



# STATION NEWS

The Connecticut Agricultural Experiment Station



# CAES

The Connecticut Agricultural Experiment Station

*Putting Science to Work for Society since 1875*

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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## DEPARTMENTAL NEWS

### ADMINISTRATION

**DR. THEODORE ANDREADIS** presented opening remarks and an update on CAES activities at the Federated Garden Clubs of Connecticut’s Gardening School held at the Station (October 13); participated in a meeting of Connecticut’s Invasive Plant Council held in Hartford (October 13); presided over a quarterly meeting of the Stations’ Board of Control held at the Valley Lab in Windsor (October 21); presented an invited symposium talk entitled “Ecology and Vector Biology of Mosquito-Borne Bunyaviruses in the Northeastern US” at the Annual meeting of the American Society of Tropical Medicine and Hygiene held in Philadelphia, PA (October 27); and was interviewed by Gregory Hladky, Hartford Courant about the public health significance of mosquito breeding in used tires in Connecticut (October 31).

### ANALYTICAL CHEMISTRY

**DR. JASON C. WHITE** attended the monthly Laboratory Preparedness Advisory Committee meeting at the Department of Public Health Laboratory in Rocky Hill CT (October 5); along with **MS. KITTY PRAPAYOTIN-RIVEROS, MR. MICHAEL CAVADINI, MR. JOHN RANCIATO, MR. CRAIG MUSANTE, DR. ALIA SERVIN AND MS. TERRI ARSENAULT** participated in the CT AES Animal Feed Regulatory Program Standard (AFRPS) Y1 grant award lab “kick-off call” (October 5); along with **DR. BRIAN EITZER, DR. CHRISTINA ROBB, DR. WALTER KROL, MS. KITTY PRAPAYOTIN-RIVEROS, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, MR. CRAIG MUSANTE, AND MS. TERRI ARSENAULT** participated in the month FDA FERN cCAP teleconference call (October 8); co-organized and attended an invitation only NSF-funded workshop entitled “FEW Workshop for Applying Sustainable Nanotechnology to Optimize and Unify Food, Energy, and Water Systems” held at Carnegie Mellon University in Pittsburgh PA (October 19-20); joined the Ph.D. Dissertation Committee of Mr. Carlos Tamez of the University of Texas-El Paso Environmental Science and Engineering Program (October 21); hosted Professor Shivendra Sahi of Western Kentucky University and discussed collaborative research on the analysis of biologically synthesized nanoparticles (October 29); and participated in the quarterly FDA FERN-wide teleconference call (October 29).

**DR. BRIAN EITZER** was a participant in organizing committee phone calls for the North American Chemical Residue Workshop (November 6, 8).

**DR. CHRISTINA ROBB** along with **DR. BRIAN EITZER** and **DR. SANGHAMITRA MAJUMDAR** attended on site LC-MS training from Thermo Scientific (October 13-15); along with **MS. KITTY PRAPAYOTIN-RIVEROS, MS. TERRI ARSENAULT** participated in a ISO Accreditation mentor – mentee phone call with the Ohio Department of Agriculture on (October 7).

**MS. KITTY PRAPAYOTIN-RIVEROS** along with **DR. ALIA SERVIN** attended Live Online Webinar of FDA/ORL Laboratory Accreditation Program and Overview of Requirements for ISO 17025 Accreditation (October 20).



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## ENTOMOLOGY

**DR. KIRBY C. STAFFORD III** presented a talk on ticks and tick control at the Connecticut Audubon center in Fairfield, CT as part of their Master Naturalist's program (October 13); visited by Dr. Daniel Green, a clinical microbiology fellow, at Yale University (October 15); visited the Department of Entomology at Kansas State University and presented an invited talk as a distinguished alumnus titled 'Ticks, Inquiries, and Invasions: A New England Perspective' (35 attendees) (October 18-20); participated in the Forest Health Cooperators Workshop in Windsor (October 22-23); participated in a Tick IPM planning committee conference call to discuss plans for a national tick IPM conference or workshop to be held in 2016 in the Washington, D.C. area; and with **DR. VICTORIA SMITH**, participated in a conference call with Kate Aitkenhead, Craig Guthrie, and Jeffrey Davidson, USDA, about a plant pest ICS exercise in 2016 (October 29).

