M.; Sun, H.; Zhao, Q.; **White, J.C.;** Wang, C.; Xing, B. 2020. Accumulation of phenanthrene and its metabolites in *Lactuca sativa* as affected by magnetic carbon nanotubes and dissolved humic acids. *Environ. Sci: Nano* In press.

Abstract- This study investigated the behavior of phenanthrene (Phe) in Lactuca sativa (lettuce) as affected by magnetic carbon nanotubes (MCNTs) and dissolved humic acids (DHAs). MCNTs reduced Phe accumulation in lettuce roots by more than 50%; in shoots, carbon nanotubes (CNTs) increased the Phe accumulation from 72.1- 114.8%, regardless the presence of DHAs. Nine Phe-related metabolites were identified in lettuce tissues across all treatments; co-exposure to CNTs and DHAs exhibited opposite impacts on the metabolite content as compared to treatment with MCNTs and DHAs alone. A positive correlation was found between TFFe and TFPhe (r2=0.9129) in MCNT treatments, indicating exogenous Fe in conjunction with MCNTs affected Phe accumulation in lettuce. However, the r2 value of this correlation was decreased with decreasing DHAs molecular weight. Additionally, MCNTs/CNTs and DHAs reduced Phe-induced toxicity to lettuce by elevating the activity of shoot glutathione (GST). The addition of MCNTs/CNTs alone and combination with DHAs enhanced photosynthesis. The upregulation of genes related to photosynthesis and carotenoid biosynthesis in the treatments with DHAs or the combinations of CNT/MCNTs and DHAs alleviated Phe-induced phytotoxicity and negative impacts on photosynthesis. Our findings provide important information on Phe accumulation in plant-soil systems and on the roles of DHAs and MCNTs in alleviating the contaminant-induced phytotoxicity

Molaei, Goudarz, James W. Mertins, and **Kirby C. Stafford.** 2020. Enduring challenge of invasive ticks: Introduction of *Amblyomma Oblongoguttatum* (Acari: Ixodidae) into the United States on a human traveler returning from Central America, *Journal of Parasitology* 106:670–674.

Abstract - Introduction of exotic tick vectors of bacteria, protozoa, viruses, and filarial parasites into the United States has accelerated in recent years, primarily because of globalization, increased frequency of travel, and a rise in legal and illegal animal trades. We herein report introduction of a live specimen of *Amblyomma oblongoguttatum* on a human into the United States from Central America, and we review 4 previous similar incidents. This tick species occurs widely in the neotropics, from western and southern Mexico, southwards through Central America, to the northern half of South America. It is a potential vector of bacterial agents of spotted fever group rickettsioses, raising concern that if *A. oblongoguttatum* ticks become established in this country, they might also be able to carry pathogens of human and veterinary concern. Given the potential for exotic ticks as vectors of numerous pathogens, proper surveillance, interception, and identification of these ticks are vital to protecting human and

veterinary health. Rigorous governmental inspections of imported livestock and pet animals at ports of entry and educating human travelers and medical practitioners about the risks should be part of an overall national tick program.

Song, C., X. Cheng, **Jason C. White**, H. Zhang, L. Zhao, J. He, Y. Zhu, and Y. Wang. 2020. Metabolic profile and physiological response of cucumber exposed to engineered MoS_2 and TiO_2 nanoparticles. *NanoImpact* (in press).

