

# Station News

The Connecticut Agricultural Experiment Station  
Volume 9 Issue 2 February 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.



# CAES

The Connecticut Agricultural Experiment Station

*Putting Science to Work for Society since 1875*

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## GRANTS RECEIVED JANUARY 2019

**Dr. James LaMondia** received a grant from the Horticultural Research Institute for Boxwood Blight Management in the Landscape Year 2.

## ADMINISTRATION

**DR. THEODORE ANDREADIS** presented an overview of the research, testing and surveillance activities conducted by staff of the CAES Center for Vector Biology & Zoonotic Disease and the Northeast Regional Center of Excellence in Vector-Borne Diseases at a *Workshop on Mosquito and Biting Flies* sponsored by the Connecticut Groundkeepers Association and held at the Station (75 attendees) (January 15); presided over a quarterly meeting of the Station's Board of Control held in Hartford (January 16); presented an update of Experiment Station research and survey activities on forest insects and pest and tick associated diseases at the *Annual Meeting of the Connecticut Tree Protective Association* held in Plantsville (300 attendees) (January 17); presented an update on Experiment Station activities at a meeting of the Experiment Station Associates Board of Directors held at the Station (8 attendees) (January 23); hosted and participated in the *2nd Annual Meeting of the Northeast Regional Center of Excellence in Vector-Borne Diseases*, held at the Station (100 attendees) (January 24-25).

## ANALYTICAL CHEMISTRY

**DR. JASON C. WHITE** participated in the weekly all-hands ZOOM call for the Center for Sustainable Nanotechnology (January 2, 9, 30); attended the CT Laboratory Preparedness Advisory Committee meeting at the Department of Public Health Laboratory in Rocky Hill (January 7); participated in a teleconference call with representatives from CT Department of Consumer Protection, CT Department of Public Health, and the CT Department of Agriculture on the formation of an FDA-funded Rapid Response Team in the state for biological and chemical contamination of the food supply (January 8); participated in a monthly faculty call for the Center for Sustainable Nanotechnology (January 11); along with **DR. WADE ELMER**, participated in a ZOOM call with CSN collaborators at Johns Hopkins University to discuss ongoing collaborative experiments (January 14); along with **DR. BRIAN EITZER**, **DR. CHRISTINA ROBB**, **DR. WALTER KROL**, **MS. TERRI ARSENAULT**, **MR. CRAIG MUSANTE**, **MR. JOHN RANCIATO**, **MR. MICHAEL AMMIRATA**, AND **MS. KITTY PRAPAYOTIN-RIVEROS**, hosted an assessor from the American Association for Laboratory Accreditation (A2LA) for our 2-year assessment of FDA accredited programs (January 15-16); met with a student and parent from Westside Middle School to describe our pesticide surveillance program and **DR. WALTER KROL** AND **DR. BRIAN EITZER** analyzed samples for his school science fair project (January 17); attended the project kick off meeting at Nanyang Technological University (NTU) in Singapore for a new collaborative research program between NTU, Harvard University T.H. Chan School of Public Health, and CAES (January 20-25); along with **DR. WADE ELMER**, hosted a bi-weekly "nano-agriculture" group call for the Center for Sustainable Nanotechnology (January 29); and hosted the monthly CAES J-1 Visa recipient meeting (January 31).

**DR. NUBIA ZUVERZA-MENA** has been mentoring Mona Elamin, a student at Gateway Community College, aiming to complete 150 hours of internship for an Environmental Science



and Toxicology Associates Degree (January 4-31).



Left- Dr. Jason C. White with Prof. Philip Demokritou (Harvard University; center) and Professor Kee Woie Ng (Nanyang Technological University; right). We are on the north shore of Singapore with Malaysia at our backs. Right- Kick off meeting for a new CAES, NTU, and Harvard collaborative project on nano-enabled agriculture.

## ENTOMOLOGY

**DR. KIRBY C. STAFFORD III** attended the TickNET meeting at Yale School of Public Health’s CT Emerging Infections Program to discuss design, distribution, and efficacy of a large-scale four-poster study in Connecticut and New York in 2019 (January 23); participated and presented talks entitled “Surveillance for *Amblyomma americanum* in NY and CT” and “Integrated Tick Management - A Connecticut Update” at the Northeast Regional Center for Excellence in Vector-Borne Diseases annual conference in New Haven (94 attendees) (January 24-25); and participated in continued discussion with US Biologic on collaborative publication of RTV study (January 31).