**MARK H. CREIGHTON** was notified by the Connecticut Department of Agriculture that he was awarded a \$40,000 grant from the USDA titled the Minority Youth Beekeeper Initiative (MYBI) (October 5); attended the Connecticut Beekeepers Association meeting in New Haven and spoke on the value of hive registration and IPM for mite control; and also collected several honey bee registration forms and made several inspection appointments (28 attendees) (October 24).

**DR. GALE E. RIDGE** presented a talk to the River Valley Services staff that serves the mentally impaired in Middletown about managing bed bugs in their work place (15 attendees) (October 1); talked to staff at the Park City Green mattress recycling company in Bridgeport about protection against bed bugs while in the work place (20 attendees) (October 14); interviewed on the Colin McEnroe live radio show on WNPR in Hartford about bed bugs (October 16); presented a talk to case managers at the Department of Developmental Services in Wallingford about how to deal with bed bugs (38 attendees) (October 28); presented at the Trash Museum in Hartford; and in collaboration with DEEP trained transfer attendants from Connecticut, Massachusetts, and Rhode Island on how to screen and manage bed bugs issues as mattresses enter the recycling stream (80 attendees) (October 29). This program is part of the 2013 Connecticut mattress recycling law, Act 13-42, (the first of its kind in the United States) which stipulates training for transfer station attendants and recyclers.

**DR. CLAIRE E. RUTLEDGE** presented a talk on the emerald ash borer at the Connecticut Audubon center in Fairfield, CT as part of their Master Naturalist's program (October 13); taught "Tree Conditions Laboratory" for Arboriculture 101, Connecticut Tree Protective Association, Wallingford, CT (35 attendees) (October 21); presented the talk 'Emerald Ash Borer Update' at the Forest Cooperators Meeting, CAES, Windsor CT (15 attendees) (October 23); presented the display "Dr. Rutledge's Insectorium and Petting Zoo" at 'Ghouls & Gourds' at the Brooklyn Botanic Garden, New York, NY (October 24); and presented on insects to Mrs. Manende's 3<sup>rd</sup> grade class, Green Acres Elementary School, North Haven, CT (18 children) (October 30).

**DR. VICTORIA L. SMITH** participated in a meeting of the Yale University Biosafety Committee, held at 135 College St., New Haven; (20 attendees) (October 15); presided over the annual meeting of the US Forest Service Durham Field Office Forest Health Cooperators, held at the Valley Laboratory in Windsor, 25 participants from CT, Massachusetts, Maine, Vermont, New Hampshire, Rhode Island and New York attended (October 22-23).

**DR. KIMBERLY A. STONER** presented information on plants utilized by specialist bees and bumble bees to the Urban Oasis Partnership meeting at the invitation of Katie Blake of Audubon CT, at the New Haven Parks Headquarters (15 attendees) (October 5).

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## ENVIRONMENTAL SCIENCES

**DR. JOSEPH PIGNATELLO** met with Prof. Lee Ferguson, Department of Civil and Environmental Engineering, Duke University over breakfast to discuss mutual research interests (September 18); participated in a U.S. Department of Agriculture NIFA-AFRI grants review panel, Agriculture Systems and Technology: Nanotechnology for Agricultural and Food Systems (October 4-9).

**DR. GOUDARZ MOLAEI** with **MS. SARYN KUNAJUKR** presented a joint invited talk, “Tracking Ticks and Tick-associated Diseases in Connecticut” and discussed the CAES research initiatives and services on ticks and tick-associated diseases to the Pomperaug Valley Garden Club, Woodbury (estimated attendance, 40) (October 13); and hosted Dr. Daniel Green, a clinical microbiology fellow at Yale University, provided him with a tour of Tick Testing Laboratory, and discussed research and service activities in the areas of tick- and mosquito-borne human diseases at the CAES (October 16).