Abstract - Nanoparticle (NPs) use is widespread across a wide range of sectors and accurate assessment of risk and/or benefits posed to important receptors such as plant species is necessary to ensure the sustainable development and application of nanotechnology. Here, 4-week-old cucumber plants were foliar exposed to different doses (0-27 mg/plant) of MoS_2 or TiO_2 NPs for 16 d. Foliar NPs exposure had no impact on plant biomass or photosynthetic pigment production. However, the higher dose of TiO_2 NPs exposure decreased lipid peroxidation by 34.7%, and the higher dose of MoS2 and TiO_2 NPs exposure significantly increased total phenolics content by 27.4%-28.2%. The photosynthetic rate was increased by 23.6-30.8% with exposure to the higher dose of MoS_2 NPs, as well as both lower and higher dose of TiO_2 NPs. A metabolomic analysis revealed that 33 metabolites were upregulated or downregulated by MoS_2 and TiO_2 NPs exposure, including 8 amino acids, 5 organic acids, 3 fatty acids, 5 sugar and sugar derivatives, 4 alcohols, and 3 aromatic compounds. The fluctuation in metabolite content suggests that when plants are exposed to NPs, their metabolic processes are altered, and subsequent responses such as modulated defense, adaptation, and photosynthesis are displayed. With regard to dose, the higher concentration of TiO_2 NPs altered several metabolic pathways, including carbohydrate and nitrogen metabolism, whereas the lower dose of TiO_2 NPs and both doses of MoS_2 had minimal impact on cucumber metabolism. These findings suggest that appropriate doses of MoS_2 and TiO_2 NPs have the potential to increase plant production by increasing plant photosynthetic rate without inducing excessive stress or toxicity.

Sun, Jian-Wei, Yuan-Zhi Si, **De-Wei Li**, Guan-Qun Jin, and Li-Hua Zhu. 2020. First report of leaf blotch of *Aesculus chinensis* caused by *Colletotrichum gloeosporioides* and *Colletotrichum fructicola* in China. *Plant Disease* 104(10); https://doi.org/10.1094/PDIS-04-20-0841-PDN.

Abstract - *Aesculus chinensis* Bunge is an important landscaping tree widely planted in China. Since 2019, a foliar disease, with a disease incidence of 100%, occurred on *A. chinensis* at the campus of Nanjing Forestry University. The brown necrotic lesions with a dark margin and exuding orange spore masses under humid conditions mostly appeared at leaf tips and edges. Small leaf tissues (3 to 4 mm^2) from lesion margins were surface sterilized with 75% ethanol for 30 s and 1% NaClO for 90 s, rinsed with sterile dH_2O three times, and placed on potato dextrose agar (PDA) at 25°C. Using monosporic isolation, six isolates were obtained, and two representative isolates (QYS2-1 and QYS3-1-2) were used for further study. On PDA, the QYS2-1 colony was white and pale orange toward the center on the reverse side. The conidia were one-celled, straight, hyaline, subcylindrical with rounded ends, and measured 16.6 ± 1.7 × 5.9 ± 0.6 µm (*n* = 50). Appressoria were one-celled, pale brown, thick-walled, ellipsoidal, and 8.2 ± 0.6 × 5.8 ± 0.5 µm (*n* = 50). The QYS3-1-2 colony was grayish-green with white edges and dark green on the reverse side, and the conidia and appressoria were almost identical to those of QYS2-1 with sizes of 16.0 ± 1.0 × 5.8 ± 0.3 µm (*n* = 50) and 7.8 ± 0.6 × 6.1 ± 0.4 µm (*n* = 50), respectively. The morphological characteristics of QYS2-1 and QYS3-1-2 fitted with the description of the *Colletotrichum gloeosporioides* complex (Weir et al. 2012). The internal transcribed spacer (ITS) region and the genes encoding glyceraldehyde-3-phosphate dehydrogenase (*GAPDH*), chitin synthase (*CHS*), and actin (*ACT*) were independently amplified with primers ITS1/ITS4 (White et al. 1990), GDF/GDR (Silva et al. 2012), CHS-79F/CHS-345R (Carbone and Kohn 1999), and ACT-512F/ACT-783R (Templeton et al. 1992), respectively. The sequences were deposited in GenBank (accession nos. MN901256 and MT113110 to MT113112 for QYS2-1; MN901251 and MT113107 to MT113109 for QYS3-1-2). The results of BLASTn showed that the ITS, *ACT*, *CHS*, and *GAPDH* consensus sequences of QYS2-1 were 100, 99, 99, and 100% identical to those of *C. gloeosporioides* (JX073027, KF772083, MK514478, and MG561658, respectively). For QYS3-1-2, BLAST analysis with the same loci showed 100, 100, 98, and 99% homology with those of *Colletotrichum fructicola* (MN295193, MG657349, MH151146, and MH270793, respectively). A maximum likelihood-based phylogenetic analysis performed using MEGA7 with these concatenated sequences placed QYS2-1 and QYS3-1-2 in the clades of *C. gloeosporioides* sensu stricto (s.s.) and *C. fructicola*, respectively. The pathogenicity of the two species was verified on leaves inoculated with 5-mm mycelial plugs cut from the edge of 5-day-old cultures on PDA and 10 µl