**MS. KATHERINE DUGAS** attended the Vegetable & Small Fruit Growers’ Conference held in South Windsor (January 7); staffed a CAPS and Forest Pest booth at the Annual Meeting of the CT Tree Protective Association held in Plantsville (January 17); and staffed a CAPS and Forest Pest booth at the CT Nursery and Landscape Association Winter Symposium held in Plantsville (January 23-24).

**MR. MARK H. CREIGHTON** attended and presented on honey bee health at the Connecticut Beekeepers Association Bee School held in Jones Auditorium (110 new beekeepers) (January 12).

**DR. MEGAN A. LINSKE** participated in a Northeast Fish and Wildlife Agencies annual conference planning call with members of CT DEEP and Delaney Meeting and Event Management group (January 11); participated in a conference call with US Biologic on collaborative publication of rodent targeted vaccine (RTV) study (January 18); attended the TickNET meeting at Yale School of Public Health’s CT Emerging Infections Program to discuss design, distribution, and efficacy of a large-scale four-poster study in Connecticut and New York in 2019 (January 23); attended and presented a poster entitled “Determining effects of winter weather conditions on nymphal *Ixodes scapularis* and adult *Amblyomma americanum* survival in Connecticut and Maine, USA” at the Northeast Regional Center for

Excellence in Vector-Borne Diseases annual conference in New Haven (94 attendees) (January 24-25); and participated in continued discussion with US Biologic on collaborative publication of RTV study (January 31).

**DR. CHRIS T. MAIER** presented a display on longhorned beetles in firewood and distributed manuals on caterpillars feeding on conifers at the Annual Meeting of the Connecticut Tree Protective Association in Southington (January 17).

**DR. VICTORIA L. SMITH** participated in a conference call with the membership of the Eastern Plant Board (10 participants) (January 11); participated in a meeting of the Yale University Biosafety Committee, held at 135 College Street (20 participants) (January 17); and participated in the Winter Symposium of the CT Nursery and Landscape Association, with a presentation entitled “Experiment Station Update”, held at the Aqua-Turf in Southington (200 participants) (January 23-24). In January 2019, CAES Inspectors issued 73 Federal Phytosanitary Certificates for export of plant products. This is the highest monthly total issued. Fifty seven of the Certificates were for consignments of tobacco destined to the Dominican Republic; the remaining consignments went to 8 other destinations, including Australia, Germany, Iran, Singapore, Trinidad and Tobago, and the United Arab Emirates.

## ENVIRONMENTAL SCIENCES

**DR. JOSEPH PIGNATELLO** gave a talk entitled “Biochars Tailored to Remove Nutrients from Animal Wastes” at the Soil Science Society of America International Soils Meeting held in San Diego, CA (50 attendees total, about 35 students) (January 8); and met with Thomas H. Epps, III, Professor of Materials Science and Engineering, University of Delaware, to discuss mutual research interests (January 23).

**DR. PHILIP ARMSTRONG** gave the talk “Vector Competence of *Ae. Albopictus*-Populations from the Northeastern US for Chikungunya and Zika viruses” at the Annual Meeting of the Northeast Regional Center for Excellence in Vector-Borne Diseases held at the station (140 attendees) (January 24); and a lecture entitled “Dengue and Other Arboviral Diseases” for the Principles of Infectious Diseases course held at the Yale School of Public Health (30 student attendees) (January 29).

