Station News

The Connecticut Agricultural Experiment Station
Volume 9 Issue 11 December 2019

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

CAES
The Connecticut Agricultural Experiment Station
Putting Science to Work for Society since 1875

This Issue

Administration	2
Analytical Chemistry	2
Entomology	4
Environmental Sciences	5
Forestry and Horticulture	6
Plant Pathology and Ecology	7
Valley Laboratory	8
Dept. Research Updates	8
Journal Articles Approved	10
Articles of Interest	11
Griswold Research Center	12

ADMINISTRATION

DR. THEODORE ANDREADIS was interviewed about eastern equine encephalitis activity in the northeastern US this year and the prospects for next year by Ray Hardman, CT Public Radio (November 5); attended the annual meeting of the Connecticut Working Lands Alliance held in Hartford (November 13); attended a Board Meeting of the Experiment Station Associates held at the Station (November 13); attended the annual meeting of the Connecticut Farm Bureau held in Wallingford (November 21); and attended a meeting held at the State Capitol with representatives from the Governor's office and commissioners of the Departments of Public Health, Energy and Environmental Protection, and Agriculture to review this year's response to the outbreak of eastern equine encephalitis in the state and plans for next year (November 25).

ANALYTICAL CHEMISTRY

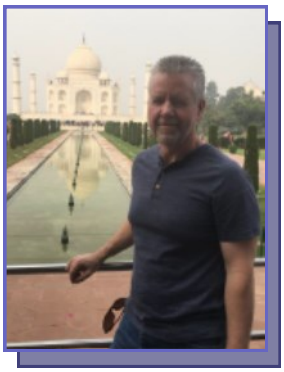
DR. JASON C. WHITE welcomed Prof. Chun Song of Sichuan Agricultural University; Prof. Song will be working at CAES for the next year on nano-enabled agriculture with funding from the China Scholarship Council (CSC) (November 2); was an invited speaker at the Golden Jubilee International Conference on New Millennia Agriculture at CCS Haryana Agricultural University in Hisar, Haryana, India, and gave a lecture entitled "Nanotechnology in agriculture: Balancing applications and implications" (125 attendees) (November 2-8); hosted the monthly "Nanochem-plant" working group ZOOM call for the Center for Sustainable Nanotechnology (CSN) (November 12); participated in a ZOOM call with collaborators from Johns Hopkins University regarding an EPA grant submission (November 12); participated in the weekly "all-hands" call for the CSN (November 13); along with **DR. BRIAN EITZER, DR. WALTER KROL, DR. CHRISTINA ROBB, MS. TERRI ARSENAULT, MR. CRAIG MUSANTE,** and **MS. KITTY PRAPAYOTIN-RIVEROS,** participated in the monthly FDA FERN cCAP WebEx call (November 12); participated in a Faculty ZOOM call for the CSN (November 14); hosted the monthly CAES J-1Visa recipients meeting (November 15); along with **DR. CHUANXIN MA,** participated in a ZOOM called with collaborators at the Harvard University TH Chan School of Public Health to discuss manuscript preparation (November 15); participated in a ZOOM meeting for the Nanyang Technological University-Harvard University TH Chan School of Public Health Initiative for Sustainable Nanotechnology (SusNano) (November 18); and hosted a class from Wesleyan University and provided a tour/description of department programs and laboratories (10 attendees) (November 20).

DR. CHRISTINA ROBB, with **DR. BRIAN EITZER,** hosted 908 Devices and a representative from the CST mobile lab and a demonstration of Zip Chip technology as a novel, alternative technique to separate ionic compounds prior to high resolution mass spectrometric detection was performed (November 4); discussed abrin analysis with the Division of Infectious Diseases, Wadsworth Center, New York State Dept. of Health (November 8); visited the Departments of Cell and Molecular Biology and the department of Chemistry at the University of Rhode Island to discuss research possibilities (November 15); assisted in running the Eastern Analytical Symposium (EAS) as vice-chair of short courses (November 17) and a member of the board attending the board meeting long-term program planning meeting (November 18), 2020 program meeting (November 19); and presented an electronic poster at EAS entitled "Abrin analysis by LC/MS," co-authored by **DR. WALTER KROL** and Dr. Kirk Gaston of the Forensic Chemistry Center of the FDA (November 20).

DR. BRIAN EITZER presented a seminar entitled "Environmental applications of mass spectrometry" to students and professors of the Chemistry Department of Southern Connecticut State University in Danbury (25 attendees) (November 8), and was a participant in the conference call of the North American Chemical Residue Workshop's Organizing Committee (November 14).