**MR. MICHAEL C. THOMAS** co-instructed a lab-field trip to Archbold Biological Research Station, Venus, Florida, for the Yale University EEB Terrestrial Arthropod Class (13 attendees) (October 21-25).



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### FORESTRY AND HORTICULTURE

**DR. JEFFREY WARD** met with Sue Martucci to examine poor survival of trees at the Connecticut Trees of Honor Memorial in Middletown (October 1); participated in the CT Invasive Plant Working Group Steering Committee meeting in Storrs (October 6); spoke on "The dynamic Connecticut forest" for the Adult Learning Program in Bloomfield (53 attendees) (October 6); spoke on "The link between deer, invasive plants, mice, and Lyme disease" for the Ashford Land Trust (18 attendees) (October 14); spoke on "Homeowner tree care" for the Morris Cove Garden club in New Haven (15 attendees) (October 14); spoke on "Invasive plant control" at the Watertown Land Trust annual meeting (22 attendees) (October 19); met with Sarah Hoskinson, Mianus River Gorge, Inc. to discuss response of native species to invasive control (October 15); invited participant in Connecticut Landscape Scenarios Workshop at Yale University to develop alternative scenarios of 50 year landscape changes (October 22); met with Dave Beers (Connwood, Inc), Pat Corbett (Connecticut Water Company), and Richard Sullivan (Eversource) to discuss roadside forest management in Prospect (October 26); was awarded the Fred Borman Outstanding Urban Forestry Professional Award at the 2015 Connecticut Urban Forest Council annual conference in Plantsville (October 28); and met with William Hochholzer (DEEP Forestry); Tony Wilber (Tennett Tree Service); and Stephen Child (Eversource) to discuss roadside forest management in Voluntown (October 29).

**DR. MARTIN P.N. GENT** presented a talk (with Ido Seginer) on "Dynamic carbohydrate supply and demand model of vegetative growth" at the MODEL-IT Symposium on Modelling in Horticulture at Wageningen University, Netherlands and chaired a session on 3-dimensional models (75 participants) (October 11-14).

**DR. ADRIANA ARANGO VELEZ** spoke on "Southern pine beetle, moving northeastern... will it stay?" at the Forest Health workshop in Windsor (20 attendees) (October 23); moderated session "Bringing back native trees – Elms and chestnuts-" at the 27th Connecticut Urban Forest Council Annual conference in Plantsville (100 attendees) (October 28); and spoke on forest physiology to students from Coop High School, New Haven (7 students, 2 teachers) (October 30).

**DR. ABIGAIL MAYNARD** spoke about how to grow pumpkins to the 1st and 2nd grades of Hamden Hall Country Day school (32 students, 4 teachers) (October 2); hosted the pre-Kindergarten and 3rd grade from Hamden Hall Country Day School at Lockwood Farm (37 students, 4 teachers, 2 adults) (October 14); reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation in Windsor (18 attendees) (October 20); and reported on Station activities at a quarterly meeting of the State Technical Committee in Tolland (31 attendees) (October 29).

**DR. SCOTT WILLIAMS** as Executive Treasurer, participated in the 27th Annual Connecticut Urban Forest Council Conference and 11th Annual Forest Forum, Plantsville, CT (October 28); with **MR. MICHAEL SHORT** and **MR. MEGAN LINSKE**, spoke to a tour group at Sessions Woods Wildlife Management Area about research on deer and rabbit browsing of oak stump resprouts (30 attendees) (October 27); gave invited lecture "The Role of Deer in Spreading Invasive Plants and Preventing Native Plant Regeneration" at the meeting of the Connecticut Invasive Plant Working Group, Storrs (50 attendees) (October 6).

**MR. JOSEPH P. BARSKY** gave a presentation on "Careers in Agricultural Science" to sophomore students at a career day event at Cheshire High School (80 students) (October 6); and participated in the quarterly meeting of the Connecticut State Consulting Committee for Agricultural Science and Technology Education at Southington High School (October 7); and gave a presentation on "Invasive Species in Connecticut" to upper class students from CO-OP High School at East Rock Park, New Haven (7 students, 2 teachers) (October 30).