**MR. GREGORY BUGBEE**, with **MS. SUMMER STEBBINS** gave an Invasive Aquatic Plant Workshop at the annual meeting of the Connecticut Association of Inland Wetland and Conservation Commissions in Cromwell (approx. 40 attendees) (November 11); with **MS. SUMMER STEBBINS** presented an invasive aquatic plant table and the CIPWIG meeting at the University of Connecticut, Storrs (approx. 200 attendees) (November 28); gave a talk entitled “2018 Aquatic Plant Survey of Lower Bolton Lake” to the Lower Bolton Lake Association (approx. 50 attendees) (November 11); gave two talks on *hydrilla* in the Connecticut River before the Northeast Aquatic Nuisance Species Panel in Portsmouth, NH (approx. 25 attendees) (December 3-4); with **MS. SUMMER STEBBINS** gave the talk “Brazilian Waterweed - Maybe Not as Tough as It Looks,” proctored the aquatic herbicide recertification program, and was elected Vice President of the Society at the Northeast Aquatic Plant Management Society meeting held in Albany, NY (January 8-10).

**DR. GOUDARZ MOLAEI** was interviewed by the New Haven Register on tick activity and human Lyme disease cases (<https://www.nhregister.com/news/article/Connecticut-not-likely-to-see-drop-in-Lyme-13530044.php>) (January 13); gave a talk entitled “Ticks and Tick-borne Diseases in Connecticut” at CAES to a symposium organized by Mosquito and Biting Fly Review Connecticut Grounds Keepers Association, CT Turf & Irrigation (71 attendees) (January 15); gave post-

er-pitch introductions for his co-authored posters, “Passive Tick Surveillance in Connecticut: Spatiotemporal Patterns of Pathogen Infection in *Ixodes scapularis* and Human Disease Cases,” “Distribution, Abundance, and Host Association of the Asian Tiger Mosquito, *Aedes albopictus*, as a Potential Vector of Arboviruses in Mid-Atlantic USA,” and “Vector-host Interactions and Population Genomics of *Culiseta melanura* (Diptera: Culicidae), the Principal Vector of Eastern Equine Encephalitis virus in the USA,” at the Annual meeting of the Northeast Regional Center for Excellence in Vector-borne Diseases (110 attendees) (January 24-25); and gave the talk, “*New Threats of Old Enemies: Enduring Challenge of Vector-borne Diseases in the 21<sup>st</sup> Century*”, to the group: Y’s Men of Meriden, CT (60 attendees) (January 29).

**MR. JOHN SHEPARD** gave two seminars, “Arbovirus Surveillance in Connecticut” and “Mosquitoes of Connecticut - Life Cycles and Habitats” in Jones Auditorium as part of a training workshop to prepare attendees for their Commercial Supervisory Certification Exams for Mosquito and Biting Fly Control (71 attendees) (January 15).

**DR. ANDREA GLORIA-SORIA** was interviewed by the New York Times for the Fixes column on “It takes a mosquito to fight a mosquito” (<https://www.nytimes.com/2019/01/08/opinion/mosquito-fighting-tropical-disease.html>) (January 4); and presented a poster entitled “Transmission of arboviruses by mosquito vectors to live vertebrate hosts is underestimated by in vitro assays” at the 2019 Northeast Regional Center for Excellence in Vector-borne Diseases meeting held at the Station (120 attendees) (January 24).

## FORESTRY AND HORTICULTURE

**DR. JEFFREY S. WARD** met with Will Hochholzer and Emery Gluck (CT DEEP) to discuss forest regeneration (January 16); attended the Annual Meeting of the Connecticut Tree Protective Association annual meeting held in Plantsville (January 17); and was interviewed about climate effects of tree species migration by Miranda Weiss of American Forests Magazine (January 30).

**DR. ABIGAIL A. MAYNARD** attended the Vegetable & Small Fruit Growers’ Conference held in South Windsor (January 7); assisted Wesleyan University students with their food waste composting operation in Middletown (4 students, 1 teacher) (January 9,16,30); reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation held in Middletown (18 adults) (January 16); and participated in a meeting of the steering committee of the 2019 New England Vegetable and Berry Conference in Goffstown, NH (January 23).

**DR. SCOTT C. WILLIAMS** participated in a conference call with members of the Northeast Regional Center for Excellence in Vector-Borne Diseases for annual planning for vector control and management (January 3); 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 (January 11); participated in a conference call with US Biologic on a collaborative publication of a rodent targeted vaccine study (January 18); attended the TickNET meeting at Yale School of Public Health’s Emerging Infections Program to discuss design, distribution, and efficacy of a large-scale 4-poster study to manage ticks on deer in Connecticut and New York (January 23); and presented a short talk entitled “Hydraulic vs. Backpack Sprayers for Tick Control: A Comparison” at the Northeast Regional Center for Excellence in Vector-Borne Diseases annual conference held at the station (94 attendees) (January 24,25).

