

Station News

The Connecticut Agricultural Experiment Station
Volume 9 Issue 5 May 2019



This Issue

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.



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ADMINISTRATION

DR. THEODORE ANDREADIS presided over a quarterly meeting of the Station's Board of Control held at the Station (April 10); presented a talk entitled, "*Jamestown Canyon Virus Revisited: Are We Neglecting an Under Recognized Disease?*" at the Symposium on Mosquito-Borne Diseases in Connecticut held at CAES (50 attendees) (April 11); was interviewed about the new "Active Tick Surveillance Program" funded with a grant from the Centers for Disease Control and Prevention by Greg Hladky, Hartford Courant (April 12); was interviewed about the Experiment Station's research and surveillance programs on ticks, mosquitoes, and associated vector-borne diseases in the state by Aaron Kupec, WTIC Radio (April 16); presented welcoming remarks and an update on Experiment Station activities at the Annual Meeting of the Experiment Station Association held at the Station (April 17); and was interviewed about the new "Active Tick Surveillance Program" for the State of Connecticut by Charity Scott, Wall Street Journal (April 23); presented a lecture entitled, *Global climate change and mosquito-borne diseases* to a class of MPH students at the Yale University School of Public Health (20 attendees) (April 24).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE hosted a ZOOM call concerning preparation of a USDA SCRI grant with colleagues at Carnegie Mellon University (April 1); along with **MS. KITTY PRAPAYOTIN-RIVEROS** participated in the US FDA Sample Analysis Data Exchange - IT Implementation Phase work group WebEx call (April 2, 16); participated in the weekly all-hands ZOOM call for the Center for Sustainable Nanotechnology (April 3, 10, 17, 24); with **DR. CHUANXIN MA** participated in the monthly Nanyang Technological University-Harvard University TH Chan School of Public Health Initiative for Sustainable Nanotechnology (NTU-Harvard SusNano) AgriChem project monthly meeting (April 4); hosted the bi-weekly ZOOM call for the Center for Sustainable Nanotechnology "Nanochem-Plant" group (April 9); along with **DR. BRIAN EITZER, DR. CHRISTINA ROBB, DR. WALTER KROL, MS. TERRI ARSENAULT, MR. CRAIG MUSANTE, MR. JOHN RANCIATO, AND MS. KITTY PRAPAYOTIN-RIVEROS** participated in the monthly FDA FERN cCAP WebEx call (April 11); participated in the Center for Sustainable Nanotechnology "Red Team" ZOOM meeting in preparation for an NSF site visit (April 12); participated in a Senior Investigator performance review for the Center for Sustainable Nanotechnology (April 15); recorded a podcast on the 15th Anniversary of the National Nanotechnology Initiative (NNI) with Dr. Lisa Friedersdorf of the National Nanotechnology Coordination Office (April 16); participated in the Center for Sustainable Nanotechnology monthly "Faculty" ZOOM meeting (April 19); gave a lecture at the University of Massachusetts Stockbridge School of Agriculture entitled "Nanotechnology in Agriculture: Assessing the Balance Between Applications and Implications" (April 23); participated in the US EPA "FIFRA Continuing Environmental Program Grant (FCEPG) Application Webinar" (April 25); and hosted the monthly CAES J-1 Visa recipient meeting (April 26).

DR. BRIAN EITZER was a participant in the conference call of the Organizing Committee of the North American Chemical Residue Workshop (April 11) and an instructor for the LB511 FDA/FERN Chemistry Training for LC-MS held in Cincinnati (12 attendees) (April 22-26).

MS. KITTY PRAPAYOTIN-RIVEROS attended the 5th governmental food and feed laboratory accreditation meeting in Houston, Texas, also gave a presentation entitled "Transitions to the New ISO/IEC 17025 Standard" along with **MS. TERRI ARSENAULT** (~100 attendees) (April 8-11); and participated in the WebEx call for Partnership for Food Protection Information Technology Work Group (PFP IT WG) hosted by the Office of Regulatory Science FDA, and gave a talk on the state perspective on the National Food Safety Data Exchange (NFSDX) participation (April 29).