**MR. MICHAEL R. SHORT** with **MR. JOSEPH P. Barsky** and **MS. MEGAN LINSKE**, staffed a Station display at the 26th Annual CT Urban Forest Council Conference and CT Forest Forum in Southington (175 attendees) (October 28).



## PLANT PATHOLOGY AND ECOLOGY

**DR. SANDRA ANAGNOSTAKIS** gave a talk to the Spring Glen Garden Club on “The Chestnuts on Chestnut Lane” (14 adults attended) (October 16).

**DR. WADE H. ELMER** visited with Dr. Shivendra Sahi from Western KY University about nanoparticles in plants (October 29).

**FRAND FERRANDINO** was interviewed by John Bell of FOX CT regarding cold resistance in grapes (October 20).

**DR. YONGHAO LI** Presented a lecture titled as ‘Understanding Plant Diseases and Garden Pests’ to the Gardening Study School in New Haven, CT (35 adults) (October 13); staffed the ‘hands-on’ table with tree disease for Arboriculture 101 in Wallingford, CT (25 Attendees) (October 21); was interviewed by Robert Miller at News Times about effects of drought conditions on trees and shrubs (October 7); was interviewed by Sam Kantrow at News 8 (WTNH) about how frost affects plants (October 8); and was interviewed by Tony Spinelli at the Litchfield County Times about drought conditions and acorn production (October 30).

**DR. LINDSAY TRIPLETT**, presented the keynote lecture “American Heirloom: Using heritage crops to solve modern agricultural problems” to the QUIP-RS undergraduate research symposium at Quinnipiac University” (26 attendees) (October 8) and to the faculty and staff of Southern Connecticut State University for their Biology Seminar Series (29 attendees) (October 13); was invited to participate in a panel review of 5 proposals (details are confidential) (October 25-30); was one of 2 American early-career molecular plant pathologists invited to speak at the 11<sup>th</sup> US-Japan Scientific Seminar on Plant-Pathogen Interactions, held in Takamatsu, Japan on “Direct Recognition of TAL Effectors: A Shared Strategy in Monocots and Dicots” (55 attendees) (October 25-29); and was invited to serve as co-organizer of the 12<sup>th</sup> US-Japan Seminar when it is held in the United States in 2020.

**DR QUAN ZENG** presented the talk "Fire blight in New England in 2015 and Streptomycin Resistance" at the first annual Northeastern IPM Center (NEIPMC) Online Conference and met with colleagues from U.S. and Canada (October 20).



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## VALLEY LABORATORY

**DR. JATINDER AULAKH** attended the Connecticut Invasive Plant Working Group meeting at UCONN, Storrs, introduced himself to the CIPWG members and explored opportunities for research and outreach collaborations (October 6); and prepared a fact-sheet and trifoliate, and gave a talk on “Distinguishing Between the Native and Non-native Phragmites” at Fulton Park, Waterbury, CT (October, 17).

**DR. CAROLE CHEAH** attended the general meeting of Connecticut Invasive Plant Working Group at the University of Connecticut (October 6); gave an update on the effects of severe winters on elongate hemlock scale and hemlock woolly adelgid in Connecticut at the NY/NE 2015 Forest Health Cooperators Meeting held at the Valley Laboratory (October 23); and was interviewed by Kendra Bobowick of the Newtown Bee for a biological control weevil update on mile-a-minute weed control in Newtown (October 30).

**DR. RICHARD COWLES** presented “Spotted wing drosophila management” for the Northeast Regional IPM webinar, (20 participants) (October 20); discussed “Is there life after neonics?” to greenhouse and nursery growers (40 participants) and “Managing annual bluegrass weevils,” for golf course superintendents (25 participants) at the Helena Chemical company educational program, Providence, RI, (October 21); spoke about “The neonicotinoid controversy” (October 26) and “Managing the emerald ash borer,” (October 27) at the New England regional meeting for the International Society for Arboriculture, North Conway, NH (150 attendees for each talk); was interviewed by David Kuack for an article on his research supported by the Horticulture Research Institute (October 27); and participated in a meeting with the Connecticut Environmental Council to discuss drafting model legislation to permit low toxicity pesticides to be used on school grounds while safeguarding students from pesticide exposure (12 participants) (October 30).