**MR. JOSEPH P. BARSKY** attended the Annual Meeting of the Connecticut Tree Protective Association held in Plantsville (January 17).

## PLANT PATHOLOGY AND ECOLOGY

**DR. WADE ELMER** attended a cut flower workshop sponsored by UConn Extension in South Windsor (January 8); presented a talk entitled “Using Mineral Nutrition to Prevent Diseases in Greenhouse Crops” at the UMass Extension meeting “Greenhouse Production 2019 - Focus on Pest Management” held in Marlborough (35 adults) (January 9); participated in a Nano-Agriculture ZOOM conference call with the Center for Sustainable Nanotechnology (16 participants) (January 14); and attended the Connecticut Nursery and Landscape Association Winter Symposium held in Plantsville (January 23).

**DR. YONGHAO LI** staffed the CAES booth at the Vegetable & Small Fruit Growers’ Conference held in South Windsor (January 7); presented a talk entitled “Selection and Care of Houseplants” to the Guilford Garden Club in Milford (24 adults) (January 8); presented a talk entitled “Pruning 101” to the Burlington Garden Club in Burlington (32 adults) (January 10); met with Drs. Baikun Li, Yu Lei, and Shuresh Ghimire from UConn and discussed soil-borne fungal pathogen detection using biosensors for a potential USDA grant proposal in New Haven (January 15); staffed the CAES booth at the Annual Meeting of the CT Tree Protective Association held in Plantsville (January 17); staffed the CAES booth at the CT Nursery Landscape Association Winter Symposium held in Plantsville (January 23); and participated in the UConn Bedding Plant Program for Greenhouse Growers and presented “Root Rots, Mildews, and Blights” in Torrington (40 adults) (January 29).

**DR. ROBERT MARRA** presented a talk entitled “Drought and Its Impact on Trees” to the Guilford Garden Club in Guilford (60 adults) (January 9); and assisted in staffing the CAES table at the Annual Meeting of the Connecticut Tree Protective Association held in Plantsville (749 adults) (January 17).

**DR. QUAN ZENG** attended the Skypecommittee meeting of graduate student, Khumbuzile Bopela from the University of Pretoria, South Africa (January 29).

## VALLEY LABORATORY

**DR. JATINDER S. AULAKH** presented a poster entitled “Role of N-Fertilization and Herbicides in Integrated Management of Mugwort in a Cool-Season Grass Pasture” (approx. 140 visitors) and served as co-chair for the turf and ornamental section at the Northeastern Plant, Pest, and Soil Conference held in Baltimore, MD (January 8 - 10).

**DR. CAROLE CHEAH** attended and helped staff the CAES booth at the Annual Meeting of the Connecticut Tree Protective Association held in Plantsville (January 17); was interviewed by Jill Dion, Editor for the Milford Mirror, for an article on biological control of mile-a-minute weed on Charles Island, Silver Sands State Park, Milford (January 18); was filmed and interviewed on the impacts of winters and climate change on hemlock woolly adelgid on eastern hemlocks by Nate Murray and Cody Pfister of Local Motives, Inc., a nonprofit organization from Ohio, which is producing video documentaries from all 50 states to communicate local perspectives on environmental issues such as climate change (January 25); and was interviewed by Patrick Skahill, for WNPR/CT Public Radio, on the effects of the polar vortex on hemlock woolly adelgid and other stressors of eastern hemlock (January 30).

**DR. RICHARD COWLES** presented “Turf and landscape insect update” for the Site One’s edu-

cation seminars (January 15, Darien, 50 attendees and January 16, Meriden, 80 attendees); discussed “The eastern hemlock pest complex: thirty years later” with the NY State Turf and Landscape Association in Westchester, NY (80 attendees) (January 15); discussed “Hard to control pests” with nursery and greenhouse managers at the Helena educational seminars held in Ledyard (70 attendees) (January 16); shared “Phytophthora root rot” with the NJ Christmas Tree Growers’ Association in Bordentown, NJ (80 attendees) (January 26); and taught “Ready, Set, Plant!” to the Christmas Tree Farmers of New York regional meeting in Millbrook, NY (30 attendees) (January 31).