DR. NUBIA ZUVERZA MENA presented a talk entitled "Can ceria nanoparticles inhibit the effects of the short chain perfluoroalkyl substance PFBS on plants?" at the Sustainable Nanotechnology Organization annul meeting in San Diego, CA (November 7); presented a guest lecture at the University of Connecticut (UCONN) for the class PVS 1000, Biomedical Issues in Pathobiology with a talk entitled "Nanomaterials: Applications and Implications" (November 13); and was appointed Assistant Research Scientist, a gratis adjunct faculty position for the Dept. of Plant Science and Landscape Architecture at the UCONN College of Agriculture, Health and Natural Resources (November 13).

Prof. Chun Song (center, back) from Sichuan Agricultural University will be working at CAES on nano-enabled agriculture for the next year.



Dr. Jason C. White lecturing at CCS Haryana Agricultural University in Hisar, India, and at the Taj Mahal in Agra, India.

ENTOMOLOGY

DR. KIRBY C. STAFFORD III spoke on "Ticks: It's More Than Just Lyme Disease" at the annual meeting of the Connecticut Environmental Health Association in Portland, CT (60 attendees) (November 1); spoke on "Lyme Disease and Tick Control" at the annual meeting of the Connecticut Master Gardener Association in Jones Auditorium (40 attendees) (November 2); presented the talk "Review of the 'Natural' Product Minefield for Bed Bug Control" at Bed Bug Forum XI in Jones Auditorium (68 attendees) (November 7); participated in a conference call of the Tick Biology, Ecology and Control subcommittee of the Tick Borne Disease Working Group (November 14 , 18); spoke to Wesleyan University students touring the Station about Entomology (November 20); and participated in a meeting of the Cooperative Agriculture Pest Survey in Wallingford (13 participants) (November 21).

MS. KATHERINE DUGAS gave an update on the recent Spotted Lanternfly interception to the Southbury Garden Club (40 attendees) (November 1); taught an insect taxonomy and identification class to Advanced Master Gardeners at the Haddam Cooperative Extension office (5 attendees) (November 13); with **DR. KIRBY STAFFORD** and **DR. VICTORIA SMITH**, attended and ran the fall State CAPS Committee meeting held at the PPQ office in Wallingford (13 participants) (November 21); and attended and staffed a CAPS and Forest Pest booth at the annual CT Association of Conservation and Inland Wetlands Commissions (CACIWC) meeting held in Cromwell, where she also gave a 60-minute workshop talk about the Cooperative Agricultural Pest Survey Program and invasive pest surveys (50 attendees) (November 23).

MR. MARK H. CREIGHTON moved an apiary at West Rock Nature Center to a new location on the property, due to recent storm damage to the area (November 27).

DR. MEGAN LINSKE with **DR. SCOTT WILLIAMS**, **MR. MICHAEL SHORT**, and **MS. JAMIE CANTONI** were interviewed by Chris Woodside, Environmental Writer for The Connecticut Health Investigative Team, on current and ongoing research and management pertaining to the link between forest and public health (November 6); with **DR. SCOTT WILLIAMS**, **MR. MICHAEL SHORT**, and **MS. JAMIE CANTONI** met with Jim Tomlinson about management strategies for Japanese barberry on Lyme Land Trust properties (November 6); with **DR. SCOTT WILLIAMS** participated in a conference call with Dr. Erika Machtinger, Assistant Professor of Entomology at Pennsylvania State University, about small mammal trapping methodology and manuscript publication (November 6); and conducted the CT FFA Forestry Career Development Event (CDE) with 11 participating high schools at Lockwood Farm with **DR. SCOTT WILLIAMS**, **MR. MICHAEL SHORT**, and **MR. JOSEPH BARSKY** (approx. 50 attendees) (November 22).

DR. GALE E. RIDGE held Bed Bug Forum XI in Jones Auditorium at the Experiment Station (74 attendees) (November 7); gave a lunchtime lecture on bed bugs and Delusory Parasitosis at UCONN's Hospital for Special Care in New Britain (45 attendees) (November 20); and with Mike Lipsett (on right, Dr. Ridge center), was interviewed on the magazine program CT-Style (Channel 8) about bed bugs and what and what not to do in managing bed bugs at home (November 21).