of spore suspension (10^6 conidia/ml), each performed with 10 seedlings (five for mycelia, and five for conidia). Controls were treated with PDA plugs or sterile dH_2O. The inocula were placed at a distance of 2 to 3 cm on the leaves, which were wounded with a sterile needle. Inoculated plants were kept in a greenhouse (relative humidity >80%, 25 ± 2˚C). Within 5 days, all the inoculated points showed lesions similar to those observed outdoors, whereas controls were asymptomatic. Recovery rates of QYS2-1 and QYS3-1-2 were 100% for each isolate. This is the first report of *C. gloeosporioides* s.s. and *C. fructicola* causing leaf blotch on *A. chinensis* in China. These data will help develop effective strategies for managing this disease.

Taerum, Stephen J., Blaire Steven, D. J. Gage, and **Lindsay R. Triplett**. 2020. Validation of a PNA clamping method for reducing host DNA amplification and increasing eukaryotic diversity in rhizosphere microbiome studies. Phytobiomes, https://apsjournals.apsnet.org/doi/10.1094/PBIOMES-05-20-0040-TA.

Abstract - Protists and microscopic animals are important but poorly understood determinants of plant health. Plant-associated eukaryotes could be surveyed by high-throughput sequencing of 18S ribosomal RNA (rRNA) genes but the abundance of plant DNA in rhizosphere samples makes 18S rRNA gene amplification with universal primers unfeasible. Here, we applied a pipeline to generate peptide nucleic acid (PNA) clamps to suppress the amplification of maize host DNA during 18S rRNA gene library preparation. PNA clamps targeting the V4 and V9 hypervariable regions of the 18S rRNA gene of maize were designed and evaluated in silico, and the performance of the V9 targeting clamp PoacV9_01 was evaluated in vitro. PoacV9_01 suppressed the amplification of five crop species in quantitative PCR assays. In an 18S rRNA gene sequencing survey of the rhizosphere of maize, PoacV9_01 reduced the relative abundance of plant reads from 65 to 0.6%, while drastically increasing the number and diversity of animal, fungal, and protist reads detected. Thus, PoacV9_01 can be used to facilitate the study of eukaryotes present in grass phytobiomes. In addition, the pipeline developed here can be used to develop PNA clamps that target other plant species.

Wang, Ping, Bing Li, Yu-Ting Pan, Yun-Zhao Zhang, **De-Wei Li**, and Lin Huang. 2020. Calcineurin responsive transcription factor CgCrzA required for cell wall integrity and infection-related morphogenesis in *Colletotrichum gloeosporioides*. *The Plant Pathology Journal* 36(5):385-397; https://doi.org/10.5423/PPJ.OA.04.2020.0071.

Abstract— The ascomycete fungus *Colletotrichum gloeosporioides* infects a wide range of plant hosts and causes enormous economic losses in the world. The transcription factors (TFs) play an important role in development and pathogenicity of many organisms. In this study, we found that the C2H2 TF CgCrzA is localized in both cytoplasm and nucleus under standard condition, and it translocated from cytoplasm to nucleus in a calcineurin- dependent manner. Moreover, the Δ*CgCrzA* was hypersensitive to cell wall perturbing agents and showed severe cell wall integrity defects. Deletion of the *CgCRZA* inhibited the development of invasive structures and lost pathogenicity to plant hosts. Our results suggested that calcineurin-responsive TF CgCrzA was not only involved in regulating cell wall integrity, but also in morphogenesis and virulence in *C. gloeosporioides*.