ENTOMOLOGY

DR. KIRBY C. STAFFORD III presented a seminar at the Department of Pathobiology at the University of Connecticut entitled “Ticks: It’s More Than Just Lyme Disease” (40 attendees) (April 4); presented a talk on tick-borne diseases and tick management at Hollandia Nursery in Bethel (38 attendees) (April 12); presented a webinar talk on “Tick Biology, Behavior and Control: Addressing the Public Health Threat” for the PCT Public Health Virtual Conference (April 17); was interviewed by Charity Scott, Wall Street Journal, about the active surveillance program (April 23); and presented two talks at the UMass Extension Ticks and Tick-Associated Diseases Conference on “Habitat and Winter Survival of *Ixodes scapularis* and *Amblyomma americanum* and Establishment of the Lone Star Tick in Connecticut” and “Management of Ticks in Landscapes: Mechanical and Chemical Management, Deer Exclusion, and Other Research” (93 attendees) (April 24).

MS. KATHERINE DUGAS staffed a Forest Pest Outreach booth at North Haven Earth Day (approx. 70 people) (April 6); with **DR. VICTORIA SMITH** and **MS. TIA BLEVINS** attended the combined meeting of the Eastern Plant Board, the Horticultural Inspection Society, and the Cooperative Agricultural Pest Survey held in Portland, ME (~100 participants) (April 8-11); and staffed a Forest Pest Outreach booth at Hamden Earth Day (~200 people) (April 27).

MR. MARK H. CREIGHTON spoke with members of the New Canaan High School Beekeeping Club on honey bee biology and varroa mite management strategies (20 attendees) (April 1); attended a course at the University of Massachusetts, Amherst on honey bee dissection presented by the Chief Apiary Inspector of Massachusetts and sampled bees for the presence of *Nosema ceranae* (April 6); spoke at Brown Middle School in Madison on honey bees and their role in pollination (160 students) (April 11); and gave a lecture about basic bee biology to twelve members of the executive staff and regional sales managers at Koster Keunen, Inc., in Watertown followed by a tour of the facility. Koster Keunen is one of the world’s largest purchaser of honeybee wax and makes honeybee wax related compounds for industry (April 16); and attended the Connecticut Beekeepers Association meeting held in Jones Auditorium (97 attendees) (April 27).

MS. MEGAN LINSKE participated in a Northeast Fish and Wildlife Agencies (NEAFWA) annual conference planning call with members of CT DEEP and Delaney Meeting and Event Management group (April 1); coordinated a professional development workshop at the NEAFWA conference entitled “Implementing an Adaptive Management Program Using Remote Automated Wildlife Monitoring Methods, with the R Package AMMonitor” as the Northeast Section of the Wildlife Society’s (NETWS) Workshop Chairperson (10 attendees) (April 14); attended the NETWS Executive Meeting as Executive Secretary and Workshop Chairperson (April 14); coordinated undergraduate and graduate student presentation judging and awards for NEAFWA (22 participants) (April 15-16); and judged students’ presentations for Quinnipiac University’s Sigma Xi Student Research Conference (April 24).

DR. GALE E. RIDGE was interviewed about the recently introduced crazy snake worm *Amyntas agrestis*, which is a serious threat to Connecticut’s forest floor ecosystem, by Bob Miller of the News-Times (April 3); and interviewed for two broadcasts, one on delusional of parasitosis and the other on bed bug biology and behavior, by Foster Brusca from the California based Pest Pose, an online service for the California Pest Management industry (April 10).

DR. CLAIRE E. RUTLEDGE presented a talk entitled “Bio-Surveillance: Using a Native Wasp to Find an Invasive Beetle” to Master Gardeners in Haddam (65 adults) (April 9); presented a talk entitled “Bio-Surveillance: Using a Native Wasp to Find an Invasive Beetle” to Master Gardeners in Bethel (40 adults) (April 11); was interviewed for a segment on the emerald ash borer, which aired on Fox61 <https://www.youtube.com/watch?v=cpLvCCY7bNg&feature=youtu.be> (April 16); presented a talk entitled “The Tempestry Project” at a panel discussion on “Craft Objects and

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Data,” which was sponsored by SCOPA and held at Yale University’s Sterling Memorial Library, in New Haven (25 adults) (April 24); and presented a talk entitled “New Insects in Connecticut” to Master Gardeners in Norwich (15 adults) (April 25).