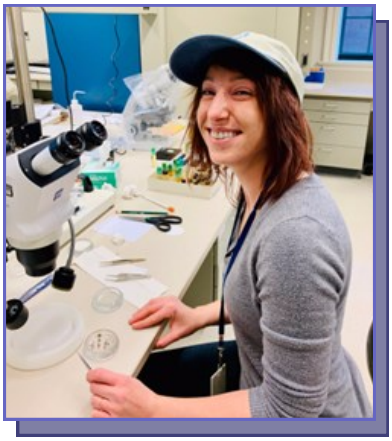
DR. CLAIRE E. RUTLEDGE taught "Tree Conditions Laboratory" for Arboriculture 101, at the Connecticut Tree Protective Association office in Wallingford (45 attendees) (November 6).

DR. VICTORIA L. SMITH participated in the annual meeting of the US Forest Service Cooperators, held at the Full Moon Resort in Big Indian, NY, and presented results of the 2019 aerial survey of pests and diseases, and general forest health issues, including beech leaf disease and spotted lanternfly (30 participants) (November 6-7); and participated in the autumn meeting of the Cooperative Agricultural Pest Survey committee, held at the USDA Plant Protection and Quarantine offices in Wallingford (13 participants) (November 21).

DR. KIMBERLY A. STONER spoke at the SALT (Smaller American Lawns Today) Conference at Connecticut College on "Pollinator Habitats: Recent Research" (80 attendees) (November 9).

MS. JAMIE CANTONI originally started working at the Station in the spring of 2014 as a mosquito trapper for the Center for Vector Biology and Zoonotic Diseases. She remained with the Station through the spring of 2016 under the direction of the Department of Forestry and Horticulture, but left to pursue her passion for marine science, working for several zoos and aquariums in both Connecticut and Australia. Jamie realized how much she missed the Station, and returned in the summer of 2018 to work in the Department of Entomology under Dr. Kirby Stafford. She was hired as a Research Assistant III to work on the active surveillance and Center of Excellence tick programs in October 2019.

Mike Lipsett (on right, **Dr. Gale Ridge** center) was interviewed on the magazine program, CT-Style (Channel 8) about bed bugs and what and what not to do in managing bed bugs at home (November 21).



Ms. Jamie Cantoni

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO gave a talk entitled "Some ways to modify chars for enhanced binding of certain organic and inorganic contaminants" at the ASA-CSA-SSSA Annual Meeting held in San Antonio, TX (approx. 75 attendees total; approx. 45 students) (November 9-14); and participated in a conference call with group leaders from GeoSyntec and the University of Maryland at College Park on a collaborative grant proposal (November 21).

DR. PHILIP ARMSTRONG was interviewed by the Comcast Newsmakers program to speak about the EEE virus outbreak in New England (November 12); and gave a talk entitled "Transmission of arboviruses by mosquito vectors to live vertebrate hosts is underestimated by in vitro assays" (100 attendees) and attended the executive council meeting of the American Committee of Medical Entomology at the Annual Meeting of the American Society of Tropical Medicine and Hygiene held in Na-

tional Harbor, MD (November 20-24).

MS. ANGELA BRANSFIELD participated in the Sandia National Laboratories' Biosafety Twinning Program held at Yale University (November 22).

MR. GREGORY BUGBEE gave a talk entitled "Hydrilla in the Connecticut River" at the United States Army Corps of Engineers Natural Resource Training Workshop held at the O'Neil Federal Building in Boston, MA (approx. 100 attendees) (November 15); with Judy Preston of CT Sea Grant, gave the talk entitled "Connecticut River Estuary Invasive SAV's: Are we at the tipping point?" at the Long Island Sound Study Habitat Restoration & Stewardship Workgroup Meeting held in Setauket, NY (approx. 30 attendees) (November 21); and with MS. SUMMER STEBBINS gave a talk entitled "Pachaug Pond aquatic plant report 2019" at a meeting of the Pachaug Pond Water Control Authority held at the Griswold Town Hall (approx. 30 attendees) (November 25).

DR. J.R. McMILLAN presented a poster entitled "Mosquito and arbovirus community composition in the northeast U.S." at the American Society for Tropical Medicine and Hygiene Annual Meeting held in National Harbor, MD (November 20-24).

DR. GOUDARZ MOLAEI hosted a tour group of students from Wesleyan University in the Tick Testing Laboratory (approx. 20 student attendees) (November 20); and was interviewed by the Managing Editor for the *New England Journal of Medicine* on the range expansion of the lone star tick and its implications for tick-borne disease dynamics in the Northeast to be later available as a podcast (November 21).