**DR. JAMES LAMONDIA** participated in the Vegetable & Small Fruit Growers’ Conference held in South Windsor (January 7); and spoke about hop production in Connecticut and integrated pest management at the CT Hop Growers Association annual meeting held in Northford (25 attendees) (January 12).

## DEPARTMENTAL RESEARCH UPDATES JANUARY 2019

Burcham, D.C., Brazee, N.J., Marra, R.E., Kane, B., 2019. Can sonic tomography predict loss in load-bearing capacity for trees with internal defects? A comparison of sonic tomograms with destructive measurements. *Trees*. <https://doi.org/10.1007/s00468-018-01808-z>.

**Abstract-** The measurement and assessment of internal defects is an important aspect of tree risk assessment. Although there are several methods for estimating the reduced load-bearing capacity of trees with internal defects, the advancement of these methods has not kept pace with improvements to methods used to measure the internal condition of trees, such as sonic tomography. In this study, the percent reduction to the section modulus, ZLOSS (%), caused by internal defects was estimated using 51 sonic tomograms collected from three tree species, and the accuracy of measurements was assessed using the destructively measured internal condition of the corresponding cross sections. In tomograms, there was a repeated underestimation of the percent total damaged area, AD (%), and a repeated overestimation of the offset distance between the centroid of the trunk and the centroid of the largest damaged part, LO (m). As a result, ZLOSS determined using tomograms was mostly less, in absolute terms, than that determined from destructive measurements. However, the accuracy of these estimates improved when using colors associated with intermediate sonic velocities to select damaged parts in tomograms, in addition to the colors explicitly associated with the slowest sonic velocities. Among seven mathematical methods used to estimate ZLOSS, those accounting for LO were more accurate than others neglecting it. In particular, a numerical method incorporating greater geometric detail, called zloss, gave estimates that were consistently better than six other analytical methods.

Cao, Y.; Ma, C.; Zhang, J.; Wang, S.; **White, J.C.**; Xing, B.; Chen, C. 2019. Accumulation and spatial distribution of copper in willow as affected by soil flooding: A synchrotron-based X-ray fluorescence study. *Environ. Poll.* [doi.org/10.1016/j.envpol.2018.12.025](https://doi.org/10.1016/j.envpol.2018.12.025).

**Abstract-** Copper (Cu)-induced phytotoxicity has become a serious environmental problem as a consequence of significant metal release through anthropogenic activity. Understanding the spatial distribution of Cu in plants such as willow is essential to elucidate the mechanisms of metal accumulation and transport in woody plants, particularly as affected by variable environment conditions such as soil flooding. Using synchrotron-based X-ray fluorescence (XRF) techniques, the spatial distribution of Cu and other nutrient elements were investigated in roots and stems of *Salix (S.) integra* exposed 450 mg·kg<sup>-1</sup> Cu under non-flooded (NF)/flooding (F) conditions for 90 d. The tolerance index (TI) suggested that *S. integra* exhibited higher Cu tolerance under the F condition than in the NF condition. Cu was mainly accumulated in the roots of *S. integra*; the Cu root concentration was 73, 86 and 23-fold higher than that in leaves, stems and cuttings, respectively. In the roots, the Cu was preferentially located in the root cap and meristematic zone of the root tips. The highest concentration of Cu was observed in root epidermis for both NF and F treatment. Under the NF conditions, the Cu intensity in the root epidermis was higher than that of the F condi-

tions, suggesting the soil flooding significantly inhibited Cu uptake by *S. integra*. The pattern of the Cu spatial distribution in the *S. integra* stem suggests that the F condition severely reduced Cu transport via the xylem vessels. To our knowledge, this is the first study to report the in vivo Cu distribution in *S. integra* in a scenario of co-exposure to the Cu and the soil flooding over a long period. The finding that Cu uptake varies significantly with flooding condition is relevant to the development of strategies for plants to detoxify the metals and to maintain the nutrient homeostasis.