DR. VICTORIA L. SMITH participated in the 94th meeting of the Eastern Plant Board, held at the Holiday Inn by the Bay in Portland, ME, with discussions on hemp regulation, invasive species, funding issues, and other topics (100 participants) (April 8-11); and participated in a meeting of the Yale Biosafety Committee held in New Haven (20 participants) (April 18).

DR. KIMBERLY A. STONER gave a talk entitled “Planting for the Bees’ Needs” to the Spring Glen Garden Club at the Lockwood Farm Cottage in Hamden (23 attendees) (April 8); gave a talk entitled “The Bees’ Needs” as the keynote speaker at the annual dinner of the Simsbury Land Trust held at The Riverview in Simsbury (150 attendees) (April 9); was interviewed about pollinator pathways by Bob Miller of the News-Times (April 17); spoke on “Planting for the Bees’ Needs” at Wakeman Town Farm in Westport (50 attendees, of whom 25 were high school students) (April 22); met with members of the New Haven Land Trust and the Garden Club of New Haven about creating pollinator habitat at the Quinnipiac Meadows Preserve in New Haven (April 26); and was interviewed about Pollinator Pathways and gardening for pollinators by Pem McNerney of Shore Publishing and Zip06 (April 29).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO served as a judge for the Northeast Regional Sigma Xi Student Research Conference held at Quinnipiac University in Hamden (April 24).

DR. PHILIP ARMSTRONG gave a talk entitled “Mosquito Surveillance for West Nile Virus and Other Arboviruses in Connecticut” at the Symposium on Mosquito-Borne Diseases in Connecticut held at the Jones Auditorium (50 attendees) (April 11).

MS. ANGELA BRANSFIELD, with **DR. PHILIP ARMSTRONG** and **MR. MICHAEL MISENCIK** met with a team of FBI Special Agents and discussed the Station’s select agent program, security features of the BSL3 laboratory, and research conducted in the BSL3 laboratory (April 8); was interviewed by Ms. Lane Warmbrod of the Johns Hopkins Center for Health Security as part of a study on vaccination of laboratory staff through the Special Immunizations Program (April 12); and participated in the Federal Select Agent Program Webinar entitled “*Entity Internal Inspections*” (April 18).

MR. GREGORY BUGBEE with **MS. SUMMER STEBBINS** gave an “Invasive Aquatic Plant Workshop” to an Environmental Studies class at Three Rivers Community College in Norwich (approx. 30 attendees) (April 3); with **MS. SUMMER STEBBINS** gave an “Invasive Aquatic Plant Workshop” as part of a CT DEEP Water Quality Monitoring Conference at Three Rivers Community College in Norwich (approx. 40 attendees) (April 5); with **MS. SUMMER STEBBINS** gave a Benthic Barrier training session to staff of the Town of Middlefield at Lake Beseck (approx. 10 attendees) (April 18); gave a talk entitled “Composting” to the Kensington Garden Club at the Berlin-Peck Library in Berlin (approx. 40 attendees) (April 18); served as a judge for the Northeast Regional Sigma Xi Student Research Conference at Quinnipiac University in Hamden (April 24); participated in a Northeast Aquatic Plant Management Board of Directors meeting via conference call (April 26); and with **MS. SUMMER STEBBINS** gave a Benthic Barrier training session at Lake Beseck in Middlefield (approx. 25 attendees) (April 26).

DR. ANDREA GLORIA-SORIA attended the workshop on Microhaplotypes, Adapting Next Generation Sequencing Platforms for Population Genomic Studies in Non-Model Organisms organized by the Cen-

ter for Genetic Analysis of Biodiversity of the Yale Institute for Biospheric Studies at Yale University (25 attendees) (April 15).

DR. JOSEPH R. McMILLAN attended the Town of Milford's Mosquito control kick off media event (April 23); served as a judge for the Northeast Regional Sigma Xi Student Research Conference held at Quinnipiac University in Hamden (April 24); and presented a poster entitled "Mosquito Diversity, Viral Transmission, and the Risk of Arboviral Exposure in Human Populations" at the Yale School of Public Health's Emerging Microbial Disease Program's Annual Research Day (approx. 70 students, 100 attendees total) (April 29).