**ROSE HISKES** participated in the Connecticut Invasive Plant Working Group Steering Committee meeting in Storrs (October 6).

**DR. JAMES LAMONIA** participated in the Connecticut Vegetable and Small Fruit Conference Steering Committee meeting in Tolland (October 6); taught a class on identification, biology and management of tree diseases to students in the Connecticut Tree Protective Association’s Arboriculture 101 class in Wallingford (30 persons)(October 14); and spoke about research results and chaired the annual meeting of the Northeast Regional Multistate Nematology Technical Committee (NE-1040) held in Orlando FL (October 20-22).

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## DEPARTMENTAL RESEARCH UPDATES OCTOBER 2015

Gámiz, B., \* **J. J. Pignatello**, L. Cox, M. C. Hermosín, R. Celis. Environmental fate of the fungicide metalaxyl in soil amended with composted olive-mill waste and its biochar: An enantioselective study. *Science of the Total Environment*, 541, 776-783 (January 15, 2016).

A large number of pesticides are chiral and reach the environment as mixtures of optical isomers or enantiomers. Agricultural practices can affect differently the environmental fate of the individual enantiomers. We investigated how amending an agricultural soil with composted olive-mill waste (OMWc) or its biochar (BC) at 2% (w:w) affected the sorption, degradation, and leaching of each of the two enantiomers of the chiral fungicide metalaxyl. Sorption of metalaxyl enantiomers was higher on BC ( $K_d \approx 145 \text{ L kg}^{-1}$ ) than on OMWc ( $K_d \approx 22 \text{ L kg}^{-1}$ ) and was not enantioselective in either case, and followed the order BC-amended > OMWc-amended > unamended soil. Both enantiomers showed greater resistance to desorption from BC-amended soil compared to unamended and OMWc-amended soil. Dissipation studies revealed that the degradation of metalaxyl was more enantioselective ( $R > S$ ) in unamended and OMWc-amended soil than in BC-amended soil. The leaching of both *S*- and *R*-metalaxyl from soil columns was almost completely suppressed after amending the soil with BC and metalaxyl residues remaining in the soil columns were more racemic than those in soil column leachates. Our findings show that addition of BC affected the final enantioselective behavior of metalaxyl in soil indirectly by reducing its bioavailability through sorption, and to a greater extent than OMWc. BC showed high sorption capacity to remove metalaxyl enantiomers from water, immobilize metalaxyl enantiomers in soil, and mitigate the groundwater contamination problems particularly associated with the high leaching potential of the more persistent enantiomer.

**Yi, P., J. J. Pignatello,\* M. Uchimiya, and J. C. White**, Heteroaggregation of Cerium Oxide Nanoparticles and Nanoparticles of Pyrolyzed Biomass, *Environmental Science & Technology*, 49 (22), 13294–13303 (publication date, October 13, 2015); DOI: 10.1021/acs.est.5b03541.