Zeng, Quan, J. Puławska, and J. Schachterle. 2020. Early events in fire blight infection and pathogenesis of *Erwinia amylovora*. *Journal of Plant Pathology* https://doi.org/10.1007/s42161-020-00675-3

Abstract - When viewing the fire blight disease from the perspective of a disease cycle, it is clear that the pathogen *Erwinia amylovora* goes through different infection stages on an annual basis. These stages include the initial infection of flowers and shoot tips with ooze as the inoculum; systemic spread through the plant vasculature; production of ooze on plant surfaces as the secondary inoculum, and formation of annual cankers to tolerate winter stresses. Among them, the stage of initial infection of flowers and shoot tips drew most research attention, as in this stage, *E. amylovora* transits from epiphytic colonization on the plant surface to endophytic infection internally in the plant tissue. Limiting the epiphytic colonization of *E. amylovora* on flower surfaces is also the focus of fire blight management, as only the epiphytic cells of *E. amylovora* can be targeted by the antimicrobial sprays. In this review, we focus on some of these “early events” during the initial infection of flowers and shoot tips. We define these “early events” as any events that occur from the production of inoculum to before the systemic

spread of the pathogen through the xylem. This includes the production and transfer of the inoculum (ooze) to flowers and shoot tips; epiphytic proliferation of *E. amylovora* on flower/leaf surfaces; entry of the pathogen cells into host through natural openings or wounds; and initial proliferation immediately after entering the host. In the first half of this review, we summarize findings of some recent pathological investigations of these early events. In the second half of this review, we discuss the pathogenesis of *E. amylovora* in the context of these early events, particularly how *E. amylovora* modulates its virulence expression to induce disease symptoms. We focus on recent findings published within the past five years.

Zhu, J., J. Li, Y. Shen, S. Liu, N. Zeng, X. Zhan, **Jason C. White**, J. Gardea-Torresdey, and B. Xing. 2020. Mechanism of ZnO nanoparticle entry into wheat seedling leaves. *Environ. Sci.: Nano*. (in press).

Abstract - Increased use of nanoparticles (NPs) is being seen as agrochemical components through foliar spraying such as foliage-fertilizers or pesticides. However, an understanding of the mechanisms of nanoparticle absorption and translocation from the leaf surface is limited. In this study, ZnO NPs (30 nm) labeled with fluorescein isothiocyanate (FITC) were foliarly applied to wheat leaf tissues to investigate the process of attachment and absorption. Using laser confocal microscopy, we observed that FITC-ZnO NPs cross the leaf epidermis through the stomata and accumulate first in the apoplast, followed by subsequent transport to mesophyll cells. The Zn concentrations in the wheat leaf apoplast and cytoplasm decrease 33.2 % and 8.3 % with stomatal aperture diameter reduction, respectively; and the apoplastic Zn concentration is influenced more by stomatal aperture than the cytoplasmic Zn level. Scanning electron microscopy with energy-dispersive X-ray analysis was used to map Zn in the wheat leaves and data suggest a different Zn distribution for ZnO NPs and $ZnSO_4$. Zn ions in ZnO NP-treated samples are heterogeneously distributed in comparison with $ZnSO_4$ treated samples. The results indicate that the main route to cross wheat leaf epidermis for ZnO NPs is stomata, then these nanoparticles accumulate and release Zn ions in the apoplast, and the released Zn ions and ZnO NPs are absorbed by mesophyll cells. Our findings demonstrate how ZnO NPs cross the wheat leaf epidermis, distribute within mesophyll tissues and enter into plant cells; and this information is useful for the development of sustainable nano-enabled platforms for nanoscale micronutrient delivery.

JOURNAL ARTICLES APPROVED OCTOBER 2020

Adeel, M., N. Shakoor, **Jason C. White**, M. A. Ahmed, G. Jilani, and Y. Rui. Bioavailability and toxicity of nanoscale/bulk rare earth oxides in soil: Physiological and ultrastructural alterations in *Eisenia fetida*. *Environmental Science & Technology*

Cerbu, C., M. Kah, **Jason C. White**, C. E. Astete, and C. Sabliov. Fate of biodegradable engineered nanoparticles used in veterinary medicine as delivery systems from a One Health perspective. *Environmental Science: Nano*

Jia, W., C. Ma, M. Yin, H. Sun, Q. Zhao, **Jason C. White**, C. Wang, and B. Xing. Accumulation of phenanthrene and its metabolites in *Lactuca sativa* as affected by magnetic carbon nanotubes and dissolved humic acids. *Environmental Science: Nano*