DR. SARA NASON gave a talk entitled "Use of LC-HRMS to assess chemical transformations during anaerobic digestion" (approx. 70 attendees); gave a poster entitled "Hemp phytoremediation of AFFF contamination at the Former Loring Air Force Base" and chaired a session at the Society for Environmental Toxicology and Chemistry North America meeting held in Toronto, Canada (November 3-7); presented a poster entitled "Hemp phytoremediation of AFFF contamination at the Former Loring Air Force Base" at the Sussex Plant Biology Symposium in New Haven (November 15); hosted a visit from Dr. Krystal Pollitt of the Department of Environmental Health at Yale University (November 12); and mentored students on science fair projects at the Sound School in New Haven (November 21).

MR. JOHN SHEPARD spoke to a group of visiting students from Wesleyan University on the Mosquito Trapping and Arbovirus Surveillance Program (9 attendees) (November 20).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD, with **MR. JOSEPH BARSKY**, met with staff of White Memorial Foundation, The Nature Conservancy - Connecticut, Regional Water Authority, and CT DEEP - Forestry to provide an update on research discoveries and discuss continued collaborative research (10 attendees) (November 5); planted a white oak donated by CTPA in Mixville Park (Cheshire) with David Rochford in celebration of the 100th anniversary of the arborist law insuring quality tree care for Connecticut's residents (November 8); spoke on "A short history of the Connecticut forest" to the Old Guard in West Hartford (108 attendees) (November 12); participated in an NESAF 2020 planning committee conference call (November 12); spoke on invasive plant identification and control in Woodbridge (18 attendees) (November 18); and met with CT NRCS staff in Tolland to discuss influence of soils and topographic features on tree growth (6 attendees) (November 19).

DR. ABIGAIL A. MAYNARD attended a meeting of the Connecticut Soil and Water Conservation Soil Health Committee in Middletown (November 6); talked about the New Crops Program with Don Offinger of Offinger Farm in Wilton (November 12); assisted in greenhouse culture with Lower

School students from Hamden Hall Country Day School (23 students, 3 teachers) (November 15,18); staffed the CAES display at the Connecticut Farm Bureau Association Annual Meeting held in South Windsor (November 21); inspected the food composting operation at Wesleyan University in Middletown (4 students, 1 teacher) (November 22).

DR. SCOTT C. WILLIAMS, with **DR. MEGAN LINSKE, MR. MICHAEL SHORT**, and **MRS. JAMIE CANTONI,** were interviewed by Chris Woodside, Environmental Writer for the Connecticut Health Investigative Team on ongoing research linking forest and public health in Westbrook (November 6); with **DR. MEGAN LINSKE, MR. MICHAEL SHORT**, and **MS. JAMIE CANTONI,** met with Jim Tomlinson about management strategies for Japanese barberry on Lyme Land Trust properties in Lyme (November 6); with **DR. MEGAN LINSKE**, participated in a conference call with Dr. Erika Machtinger, Assistant Professor of Entomology at Pennsylvania State University, about small mammal trapping methodology manuscript publication (November 6).

MR. JOSEPH P. BARSKY participated in an NESAF 2020 planning committee conference call (November 12); spoke on "Careers in natural resources" during the Cheshire High School Career Day Event (80 students) (November 19); met with Mr. Anthony Pietrini in Southbury to discuss invasive plant species control methods (November 19).

MR. MICHAEL R. SHORT, with **DR. SCOTT WILLIAMS, DR. MEGAN LINSKE**, and **MR. JOSEPH BARSKY**, hosted and served as judges at the FFA Forestry Career Development Event held at Lockwood Farm (48 students, 12 teachers) (November 22).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER met with two undergraduate students and Dr. Tim Pusack, of the Marine Ecology & Marine Science at Williams-Mystic in Mystic at Hammonasset Beach State Park to inspect and sample Sudden Vegetation dieback sites (November 5); presented the topic "Try a little salt on your asparagus" at the Green Café at Yale University (17 attendees) November 7); participated with **DR. JASON WHITE** in the biweekly Center for Sustainable Nanotechnology (CSN) zoom conference meeting (November 12); attended the Ian Sussex Plant Biology Symposium in Jones Auditorium (November 15); met with Mr. Andrew Bramante of Greenwich High School and his student and discussed a science project with his student (November 19); participated in an Editorial Board Conference Call meeting for the American Phytopathological Society (November 20); presented an invited lecture entitled "Nanoparticles for crop health" at the 13th Postgraduate Colloquium held at the Autonomous University of Queretaro, Mexico (69 attended) (November 22); presented an invited lecture entitled "Use of Nanotechnology in Plant Pathology" at the XIX International Symposium on Plant Disease Management held at the Federal University of Lavras in Lavras, Brazil (64 attendees) (November 26-28).