Heteroaggregation with indigenous particles is critical to the environmental mobility of engineered nanomaterials (ENM). We studied heteroaggregation of ceria nanoparticles (n-CeO<sub>2</sub>), as a model for metal oxide ENM, with nanoparticles of pyrogenic carbonaceous material (n-PCM) derived from pecan shell biochar, a model for natural chars and human-made chars used in soil remediation and agriculture. The TEM and STEM images of n-PCM identify both hard and soft particles, both C-rich and C,O,Ca-containing particles (with CaCO<sub>3</sub> crystals), both amorphous and “onion-skin” C-rich particles, and traces of nanotubes. Heteroaggregation was evaluated at constant n-CeO<sub>2</sub>, variable n-PCM concentration by monitoring hydrodynamic diameter and zeta potential by dynamic light scattering under conditions where n-PCM is “invisible”. At pH 5.3, where n-CeO<sub>2</sub> and n-PCM are positively and negatively charged, respectively, and each stable to homoaggregation, heteroaggregation is favorable and occurs by a Charge Neutralization-Charge Reversal mechanism (CNCR): in this mechanism, primary heteroaggregates that form in the initial stage are stable at low or high n-PCM concentration due to electrostatic repulsion, but unstable at intermediate n-PCM concentration, leading to secondary heteroaggregation. The greatest instability coincides with full charge neutralization. At pH 7.1, where n-CeO<sub>2</sub> is neutral and unstable alone, and n-PCM is negative and stable alone, heteroaggregation occurs by a Charge-Accumulation, Core-shell Stabilization (CACS) mechanism: n-PCM binds to and forms a negatively charged shell on the neutral surface of the nascent n-CeO<sub>2</sub> core, stabilizing the core-shell heteraggre-

gate at a size that decreases with n-PCM concentration. The CNCR and CACS mechanisms give fundamental insight into heteroaggregation between oppositely-charged, and between neutral and charged nanoparticles.

**Molaei, G.,\* P. M. Armstrong, A. C. Graham, L. D. Kramer, T. G. Andreadis,** “Insights Into the Recent Emergence and Expansion of Eastern Equine Encephalitis Virus in a New Focus in the Northern New England USA”. *Parasites & Vectors* 2015, 8:516; doi:10.1186/s13071-015-1145-2 (Published October 9, 2015).

Eastern equine encephalomyelitis virus (EEEV) causes a highly pathogenic zoonosis that circulates in an enzootic cycle involving the ornithophilic mosquito, *Culiseta melanura*, and wild passerine birds in freshwater hardwood swamps in the northeastern U.S. Epidemic/epizootic transmission to humans/equines typically occurs towards the end of the transmission season and is generally assumed to be mediated by locally abundant and contiguous mammalophilic “bridge vector” mosquitoes. Engorged mosquitoes were collected using CDC light, resting box, and gravid traps during epidemic transmission of EEEV in 2012 in Addison and Rutland counties, Vermont. Mosquitoes were identified to species and blood meal analysis performed by sequencing mitochondrial cytochrome b gene polymerase chain reaction products. Infection status with EEEV in mosquitoes was determined using cell culture and RT-PCR assays, and all viral isolates were sequenced and compared to other EEEV strains by phylogenetic analysis. The host choices of 574 engorged mosquitoes were as follows: *Cs. melanura* (n = 331, 94.3 % avian-derived, 5.7 % mammalian-derived); *Anopheles quadrimaculatus* (n = 164, 3.0 % avian, 97.0 % mammalian); *An. punctipennis* (n = 56, 7.2 % avian, 92.8 % mammalian), *Aedes vexans* (n = 9, 22.2 % avian, 77.8 % mammalian); *Culex pipiens* s.l. n = 6, 100 % avian); *Coquillettia perturbans* (n = 4, 25.0 % avian, 75.0 % mammalian); and *Cs. morsitans* (n = 4, 100 % avian). A seasonal shift in blood feeding by *Cs. melanura* from Green Heron towards other avian species was observed. EEEV was successfully isolated from blood-fed *Cs. melanura* and analyzed by phylogenetic analysis. Vermont strains from 2012 clustered with viral strains previously isolated in Virginia yet were genetically distinct from an earlier EEEV isolate from Vermont during 2011. *Culiseta melanura* acquired blood meals primarily from birds and focused feeding activity on several competent species capable of supporting EEEV transmission. *Culiseta melanura* also occasionally obtained blood meals from mammalian hosts including humans. This mosquito species serves as the primary vector of EEEV among wild bird species, but also is capable of occasionally contributing to epidemic/epizootic transmission of EEEV to humans/equines. Other mosquito species including *Cq. perturbans* that feed more opportunistically on both avian and mammalian hosts may be important in epidemic/epizootic transmission under certain conditions. Phylogenetic analyses suggest that EEEV was independently introduced into Vermont on at least two separate occasions.