DR. GOUDARZ MOLAEI was interviewed on tick reproduction and the prospect of tick abundance and activity this season by the Republican American (April 12); was interviewed about whether a mild winter will impact ticks by the Wilton Bulletin <https://www.wiltonbulletin.com/138544/will-a-mild-winter-impact-ticks/> (April 15); gave an invited talk entitled "Nature's Revenge: Persistent Challenge of Mosquito- and Tick-borne Diseases in Connecticut" to the Association of Retired Employees of Northeast Utilities (ARENU) in Berlin (30 attendees) (April 17); was interviewed about the Asian longhorned tick by the MV (Martha's Vineyard) Times <https://www.mvtimes.com/2019/04/19/asian-longhorn-tick-continues-northward-march/> (April 19); and attended the 5th Annual EMD Research Day Symposium, Department of Epidemiology of Microbial Disease, Yale School of Public Health, to witness Dasha Pokutnaya, an MPH student who conducted her internship and thesis under his supervision, present her thesis work (approx. 60 attendees) (April 29).

DR. SARA NASON organized a visit by eight CAES staff scientists and visiting scholars to tour the water treatment plant of the Greater New Haven Water Pollution Control Authority in New Haven (April 11); and served as a judge for the Northeast Regional Sigma Xi Student Research Conference held at Quinnipiac University in Hamden (April 24).

MR. JOHN SHEPARD presented a talk entitled "Biology, Ecology, and Feeding Behavior of Mosquitoes in Connecticut" at a Symposium on Mosquito-Borne Diseases in Connecticut held in Jones Auditorium (50 attendees) (April 11); and attended the Town of Milford's Mosquito control kick off media event and was interviewed by WFSB - 3, WTNH -8, WTIC - Fox 61, WVIT -30, News 12, and Hearst Media about the state Mosquito and Arbovirus Surveillance Program (April 23).

MS. SUMMER STEBBINS presented an online mapping tool and spoke about the new infestation of Hydrilla in the Connecticut River at a water chestnut cooperators meeting at the U.S. Fish and Wildlife Service Northeast Region in Hadley, MA (approx. 30 attendees) (April 24).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD spoke on "STORMWISE: Integrating Arboriculture and Silviculture to Create Storm Resilient Roadside Forests" at the Northeast Natural History Conference held in Springfield, MA (23 attendees) (April 13).

DR. ABIGAIL A. MAYNARD represented the Station at a meeting of the State Technical Committee held in Tolland (23 adults) (April 10); assisted students in planting a vegetable garden at Hamden Hall Country Day School in Hamden (32 students and 3 teachers) (April 11, 12, 16, 18, 24); reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation held in Middletown (11 adults) (April 24); judged posters at the Sigma Xi poster competition at Quinnipiac University in Hamden (April 24); presented a talk entitled "Growing Unusual Vegetables" as part of the 2019 Garden Series at the Avon Free Public Library in Avon (22 adults) (April 30).

DR. SCOTT C. WILLIAMS participated in a Northeast Fish and Wildlife Agencies (NEAFWA) annual conference planning call with members of CT DEEP and Delaney Meeting and Event Management group (April 1); participated in a conference call for the Editorial Advisory Board for The Wildlife Professional (April 4); as President-Elect, attended the Executive Committee meeting of The Northeast Section of The Wildlife Society in Groton (April 14); presided over the annual members meeting of The Northeast Section of the Wildlife Society, Groton (April 15); moderated a symposium titled "Persistent and Emerging Ectoparasites Affecting Wildlife and Public Health Alike" at the NEAFWA conference in Groton (April 16); gave an invited lecture entitled "Discovery of an Established Population of Lone Star Ticks in Southwestern Connecticut" at the NEAFWA conference, Groton (April 16); and met with Dr. Nathan Grubaugh and graduate students from the Yale School of Public Health along with **DR. PHILIP ARMSTRONG** and **DR. DOUGLAS BRACKNEY** about a collaborative research opportunity (April 26).