Kudo, E., B. Israelow, C. B. F. Vogels, P. Lu, A. Wyllie, M. Tokuyama, A. Venkataraman, **Doug E. Brackney**, I. M. Ott, M. E. Petrone, R. Earnest, S. Lapidus, M. C. Muenker, A. J. Moore, A. Casanovas-Massana, Yale IMPACT Research Team, S. B. Omer. C. S. Dela Cruz, S. F. Farhadian, A. I. Ko, N. D. Grubaugh, and A. Iwasaki. Detection of SARS-CoV-2 RNA by multiplex RT-qPCR. *PLOS Biology*

Li, C., C. Ma, H. Shang, **Jason C. White**, D. J. McClements, and B. Xing. Food-grade titanium dioxide particles decrease the bioaccessibility of iron released from spinach leaves: A simulated human gastrointestinal tract study. *NanoImpact*

Molaei, Goudarz, **Eliza Little**, **Noelle Khalil**, B. Ayres, W. Nicholson, and C. Paddock. Established population of the Gulf Coast tick (*Amblyomma maculatum*) infected with *Rickettsia parkeri* found in Connecticut. *Emerging Infectious Diseases*

Patel, Ravikumar R., D. D. Patel, J. Bhatt, P. Thakor, **Lindsay R. Triplett**, and V. R. Thakkar. Induction of pre-chorismate and jasmonate pathways by *Burkholderia* sp. RR18 in peanut seedlings. *BioControl*

Zhang, K., H. Zhang, **De-Wei Li**, and R. F. Castañeda-Ruiz. *Mirohelminthosporium* gen. nov. for an atypical Helminthosporium species and *H. matsushimae* nom. nov. *Mycotaxon*

ARTICLES OF INTEREST OCTOBER 2020

Mr. Michael Ammirata from the Department of Analytical Chemistry welcomed his daughter, Evelyn, into the world on September 1. She is happy, healthy, and growing by the day.

NEW STAFF, STUDENTS, AND VOLUNTEERS OCTOBER 2020

Biography of Zannatul Ferdous, PhD

Dr. Ferdous is interested in understanding the biology of infectious diseases and the possible interactions between climate change and vector-borne diseases. She wishes to contribute to public health innovations and improvement in human health through her research. Her major research findings have been featured in several reputed peer-reviewed journals.

Zannatul received her PhD on Molecular Biology and MSc on Molecular Genetics from Imperial College London and the University of Leicester, UK respectively. She completed her studies under the "Commonwealth Scholarship," one of the most prestigious UK Government funded awards. She continued her research career as an Associate Professor of Zoology at the University of Dhaka, Bangladesh, until she moved to the United States of America. She has been teaching Forensic Science and Biology at Trinity Washington University, DC as an adjunct faculty since 2019.

She also serves as an honorary environmental advocate to "United Nations Development

Program" (UNDP) and "Local Environment Development and Agricultural Research Society (LEDARS)," to catalyze climate resilient health and livelihood development.

She loves cooking and feeding family and friends. According to her, if she was not a vector biologist, she would have been a cook who tried to bring the whole world to her kitchen. She is a proud mother of 2 children.

Ms. Cora Ottaviani is a seasonal assistant working with Dr. Jeffrey Ward and J.P. Barsky in the Department of Forestry and Horticulture. She earned a Master of Environmental Management with a specialization in Ecosystems and Land Conservation and Management from the Yale School of the Environment. Cora is interested in habitat and wildlife conservation, along with science communication. She will be assisting with the Forest Ecosystem Monitoring Cooperative (FEMC) by establishing field plots to assess forest health.

Mr. Aiden Florio is a recent graduate from the College of Natural Sciences, Forestry and Agriculture at the University of Maine, obtaining a degree in Ecology and Environmental Science. He joins the Forestry and Horticulture Department as a seasonal assistant, working with Dr. Jeffrey Ward in establishing a series of forest health plots as part of the Forest Ecosystem Monitoring Cooperative (FEMC). Aiden's interest in natural resources peaked while working at White Memorial Conservation Center and their efforts with the invasive species, Emerald Ash Borer and the Asian Spotted Lanternfly.

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