DR. YONGHAO LI presented "Selection and care of houseplants" in the Canterbury Public Library in Canterbury (10 adults attendees) (November 4); presented "Fungi and fungicides – Every gardener needs to know" for the UConn Advanced Master Gardener Program held in Torrington (16 adult attendees) (November 6); lectured on "Tree Diseases" in the Arboriculture 101 Hands-on Night Class held in Wallingford (27 adult attendees) (November 6); presented "Pruning 101" for the UConn Advanced Master Gardener Program in Vernon (16 adult attendees) (November 7); presented "Plant diseases and their management in landscapes" for the CT NOFA Organic Land Care Accreditation Program (46 adult attendees) (November 13); and spoke about the Plant Disease Information Office and disease diagnostics to a group of visiting Wesleyan University students, led by Professor Rosemary Ostfeld (10 adult attendees) (November 20).

DR. ROBERT E. MARRA participated as a member of the Steering Committee for the Connecticut Conference on Natural Resources scheduled at the University of Connecticut on 16 March 2020

(November 6).

DR. NEIL SCHULTES presented the last lecture in a three-lecture series on "Genetically Modified Plants in Agriculture" in a Yale Course Scie 031 "Current Topics in Science (8 students) (November 1); presented a poster entitled "Nucleobase transport in fire blight pathogen and host "at the annual Ian Sussex Plant Biology Symposium held in Jones Auditorium (75 participants) (November 15).

DR. STEPHEN TAERUM presented "What are protists doing in the maize rhizosphere?" to the Sussex Plant Biology Symposium held in Jones Auditorium (60 attendees) (November 15).

DR. QUAN ZENG taught two guest lectures entitled "Bacterial plant pathogens and diseases" and lab "Diagnosis of bacterial plant diseases and isolation of bacterial pathogens" at the University of Connecticut (16 students) (November 13); gave an oral presentation entitled "Role of the type III secretion system during the infection of apple flowers by a phytopathogenic bacterium" at the Sussex Plant Biology Symposium organized by Yale Department of Molecular, Cellular and Developmental Biology (60 attendants) (November 15).

VALLEY LABORATORY

DR. CAROLE CHEAH gave a presentation on "Eastern Hemlock: Prospects for Conservation & Sustainability" at the Appalachian Mountain Club Annual Gathering, Portland (50 attendees) (November 17).

ROSE HISKES along with Dr. Yonghao Li, taught the Connecticut Tree Protective Association Arboriculture 101 students about tree diseases at the Tree Conditions Lab, Wallingford (42 attendees) (November 6); participated in a Connecticut Invasive Plant Working Group symposium planning committee meeting, Windsor (November 14); and taught Advanced Master Gardeners about "Insect Pests of Plants" at Bartlett Arboretum, Stamford (17 attendees) (November 19).

DEPARTMENTAL RESEARCH UPDATES NOVEMBER 2019

Buchman, J.; **Elmer, W.; Ma, C.**; Landy, K.; **White, J.C.**; Haynes, C. 2019. Chitosan-coated mesoporous silica nanoparticle treatment of *Citrullus lanatus* (Watermelon): Enhanced fungal disease suppression and modulated expression of stress-related genes. *ACS Sus. Chem. Eng.* https://doi.org/10.1021/acssuschemeng.9b04800.

Abstract- This work assesses the potential of mesoporous silica nanoparticles with or without a chitosan coating to suppress Fusarium wilt (*Fusarium oxysporum f. sp. niveum*) in watermelon (Citrullus lanatus) by virtue of dissolving to release silicic acid. Plant health was assessed by monitoring the total biomass and fruit production in both healthy and pathogen-infected plants up to 100 days after a single nanoparticle application (500 mg/L) at the seedling stage. Both types of mesoporous silica nanoparticles enhanced the innate defense mechanisms of watermelon, with mesoporous silica nanoparticles (MSNs) and chitosan-coated mesoporous silica nanoparticles (CTS-MSNs) reducing disease severity by ~40% and ~27%, respectively, as measured by the area-under-the-disease-progress curve. Changes in gene expression measured several weeks after nanoparticle application demonstrated reduced expression of several stress-related genes after CTS-MSN and MSN treatments, indicating a reduced disease burden on the plant. Although treatment did not impact fruit production from diseased plants, a single application of chitosan-coated mesoporous silica nanoparticles at the seedling stage led to a 70% increase in the fruit yield of uninfected watermelon. Monitoring plant biomass revealed that MSNs and CTS-MSNs had no significant impact on the biomass reductions in diseased plants, likely because seedlings were treated and biomass was measured weeks later in the fully grown plants. These findings demonstrate the utility of a single application of mesoporous silica nanoparticles with or

without a chitosan coating as a nano-enabled agricultural amendment, and current work is focused on optimizing the material synthesis and treatment regimens for maximum benefit.