MR. JOSEPH P. BARSKY participated in the triennial review of the Wamogo Agriscience Program in Litchfield (25 high school students, 5 teachers) (April 30); and participated in the New England Society of American Foresters Annual Meeting Conference Call (April 30).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER attended and gave a presentation entitled "Nanoparticles for Suppression of Fusarium Root Disease" at the Annual Meeting of the Northeastern Division of the American Phytopathological Society held in State College, PA (32 adults) (April 2-5); hosted Dr. Pam Marrone of Marrone Bio Innovations for discussion and a CAES seminar (April 9); participated in Mr. Ishaq Adisa's Ph.D. defense at the University of Texas, El Paso, via video conference (April 11); and served as a judge for the Northeast Regional Sigma Xi Student Research conference (54 students, 12 adults) (April 24).

DR. WASHINGTON DA SILVA and his Ph.D. student from Brazil **DARLAN BORGES** attended and presented a poster entitled "Grapevine Leafroll Disease is Widespread in Connecticut" at the Annual Meeting of the Northeastern Division of the American Phytopathological Society held in State College, PA (April 2-5); presented a seminar entitled "Small Things Considered: The Impact of Plant Viruses on Wine Production" at Quinnipiac University for the Quinnipiac Chapter of Sigma Xi, The Scientific Research Society (41 students) (April 12); served as a judge at the Northeast Regional Sigma Xi Student Research Conference held at Quinnipiac University in Hamden (54 students, 12 adults) (April 24); and gave a Skype presentation (Skype a Scientist Program) to first grade students for a program near the Twin Cities of Minnesota called Young Scholars, which works to recognize and support gifted learners (12 attendees) (April 23).

DR. YONGHAO LI attended and presented "Plant Disease Updates in Connecticut" in the Extension & Industry Session at the Annual Meeting of the Northeastern Division of the American Phytopathological Society held in State College, PA (60 adults) (April 2-5); attended the National Plant Diagnostic Network 2019 Conference and presented a poster entitled "Outbreaks of Boxwood Blight in Connecticut" and gave a talk entitled "Highlights of Plant Diseases in 2018" in Indianapolis, IN (25 adults) (April 16); presented "Pruning 101" for the Long Hill Garden Club in Trumbull (55 adults) (April 22); and presented "Boxwood Blight in Connecticut" in the Expert Panel Discussion at the Sam Bridge Nursery & Greenhouses in Greenwich (65 adults) (April 27).

DR. ROBERT MARRA participated in a workshop titled "Microhaplotypes: Adapting NGS for Population Genomic Studies," hosted by Dr. Gisella Caccone, at the Yale University Environmental Science Center (50 adults) (April 15); was interviewed by Jan Ellen Spiegel about his work quantifying carbon loss due to internal decay in trees, for the MIT publication, "Undark" (April 26); and was presented the Sigma Xi Quinnipiac Chapter "Outstanding Paper of the Year Award" for "Estimating Carbon Loss Due to Internal Decay in Living Trees Using Tomography: Implications for Forest Carbon Budgets" (Environmental Research Letters 2018) at Luce Ristorante in Hamden (April 30).

DR. NEIL SCHULTES attended the Annual Meeting of the Northeastern Division of the American Phytopathological Society Meeting held in State College, PA (April 2 - 5); attended the Fusarium workshop hosted by Dr. David Geiser (April 5-6); co-organized and served as a judge for fifty-four student research posters at the Northeast Regional Student Research Conference held at Quinnipiac University in Hamden (April 26); and with **DR. QUAN ZENG** participated in a Northeast IPM Center webinar (April 25).

DR. QUAN ZENG met Dr. Pamela Marrone of Marrone Bio Innovations and discussed mutual research interests (April 9), attended the Biology Symposium at Southern Connecticut State University, judged the NE Regional Sigma Xi Student Research Conference held at Quinnipiac University in Hamden (April 24); and along with **DR. NEIL SCHULTES** attended the Northeastern IPM Center Welcome Webinar for 2019 Partnership Grantees (April 25).



DR. ROBERT MARRA shows off the wheat spike bread he made for a potluck in honor of Robigalia, an ancient holiday to bring healthy crops.

DR. ROBERT MARRA received the Sigma Xi Quinnipiac Chapter “Outstanding Paper of the Year Award” for “Estimating carbon loss due to internal decay in living trees using tomography: implications for forest carbon budgets,” (Environmental Research Letters 2018).



VALLEY LABORATORY

DR. JATINDER S. AULAKH talked about pesticide formulations, pesticide hazards and first aid, personal protective equipment, and pesticide transport, storage and security in the commercial pesticide applicators training classes held at the Valley Laboratory in Windsor (April 18, 25).