Deng, R.; Zhu, Y.; Hou, J.; White, J.C.; Gardea-Torresdey, J.L.; Lin, D. 2019. Antagonistic toxicity of carbon nanotubes and pentachlorophenol to *Escherichia coli*: Physiological and transcriptional response. *Carbon*. 145:658-667

**Abstract-** With their accelerated production and application, engineered nanoparticles (NPs) are increasingly being released into the environment. The discharged NPs can potentially interact with pre-existing contaminants, resulting in joint toxicities that are poorly understood. Here, we investigated the individual and joint toxicities of carbon nanotubes (CNTs), a commonly utilized NP, and pentachlorophenol (PCP), a toxicant to a model bacterium, *Escherichia coli*. Bacterial growth inhibition, cell morphology and structure changes, surface properties of CNTs and bacteria, interactions among CNTs, PCP, and bacteria, oxidative stress, and the bioaccumulation of CNTs and PCP were assayed. Transcriptome sequencing (RNA-seq) technology was used to analyze bacterial responses to CNTs and/or PCP in the co-exposure system. As determined by the toxic unit index, co-exposure of CNTs and PCP led to antagonistic toxicity to bacterial growth; decreased CNT bioaccumulation (compared with 0 mg/L PCP, the accumulated concentration of CNTs was decreased by 31.8% in the presence of 9.2 mg/L PCP) and intracellular ROS generation likely account for these findings. At the transcriptional level, CNTs attenuated the PCP-induced disturbances of gene expression in biosynthetic, protein metabolic, and small molecule metabolic processes, as well as for organelles. This work significantly adds to our understanding of the ecological risk of discharged CNTs in the environment.

Elmer, W., Maderias, A., Yavuz, S., Schultes, N. P. 2019. Fusarium Flower Rot of Threadleaf Coreopsis (*Coreopsis verticillata*) in Connecticut and Massachusetts caused by *Fusarium succisae*. *Plant Disease* <https://doi.org/10.1094/PDIS-11-18-1997-PDN>.

**Abstract-** Flower rot of threadleaf coreopsis (*Coreopsis verticillata*) was first observed in Korea in 2010 (Choi et al. 2014). Signs and symptoms include flower bud rot, mycelium, and pinkish sporodochia bearing spores characteristic of a *Fusarium* species identified as *Fusarium succisae*. The same disease has been observed in New England since 2012, but neither Koch's Postulates nor molecular genotyping have ever been performed on any putative pathogen. In 2017, diseased coreopsis flowers were collected from a nursery in Connecticut and a greenhouse in Massachusetts. Pieces of flower tissue were surface-disinfested with 0.525% NaOCl (10% household bleach) for 30 sec, rinsed thoroughly with distilled water, and placed on peptone PCNB agar (Leslie and Summerell 2006). After 5 to 7 days colonies were transferred to carnation leaf agar and incubated for 7 days under 12 hour photoperiods at 21-25 °C. Single conidia from each colony were sub-cultured onto carnation leaf agar and the resulting colonies identified as *Fusarium* spp. based on macroconidia morphology. Sporodochia were not observed in culture. Macroconidia were falcate, distinctly curved, and borne on monophialides or polyphialides. Microconidia were common and appeared oval, allantoid, or pyriform, had 1 to 2 septa, and were borne in false heads. Chlamydospores were absent. Morphology was consistent with descriptions of *F. succisae* (Leslie and Summerell 2006). Genomic DNA from six CT isolates (CAES F. suc #2-7) was amplified by PCR using primers for the internal transcribed spacer region (*ITS*) and partial translation elongation factor 1 (*EF1-a*). A BLASTn query and sequence alignment revealed that the ITS sequences were 100% identical to *F. succisae* (GenBank Accession Nos. KC464634.1, KC464633.1, and KJ439120.1). The *EF1-a* sequences were 100% identical to those of the Korean isolates (Choi et al. 2014) and 99.5% similar to NRRL13613 (GenBank Accession No. AF160291). Sequences were deposited in GenBank (*ITS* sequences MK127936, MK127555, MK130958 - MK130961, and *EF1-a* sequences MK140607- MK140612). Koch's Postulates were satisfied using 3-mo. old *Coreopsis* spp. Big Bang Hybrid 'Cosmic Eye' plants that were just beginning to bloom. Conidia from three isolates (two from CT and one from MA) were increased on 25% potato dextrose agar (Leslie et al. 2006) for 7 days at 25°C, washed with sterile distilled water, and enumerated to 1 X 10<sup>6</sup>