Ebbs, S.; Bradfield, S.; Kumar, P.; **White, J.C.; Musante, C.**; Ma, X. 2015. Accumulation of zinc, copper, or cerium in carrot (*Daucus carota*) exposed to metal oxide nanoparticles. *Environ. Sci.: Nano*. DOI: 10.1039/C5EN00161G.

The release of engineered nanoparticles (ENPs) into the environment has raised concerns about the potential risks to food safety and human health. There is a particular need to determine the extent of ENP uptake into plant foods. Belowground vegetables growing in direct contact with the growth substrate are likely accumulate the highest concentration of ENPs. Carrot (*Daucus carota*) was grown in sand amended with ZnO, CuO, or CeO<sub>2</sub> NPs or same concentrations of Zn<sup>2+</sup>, Cu<sup>2+</sup>, or Ce<sup>4+</sup>. Treatment with ZnO or Zn<sup>2+</sup> produced a concentration-dependent decrease in root and total biomass.

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Ionic  $\text{Cu}^{2+}$  and  $\text{Ce}^{4+}$  caused a greater reduction in shoot biomass as compared to the corresponding ENP treatments. Accumulation of Zn, Cu, or Ce in the taproot was restricted to the taproot periderm. Metal concentrations in the taproot periderm were higher for the ionic treatments than for the ENP treatments. Radial penetration of the metals into the taproot and subsequent translocation to shoots was also generally greater for plants receiving the ionic treatment than the ENP treatment. The distribution of the metals from the ENP treatments across the periderm, taproot, and shoots differed from that observed for the ionic treatments. Overall, the ENPs were no more toxic than the ionic treatments and showed reduced accumulation in the edible tissues of carrot. The results demonstrate that the understanding of ionic metal transport in plants may not accurately predict ENP transport and that additional comparative study is needed for this and other crop plants.

Majumdar, S.; Arigi, E.A.; Choi, H.; Trujillo-Reyes, J.; Margez, J.P.F.; Almeida, I.; **White, J.C.**; Peralta-Videa, J.R.; Gardea-Torressey, J.L. 2015. Environmental effects of nanoceria on seed production of common bean (*Phaseolus vulgaris*): A proteomic analysis. *Environ. Sci. Technol.* 10.1021/acs.est.5b03452.

The rapidly growing literature on the response of edible plants to nanoceria has provided evidence of its uptake and bioaccumulation, which delineates a possible route of entry into the food chain. However, little is known about how the residing organic matter in soil may affect the bioavailability and resulting impacts of nanoceria on plants. Here, we examined the effect of nanoceria exposure (62.5 to 500 mg/kg) on kidney bean (*Phaseolus vulgaris*) productivity and seed quality as a function of soil organic matter content. Cerium accumulation in the seeds produced from plants in organic matter enriched soil showed a dose-dependent increase, unlike in low organic matter soil treatments. Seeds obtained upon nanoceria exposure in soils with higher organic matter were more susceptible to changes in nutrient quality. A quantitative proteomic analysis of the seeds produced upon nanoceria exposure provided evidence for upregulation of stress-related proteins at 62.5 and 125 mg/kg nanoceria treatments. Although the plants did not exhibit overt toxicity, the major seed proteins primarily associated with nutrient storage (phaseolin) and carbohydrate metabolism (lectins) were significantly down-regulated in a dose dependent manner upon nanoceria exposure. This study thus suggests that nanoceria exposures may negatively affect the nutritional quality of kidney beans at the cellular and molecular level. More confirmatory studies with nanoceria along different species using alternative and orthogonal “omic” tools are currently under active investigation, which will enable the identification of biomarkers of exposure and susceptibility.