MS. ROSE HISKES assisted the Connecticut Tree Protective Association Arboriculture 101 students with diagnosing insect tree problems at the hands-on night in Wallingford (35 attendees) (April 10); co-chaired a Steering Committee Meeting and General Meeting of the Connecticut Invasive Plant Working Group held at the Valley Laboratory in Windsor (April 11); with **MR. THOMAS RATHIER** and **DR. JATINDER AULAKH**, taught a Private Applicator Pesticide Certificate Test Preparation Class to tobacco, vegetable, and fruit growers (29 attendees) (April 18, 25); and prepared a display with insect boxes and appropriate Station coloring books and fact sheets for the Earth Day celebration of the Killingworth Library at Chatfield Hollow Farm (approx. 100 attendees) (April 27).

DR. JAMES LAMONDIA presented a seminar entitled “Connecticut Cigar Wrapper Leaf: The Result of Practical Research and Over 380 Years of Tobacco Production” at the annual meeting of the Experiment Station Associates held in Jones Auditorium (18 attendees) (April 17); and spoke about the history of tobacco production in Connecticut from the 1630s to today and tobacco research in support of production especially in regard to plant breeding for resistance at the Nutrient Ag Solutions Grower meeting held in Windsor Locks (70 attendees) (April 30).

DEPARTMENTAL RESEARCH UPDATES APRIL 2019

Dimkpa, C.O.; Singh, U.; Bindraban, P.S.; Adisa, I.O.; **Elmer, W.H.**; Gardea-Torresdey, J.L.; **White, J.C.** 2019. Addition-omission of zinc, copper, and boron nano and bulk oxide particles demonstrate element and size -specific response of soybean to micronutrients exposure. *Sci. Tot. Environ.* 665:606-616.

Abstract- Plant response to trace elements exposure can be modulated based on particle size. However, studies are lacking on the roles of particle size and specific elements in mixed exposure systems designed for nutrition, rather than toxicology. Here, an addition-omission strategy was used to address particle-size and nutrient-specific effects in soybean exposed to a mixture of nanoscale or bulk oxide particles of Zn (2 mg Zn/kg), Cu (1 mg Cu/kg) and B (1 mg B/kg) in soil. The mixture of oxide particles of both sizes significantly ($p < 0.05$) promoted grain yield and Zn accumulation, but suppressed P accumulation. However, exposure to the nano-oxides specifically stimulated shoot growth (47%), flower formation (63%), shoot biomass (34%), and N (53%) and K (42%) accumulation. Omission of individual nutrients from the mixtures evoked significant responses that were both nano and bulk-specific, including promotion of shoot growth by bulk-B; inhibition of flower formation by nano-Cu; stimulation of flower formation by bulk-B; suppression of grain yield by nano-Zn; enhancement of Cu uptake by nano-B; enhancement of B uptake by bulk-Cu; stimulation of P uptake by nano-Zn or bulk-B; enhancement of residual soil N and Zn levels by nano-Cu; and enhancement of residual soil Cu level by nano-Zn and nano-B. Collectively, Zn was largely responsible for driving the agronomic (biomass and grain yield) responses in this soil, with concurrent ramifications for environmental management (N and P) and human health (Zn nutrition). Overall, compared to bulk nutrients, nano-scale nutrients played a greater role in evoking plant response.

Qiao Min, **De-Wei Li**, Ze-Fen Yu, Rafael F. Castañeda-Ruiz. 2019. *Spadicoides matsushimae* sp. nov., and *Anisospadicoides* gen. nov. for two atypical *Spadicoides* species. *Mycotaxon* 134: 161-167.

Abstract - *Anisospadicoides* is proposed as a new genus for two species of *Spadicoides*,

S. macrocontinua and *S. macrobovata*, that have polytretic and blastic conidial ontogeny on the apical conidiogenous cells. A new species, *Spadicoides matsushimae*, distinguished by broadly fusiform to navicular, mostly 2-septate, brown to dark brown conidia, is also described and illustrated.