conidia/ml. Twenty  $\mu$ l of the conidial suspension were pipetted onto unopened flower buds. Ten flowers from three plants each were inoculated for each isolate. Flower buds treated with distilled water served as controls. Plants were held in the greenhouse in clear plastic humidity tents for 7 days. Two weeks after inoculation mycelium was observed on inoculated buds similar to, but not on buds treated with distilled water. After three weeks, all inoculated buds were diseased. *F. succisae* was re-isolated from the inoculated flowers. Our results indicate that this pathogen may have achieved a wide distribution on threadleaf coreopsis.

Ostiguy, N.; Drummond, F.A.; Aronstein, K.; Eitzer, B.; Ellis, J.D.; Spivak, M.; Sheppard, W.S. 2019. Honey Bee Exposure to Pesticides: A Four-Year Nationwide Study. *Insects* 10,13; doi:10.3390

**Abstract-** Pollinators, including honey bees, are responsible for the successful reproduction of more than 87% of flowering plant species: they are thus vital to ecosystem health and agricultural services world-wide. To investigate honey bee exposure to pesticides, 168 pollen samples and 142 wax comb samples were collected from colonies within six stationary apiaries in six U.S. states. These samples were analyzed for evidence of pesticides. Samples were taken bi-weekly when each colony was active. Each apiary included thirty colonies, of which five randomly chosen colonies in each apiary were sampled for pollen. The pollen samples were separately pooled by apiary. There were a total of 714 detections in the collected pollen and 1008 detections in collected wax. A total of 91 different compounds were detected: of these, 79 different pesticides and metabolites were observed in the pollen and 56 were observed in the wax. In all years, insecticides were detected more frequently than were fungicides or herbicides: one third of the detected pesticides were found only in pollen. The mean (standard deviation (SD)) number of detections per pooled pollen sample varied by location from 1.1 (1.1) to 8.7 (2.1). Ten different modes of action were found across all four years and nine additional modes of action occurred in only one year. If synergy in toxicological response is a function of simultaneous occurrence of multiple distinct modes of action, then a high frequency of potential synergies was found in pollen and wax-comb samples. Because only pooled pollen samples were obtained from each apiary, and these from only five colonies per apiary per year, more data are needed to adequately evaluate the differences in pesticide exposure risk to honey bees among colonies in the same apiary and by year and location.

Zhao, L.; Zhang, Z.; Wang, J.; Tian, L.; Li, F.; Liu, S.; Peralta-Videa, J.; Gardea-Torresdey, J.G.; White, J.C.; Huang, Y.; Keller, A.; Rong, J. 2019. C60 Fullerols enhance copper toxicity and alter the leaf metabolite and protein profile in cucumber. *Environ. Sci. Technol.* DOI: 10.1021/acs.est.8b06758.

**Abstract-** Crop production is often limited by abiotic and biotic stress factors. Radical Scavengers of oxygen radicals may help plants tolerate or overcome stress. Here, C60(OH)24 nanoparticles (NPs) with free radical scavenging activities were fabricated and were evaluated for their ability to alleviate Cu-induced oxidative stress in cucumber plants. The molecular mechanisms of plant response to C60(OH)24 NPs were investigated via “omics” approaches. Unexpectedly, low doses of C60(OH)24 NPs enhanced Cu-induced toxicity in plants by increasing the influx of copper into the cell, either through disruption of cell membrane permeability or by uptake of the Cu-C60(OH)24 complex (i.e., ‘Trojan horse effect’). Although there was no overt phytotoxicity, C60(OH)24 NPs altered both the metabolite and protein profiles of exposed plants. The up-regulation of defense-responsive metabolites, such as 3-hydroxyflavone, 1,2,4-benzenetriol, methyl trans-cinnamate, quinic acid, dehydroascorbic acid, DL-anabasine and phytol, and the down-regulation of cell membrane composition metabolites (e.g. linolenic acid, palmitoleic acid, 2-monopalmitin) were observed in cucumber leaves exposed to C60(OH)24 NPs. Proteomic analysis revealed that C60(OH)24 NP triggered (1) the up-regulation of chloroplast proteins involved in electron transport (PSII), light-harvesting (Cyt) and pigment fixation (Mg-PPIX), as well as those of glycolysis (GPI, GAPDH, PDC); and (2) the down-regulation of TCA cycle proteins (MDH, Aconitase, SCoAL). Our results show that although C60(OH)24 NPs can scavenge free radicals in vivo, this material does alter the metabolic network in plants; thus warranting caution when planning to use this material for agricultural applications.