Hyde, J., Correa, M.A., Brackney, D.E., Steven, B*. Generation and rearing of axenic Aedes aegypti mosquitoes, 28 November 2019, *Protocol Exchange* [doi.org/10.21203/rs.2.17705/v1+]

Abstract- This protocol describes the generation of axenic *Aedes aegypti*, which can be raised from larvae to adults in the absence of a microflora. The total protocol including the time taken to grow *E. coli* (used in one of the diets) takes two days to set up. The mosquitoes will develop normally with a slight developmental lag compared to conventionally raised mosquitoes (~1 week). Two larval diets are described, a liver:yeast (LY) extract diet and an LY diet supplemented with heat-inactivated *E. coli*. Axenic mosquitoes raised on food supplemented with heat-inactivated *E. coli* develop slightly faster than axenic mosquitoes raised without killed bacteria. This axenic system allows the manipulation of the mosquito microbiome and transitions the microbiome into a variable that can be controlled and manipulated in a mechanistic manner.

Liao, Y.Y.; Strayer-Scherer, A.; **White, J.C.; De La Torre-Roche, R.**; Ritchie, L.; Colee, J.; Vallad G. E., Freeman, J.; Jones, J. B.; Paret, M. L. 2019. Particle-size dependent bactericidal activity of magnesium oxide against *Xanthomonas perforans* and bacterial spot of tomato. *Sci. Reports* In press.

Abstract- Bacterial spot caused by Xanthomonas spp. is a highly destructive disease of tomatoes in Flori-da. The bacterial strains are copper (Cu)-tolerant, making Cu bactericides ineffective in disease management. Magnesium oxide (MgO) is an effective alternative to Cu bactericides against Xanthomonas spp. However, the effect of particle size on bactericidal activity and fruit ele-mental levels are unknown. In this study, nanoparticle (nano) (20 nm) and micron (0.3 and 0.6 µm) MgO were evaluated by in vitro culture amendment assays at 12.5, 25, 50, 75, and 100 µg/ml and byepifluorescence assay at 100 µg/ml to understand the impact of particle size on bacterial cell viability. Nano MgO had significantly greater bactericidal activity than micron MgO at low concentrations of 25-50 µg/ml against a Cu-tolerant X. perforans strain (SNK, p = 0.05) in vitro. Disease severity of plants treated in the field with nano and micron MgO at 200 and 1,000 µg/ml were evaluated. Nano MgO at 200 µg/ml was the only treatment that consist-ently reduced bacterial spot disease severity compared to the untreated in two field trials (LSD, p = 0.05). Fruits from the field studies were assessed for elemental levels using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). Nano MgO did not alter the accu-mulation of Mg, Cu, Ca, K, Mn, P and S compared to fruits from the untreated plants. In this study we demonstrated that although both nano sized MgO and micron sized MgO have bacte-ricidal activity against copper tolerant strains in vitro, only nano sized MgO is effective in bac-terial spot disease management under field conditions.

Li, Y. H. 2019. Fungicides for Christmas Tree Foliar Diseases. The Real Tree Line 59(3): Page 10.

Brief article about common diseases of Christmas trees.

Li, Y. H. 2019. Disease Alert: Delphinella Shoot Blight of Fir. The Real Tree Line 59(4): Page 10.

Brief article about the biology, symptoms, and Management of the Delphinella Shoot Blight of Fir.

Tian, L.; Zhang, H.; Zhao, X.; Gu, X.; **White, J.C.**; Li, X.; Zhao, L.; Ji, R. 2019. CdS nanoparticles induce metabolic reprogramming in Broad Bean (*Vicia faba* L.) roots and leaves. *Environ. Sci.: Nano* DOI: 10.1039/C9EN00933G.