Petersen, E. J.; Mortimer, M.; Burgess, R.; Handy, R.; Hanna, S.; Ho, K.; Johnson, M.; Loureiro, S.; Selck, H.; Scott-Fordsmand, J.; Spurgeon, D.; Unrine, J.; van den Brink, N.; Wang, Y.; White, J.C.; Holden, P. 2019. Strategies for robust and accurate experimental approaches to quantify nanomaterial bioaccumulation across a broad range of organisms. *Environ. Sci.: Nano*. DOI: 10.1039/C8EN01378K.

Abstract- One of the key components for environmental risk assessment of engineered nanomaterials (ENMs) is data on bioaccumulation potential. Accurately measuring bioaccumulation can be critical for regulatory decision making regarding material hazard and risk, and for understanding the mechanism of toxicity. This manuscript provides expert guidance for performing ENM bioaccumulation measurements across a broad range of test organisms and species. To accomplish this aim, we critically evaluated ENM bioaccumulation within three categories of organisms: single-celled species, multicellular species excluding plants, and multicellular plants. For aqueous exposures of suspended single-celled and small multicellular species, it is critical to perform a robust procedure to separate suspended ENMs and small organisms to avoid overestimating bioaccumulation. For many multicellular organisms, it is essential to differentiate between the ENMs adsorbed to external surfaces or in the digestive tract and the amount absorbed across epithelial tissues. For multicellular plants, key considerations include how exposure route and the role of the rhizosphere may affect the quantitative measurement of uptake, and that the efficiency of washing procedures to remove loosely attached ENMs to the roots is not well understood. Within each organism category, case studies are provided to illustrate key methodological considerations for conducting robust bioaccumulation experiments for different species within each major group. One key finding to improve bioaccumulation measurements was the critical need for further analytical method development to identify and quantify ENMs in complex matrices. Overall, the discussion, suggestions, and case studies described herein will help improve the robustness of ENM bioaccumulation studies.

Schultes*, Neil P., Noelle Strzalkowski and De-Wei Li*. 2019. *Botryotrichum domesticum* sp. nov., a new hyphomycete from an indoor environment. *Botany* 97: 311-319. <https://doi.org/10.1139/cjb-2018-0196>

Abstract - Here we report on a fungus that is new to science and was isolated from a swab sample collected in a Massachusetts (USA) residence. Morphological characters of the fungus were studied and DNA sequences generated from internal transcribed spacer (ITS) and large subunit (LSU) ribosomal loci and from *rpb2* and *tub2* loci were used to establish a proper phylogenetic relationship with allied genera. The fungus was named *Botryotrichum domesticum*. The newly named species has thick-walled conidia globose to subglobose, $17.7 \mu\text{m} \pm 2.6 \mu\text{m} \times 17.3 \mu\text{m} \pm 2.5 \mu\text{m}$, developing on both aerial and immersed hyphae, with an absence of setae.

T. Shidore, Q. Zeng, and L.R. Triplett. 2019. Survey of Toxin-Antitoxin systems in *Erwinia amylovora* reveals insights into diversity and functional specificity. *Toxins* 11(4), 206.

Abstract-Toxin-antitoxin (TA) systems are diverse genetic modules with demonstrated roles in plasmid stability, stress management, biofilm formation and antibiotic persistence. However, relatively little is known about their functional significance in plant pathogens. In this study we characterize type II and IV TA systems in the economically important plant pathogen *Erwinia amylovora*. Hidden Markov Model (HMM) and BLAST-based programs were used to predict the identity and distribution of putative TA systems among sequenced genomes of *E. amylovora* and other plant-associated *Erwinia* spp. Of six conserved TA systems tested for function from *E. amylovora*, three (CbtA/CbeA, ParE/RHH and Doc/PhD) were validated as functional. CbtA was toxic to *E. amylovora*, but not to *Escherichia coli*. While the *E. coli* homolog of CbtA elicits the formation of lemon-shaped cells upon overexpression and targets cytoskeletal proteins FtsZ and MreB, *E. amylovora* CbtA led to cell elongation and did not interact with these cytoskeletal proteins. Phylogenetic analysis revealed that *E. amylovora* CbtA belongs to a distinct clade from the CbtA of pathogenic *E. coli*. This study expands the repertoire of experimentally validated TA systems in plant pathogenic bacteria, and suggests that the *E. amylovora* homolog of CbtA is functionally

distinct from that of *E. coli*.