## JOURNAL ARTICLES APPROVED JANUARY 2019

Allan-Perkins, Elisha, D. Manter, and G. Jung. Soil Microbial Communities on Roughs, Fairways, and Putting Greens of Cool-Season Golf Courses. *Crop Science*

Aulakh, Jatinder S. Role of N-Fertilization and Herbicides in Integrated Management of Mugwort (*Artemisia vulgaris* L.) in a Cool-Season Grass Pasture. *Proceedings - Volume 4, The Northeastern Plant, Pest, and Soils Conference 2019*

Aulakh, Jatinder S. Weed Control Efficacy and Christmas Tree Tolerance to Pre and Postemergence Herbicides. *Proceedings - WSSA 2019 Meetings and Abstracts*

Cao, Y., Chuanxin Ma, G. Chen, J. Zhang, Jason C. White, and B. Xing. Copper Stress in Flooded Soil: Impact on Rhizosphere Soil Enzymes, Microbial Community Composition and Diversity. *Land Degradation and Development*

Ceah, Carole. Hemlock Woolly Adelgid (HWA) and Other Factors Impacting Eastern Hemlock. *CAES Fact Sheet*

Ceah, Carole and D. Ellis. Spread of Mile-a-Minute Vine, *Persicaria perfoliata* L. (Polygonaceae) to Connecticut Islands in Long Island Sound. *Rhodora*, the Journal of the New England Botany Club

da Silva, Washington. Grapevine Fanleaf Degeneration/Decline Disease. *CAES Fact Sheet*

Hao, Y., Y. Wang, Chuanxin Ma, Jason C. White, et al. Carbon Nanomaterials Increase Methane Production from Livestock Manure in an Anaerobic Digestion System. *Bioresource Technology*

Keyel, A. C., O. E. Timm, P. B. Backenson, C. Prussing, S. Quinones, K. McDonough, M. Vuille, J. E. Conn, Philip M. Armstrong, Theodore G. Andreadis, and L. Kramer. Seasonal Temperatures and Hydrological Conditions Improve the Prediction of West Nile Virus Infection Rates in *Culex* Mosquitoes and Human Case Counts in New York and Connecticut. *PLOS ONE*

Krichilsky, E., M. Centrella, Brian D. Eitzer, B. Danforth, K. Poveda, and H. Grab. Fungicide Exposure and Landscape Composition Influence Host-Pathogen Dynamics in a Solitary Bee. *Journal of Applied Ecology*

Li, Yonghao. Delphinella Shoot Blight of Fir. *CAES Fact Sheet*

Li, Yonghao. Disease Alert: Delphinella Shoot Blight of Fir. *The Real Tree Line*

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**Dr. Zhengyang “Philip” Wang** joined the Station on January 18<sup>th</sup>, 2019 as a Postdoctoral Scientist in Dr. Joseph Pignatello’s group. He was born in Guizhou Province, P. R. China. He earned his Ph.D. degree in Environmental Engineering at University of Missouri-Columbia in 2018. There, he studied iron-based carbon materials for removal of arsenic from water. At CAES he will study modified biochars to be used for removal of excess nutrients from animal wastes for recycling. Feel free to stop by his office in Room 213 or the laboratories on the third floor of the Slate Laboratory to talk about research or anything else.



**Mr. Andrew T. Forgetta**, an undergraduate student from Southern Connecticut State University, joined the laboratory of Dr. Quan Zeng in Plant Pathology and Ecology on January 28, 2019 as a laboratory intern. He will work on a project of fire blight biological control at the station for 15 weeks.



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