Abstract- The rapid development of nanotechnology has raised concern regarding the environmental toxicity of nanoparticles (NPs). However, little is known about the molecular mechanisms underlying NP toxicity in plants. Broad bean (Vicia faba L.) plants were cultivated in soil amended with 0, 10, and 100 mg cadmium sulfide (CdS)-NPs kg soil−1 for 4 weeks and then the phenotypic, biochemical, and metabolic responses of the plants to CdS-NPs stress were evaluated. Metabolomics analysis revealed the significant up-regulation of several antioxidative metabolites, including N-acetyl-5-hydroxytryptamine, 2-hydroxybutanoic acid, putrescine and flavone, upon CdS-NPs exposure, but no negative phenotypic effects were visible (plant biomass, photo-

synthetic pigment contents, and lipid peroxidation). This observation was in accordance with the observed regulation of antioxidative-defense-related metabolic pathways (tyrosine pathway and phenylpropanoid biosynthesis) that were identified by biological pathway analysis. Importantly, twice as many metabolites were modulated in the leaves than in roots, including three nitrogen-related (purine metabolism; alanine, aspartate, and glutamate metabolism; ß-alanine metabolism) and two carbon-related (pantothenate and CoA biosynthesis and carbon fixation) metabolic pathways. These results indicate that to alleviate the toxicity of CdS-NPs exposure in soil, plants significantly reprogram the metabolic profiles of leaves rather than of roots, which may subsequently impact both harvest and crop quality.

Qiao, Huan, Xiao-Rui Sun, Xiao-Qin Wu, Gui-E Li, Zao Wang, and **De-Wei Li**. 2019. The phosphate -solubilising ability of *Penicillium guanacastense* and its effects on the growth of *Pinus massoniana* in phosphate limiting conditions. Biology-Open 8: bio046797. doi: 10.1242/bio.046797

Abstract- Microbes in soil can degrade insoluble inorganic and organic phosphorus, which are components of the soil phosphorus cycle and play an important role in plant growth. Pinus massoniana is a pioneer tree species used for afforestation in southern China and grows in poor, acidic soil. A shortage of available phosphorus in soil limits the growth of *P. massoniana*. To alleviate this situation, it is necessary to improve soil fertility. A fungal strain (JP-NJ2) with the ability to solubilize phosphate was isolated from the *P. massoniana* rhizosphere. The ability of JP-NJ2 to solubilize inorganic and organic phosphorus and promote the growth of *P. massoniana* was evaluated. It showed that JP-NJ2 could grow in NBRIP inorganic phosphate (AlPO4, FePO4·4H2O, and Ca3[PO4]2) fermentation broths, with the highest phosphorus concentration (1.93 mg/ml) and phosphate-solubilizing rate (43.7%) for AlPO4 and in Monkina organic phosphate fermentation broth with a phosphorus concentration of 0.153 mg/ml. The phosphate-solubilizing capability in inorganic and organic fermentation broths was negatively correlated with pH. JP-NJ2-produced acids at a total concentration of 4.7 g/l, which included gluconic (2.3 g/l), oxalic (1.1 g/l), lactic (0.7 g/l) and malonic (0.5 g/l) acids. It prioritized extracellular acidic phosphatase and combined with phytase to solubilize organic phosphates. The fungal suspension and extracellular metabolites from phosphate-solubilizing fungi promoted the shoot length of *P. massoniana* seedlings by 97.7% and 59.5%, respectively, while increasing the root crown diameter by 46.8% and 27.7%. JP-NJ2 was identified as *Penicillium guanacastense* based on its morphology and phylogenetic analyses of five genes/regions (ITS, ben A, cmd, cox1 and tef). This is the first report on *P. guanacastense* isolated from pine tree rhizosphere soil in China and its high phosphate-solubilizing capability, which promoted the growth of *P. massoniana*. *P. guanacastense* JP-NJ2 has potential use as a biological fertilizer in forestry and farming.

JOURNAL ARTICLES APPROVED NOVEMBER 2019

Aulakh, Jatinder S. Weed alert: First report of Palmer amaranth in Connecticut – Watch out for this pigweed! *CAES Fact Sheet*

Buchman, J., **Wade H. Elmer**, **Chuanxin Ma**, K. Landy, **Jason C. White**, and C. Haynes. Chitosan-coated mesoporous silica nanoparticle treatment of *Citrullus lanatus* (Watermelon): Enhanced fungal disease suppression and modulated expression of stress-related genes. *ACS Sustainable Chemistry & Engineering*

Cowles, Richard S. Chemical control for spotted wing drosophila. *Proceedings, New England Vegetable and Berry Growers Association Conference*

Cowles, Richard S. White pine weevil management in Christmas tree plantations. *Great Lakes Christmas Tree Journal*

Cowles, Richard S. Zimmerman pine moth biology and management. *Great Lakes Christmas Tree Journal*

Cowles, Richard S. and **DeWei Li**. Exploring sustainable management for armored scales in Christmas tree plantations. *The Real Tree Line*

Noori, A., A. Ngo, P. Gutierrez, S. Theberge, and **Jason C. White**. Silver nanoparticle detection and accumulation in tomato (*Lycopersicon esculentum*). *Journal of Nanoparticle Research*

Pignatello, Joseph J. and **Sara L. Nason**. Importance of soil properties and processes on bioavailability of organic compounds. Book Chapter in *Bioavailability of Organic Chemicals in Soil and Sediment*, in *The Handbook of Environmental Chemistry* series, Springer.