Zhao, L.; Zhang, H.; Chen, X.; Li, H.; Qu, X.; White, J.C.; Ji, R. 2019 Metabolomics reveal that engineered nanomaterial exposure in soil alters both soil rhizosphere metabolite profiles and maize metabolic pathways. *Environ. Sci.: Nano*. 10.1039/c9en00137a.

Abstract- Accurate risk assessment of engineered nanomaterials (ENMs) in the environment is important for sustainable development and application of nanotechnology. Soil metabolomics, which reflects the integrated response of both plant and microbial communities to ENM exposure, has not been used extensively. Moreover, since microbe- and plant-released metabolites contribute to the formation and accumulation of soil organic carbon (SOC), soil metabolite profile alteration from impacted plant and microbial activity may change SOC pool enrichment. Here, maize plants were grown in soil amended with SiO₂, TiO₂, or Fe₃O₄ ENMs (100 mg kg⁻¹ soil) for four weeks. Plant and soil metabolomics were then used to investigate the global metabolic response of both the plant and soil to ENM exposure. None of the tested ENMs showed negative impacts on plant growth. However, metabolomics analysis revealed that all ENM treatments altered the leaf, root and soil metabolite profiles in an ENM-dependent manner. Fe₃O₄ and TiO₂ ENM exposure induced stronger metabolic reprogramming in leaves, roots and soil compared to SiO₂ ENMs. Interestingly, leaf tissues, which is not the organ directly exposed to ENMs, showed significant amino acid pool alteration upon exposure to ENMs. In soil, levoglucosan, linolenic acid, 4-hydroxycinnamic acid and allo-inositol were significantly increased in response to ENMs. Alteration of the soil metabolite profile indicates that ENMs changed the SOC pool. Integration of leaf, root and soil metabolomics enables a thorough characterization of plant metabolism and soil chemistry that can be a powerful tool for ENM risk assessment.

JOURNAL ARTICLES APPROVED APRIL 2019

Aulakh, Jatinder S. Weed Control Efficacy and Canaan Fir (*Abies balsamea* var. *phanerolepis*)'s Tolerance to Different Preemergence Herbicides. *Weed Technology*

Hu, J., X. Wu, F. Wu, W. Chen, **Jason C. White**, Y. Yang, B. Wang, B. Xing, S. Tao, and X. Wang. Titanium Dioxide Nanoparticles Improve the Nutritional Quality of Coriander (*Coriandrum sativum* L.). *Environmental Science: Nano*

Kache, P. A., **G. Eastwood**, K. Collins-Palmer, M. Katz, R. Falco, **Philip M. Armstrong**, **Theodore G. Andreadis**, and M. Diuk-Wasser. Environmental Determinants of *Aedes albopictus* Abundance at a Northern Limit of Its Range in the United States. *American Journal of Tropical Medicine and Hygiene*

Ma, Chuanxin, J. Borgatta, **Roberto De La Torre Roche**, **Nubia Zuverza-Mena**, **Jason C. White**, R. J. Hamers, and **Wade H. Elmer**. Time-Dependent Transcriptional Response of Tomato (*Solanum lycopersicum* L.) to Cu Nanoparticle Exposure upon Infection with *Fusarium oxysporum* f. sp. *lycopersici*. *ACS Sustainable Chemistry & Engineering*

Uraki, R., A. K. Hastings, **Doug E. Brackney**, **Philip M. Armstrong**, and E. Fikrig. AgBR1 Antibodies Delay Lethal Mosquito-borne West Nile Virus Infection in Mice. *npj Vaccines*

ARTICLES OF INTEREST APRIL 2019

We welcome **DR. TEJA SHIDORE** who has accepted the Dr. Louis Magnarelli Postdoctoral position under the direction of **DRS. WASHINGTON DA SILVA** and **NUBIA ZUVERZA-MENA**.



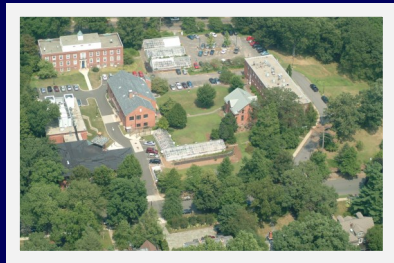
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