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## JOURNAL ARTICLES APPROVED OCTOBER 2015

- Aulakh, J. S.** Phragmites – Distinguishing the native from the non-native. *CAES Fact Sheet*
- Benton, E., J. F. Grant, **R. S. Cowles**, J. Webster, R. Nichols, A. Lagalante, and C. Coots. Assessing relationships between tree diameter and long-term persistence of imidacloprid and olefin to optimize imidacloprid treatments on eastern hemlock. *Forest Ecology and Management*
- Dandurand, L.-M., G. R. Knudsen, R. Kooliyottil, and **J. A. LaMondia**. Alternative eradication strategies for the pale cyst nematode, *Globodera pallida*, using the trap crop *Solanum sisymbriifolium* and two biological control fungi. *Methyl Bromide Alternatives Outreach Proceedings*
- Dingman, D. W.** and A. M. Alippi. *Paenibacillus larvae*: with or without subspecies (Letter to the Editor). *International Journal of Systematic and Evolutionary Microbiology*
- Ebbs, S., S. Bradfield, P. Kumar, **J. C. White**, and X. Ma. Modeling dietary intake of zinc and copper from consumption of carrot (*Daucus carota*) exposed to metal oxide nanoparticles and metal ions. *Frontiers in Plant Science*
- Elmer, W. H.** Effect of biochar and earthworms on Fusarium crown and root rot, mycorrhizal colonization and yield of asparagus. *Plant Disease*
- Hiskes, R.** African ant, *Pheidole megacephala*, found in a Connecticut structure. *CAES Fact Sheet*
- Li, Yonghao, Sharon Douglas, Pamela Sletten, and Lindsay Patrick.** Seed germination and purity analysis 2015. *CAES Technical Bulletin*
- Majumdar, S.**, J. Trujillo-Reyes, J. Hernandez-Vieczas, **J. C. White**, J. Peralta-Videa, and J. Gardea-Torresdey. Terrestrial trophic transfer and biomagnification of cerium oxide nanoparticles: cross talk between growth stages and metabolic processes. *Environmental Science and Technology*
- Malapi-Wright, M., J. E. Demers, D. Veltri, **R. E. Marra**, and J. A. Crouch. LAMP detection assays for boxwood blight pathogens: a comparative genomics approach. *Nature Scientific Reports*
- Maynard, A. A.** Calabaza squash and personal-sized watermelons – two high value specialty crops. *Proceedings of the 2015 New England Vegetable and Fruit Conference*
- Minton, J. A., M. Rapp, A. J. Stoffer, **N. P. Schultes**, and G. S. Mourad. Heterologous complementation studies reveal the solute transport profiles of a two-member Nucleobase Cation Symporter 1 (NCS1) family of *Physcomitrella patens*. *Plant Physiology and Biochemistry*
- Niazi, N. K., B. Murtaza, I. Bibi, M. Shadid, **J. C. White**, M. F. Nawaz, S. Bashir, and G. Murtaza. Removal and recovery of metals by bisorbents and biochars derived from biowastes. Book Chapter in *Environmental Materials and Waste: Resource Recovery and Pollution Prevention*, Elsevier
- Tian, M., L. Zhao, S. Li, J. Huang, Z. Sui, J. Wen, and **Y. Li**. Pathotypes and metalaxyl sensitivity of *Phytophthora sojae* and their distribution in Heilongjiang, China 2011 to 2015. *Journal of General Plant Pathology*
- Yang, B., **J. J. Pignatello**, D. Qu, and B. Xing. Activation of hydrogen peroxide and solid peroxide reagents by phosphate ion in alkaline solution. *Environmental Engineering Science*

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## ARTICLES OF INTEREST OCTOBER 2015



**Dr. Gale Ridge speaking to multi-state transfer station attendants on October 29<sup>th</sup>, 2015**



**Mr. Joseph P. Barsky with upper class students and teachers from CO-OP High School at East Rock Park, New Haven following a native and invasive species identification field trip.**

**THE  
CONNECTICUT  
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EXPERIMENT  
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Entrance to The Connecticut Agricultural Experiment Station in New Haven on Huntington Street



Main Laboratories, New Haven



Lockwood Farm, Hamden



Griswold Research Center, Griswold



Valley Laboratory, Windsor

**THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION**

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