Ward, Jeffrey S. and **Scott C. Williams**. Influence of white-tailed deer hunting and residual stand structure on tree regeneration in temperate deciduous forests. *Wildlife Society Bulletin*

Zhu, J., J. Li, Y. Shen, S. Liu, N. Zeng, X. Zhan, **Jason C. White**, J. Gardea-Torresdey, and B. Xing. Mechanism of ZnO nanoparticle entry into wheat seedling leaves. *ACS Nano*

ARTICLES OF INTEREST NOVEMBER 2019

2019 Connecticut FFA Association Forestry Career Development Event

On November 22, 2019 the Department of Forestry and Horticulture hosted the Connecticut FFA Association Forestry Career Development Event (CDE) at the Lockwood Farm Pavilion. This year's Forestry CDE evaluated students' knowledge of forest management practices, forest mensuration, topographic map interpretation, forestry-related equipment, chainsaw troubleshooting, and tree identification.

Forty-eight students from 12 State FFA Chapters participated in this year's event, with the 4-student team from E.O. Smith High School Agricultural Education Program taking first place. Students from E.O Smith FFA will represent the State of Connecticut in regional and national competitions at the 2020 Eastern States Exposition and the 2020 National FFA Convention in Indianapolis, IN.

We would like to thank Eric Hansen of Ferrucci & Walicki, LLC for his assistance.

Dr. Scott Williams, **Mr. Michael short**, and **Mr. Joseph P. Barsky** of the Dept. of Forestry and Horticulture and **Dr. Megan Linske** of the Dept. of Entomology organized and oversaw the event.

GRISWOLD RESEARCH CENTER

MR. ROBERT DURGY presented a lecture describing the Griswold Research Center's propagation of Connecticut Charter Oak seedlings for a tree dedication ceremony at the Enfield Public Library in Enfield (30 attendees) (October 31); and presented a lecture on common beneficial and pest insects in the home garden for the University of Connecticut Advanced Master Gardener Program held in Brooklyn (7 attendees) (November 15).

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

The Connecticut Agricultural Experiment Station

Main Laboratories
123 Huntington Street
New Haven, CT 06511-2016
Phone: 203-974-8500

Lockwood Farm
890 Evergreen Avenue
Hamden, CT 06518-2361
Phone: 203-974-8618

Griswold Research Center
190 Sheldon Road
Griswold, CT 06351-3627

Valley Laboratory
153 Cook Hill Road
Windsor, CT 06095-0248
Phone: 860-683-4977

Putting Science to Work for Society.

Main Laboratories, New Haven

Lockwood Farm, Hamden

Griswold Research Center, Griswold

Valley Laboratory, Windsor

The Connecticut Agricultural Experiment Station

Back and Current issues of Station News are located on our website at https://portal.ct.gov/CAES/Publications/Publications/Station-News

The Connecticut Agricultural Experiment Station (CAES) prohibits discrimination in all of its programs and activities on the basis of race, color, religious creed, age, sex, marital status, veteran status, sexual orientation, gender identity, gender expression, national origin, ancestry, criminal conviction record, genetic information, learning disability, present or past history of mental disability, intellectual or physical disability, including, but not limited to blindness, of an applicant for employment or an employee, unless the mental disability or physical disability prevents adequate performance. To file a complaint of discrimination, contact Dr. Jason White, Vice Director, The Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven, CT 06504, (203) 974-8523 (voice), or Jason.White@ct.gov (e-mail). CAES is an affirmative action/equal opportunity provider and employer. Persons with disabilities who require alternate means of communication of program information should contact the Chief of Services, Michael Last at (203) 974-8442 (voice), (203) 974-8502 (FAX), or Michael.Last@ct.gov (e-mail).

Station News was prepared and edited by Dr. Theodore G. Andreadis, Ms. Vickie Bomba-Lewandoski, Ms. Sandra Carney, and Ms. Brandi Marks.

https://portal.ct.gov/CAES

Volume 9 Issue 12
December 2019