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

DEPARTMENTAL NEWS

ADMINISTRATION

DR. THEODORE ANDREADIS attended an Invasive Council Meeting in Hartford (February 10); with **MR. MICHAEL LAST** met with members of the State Construction Services QBS Selection Panel to interview and select an architectural firm for design of the Valley Laboratory renovation and new building (February 19); and presented an update on Station activities at the annual meeting of the Tobacco Growers held in Windsor (100 attendees) (February 24).

ANALYTICAL CHEMISTRY

DR. JASON WHITE, along with **DR ARNAB MUKHERJEE, DR SANGHAMITRA MAJUMDAR, DR. ALIA SERVIN, DR. ROBERTO DE LA TORRE-ROCHE, AND MR. JOSEPH HAWTHORNE** met with collaborators at the University of Massachusetts Amherst and planned new collaborative investigations (February 4); was interviewed by Ms. Jay-Me Brown of "60 Minutes Sports" on the use of pesticides on golf courses and the potential links to disease (February 6); along with **DR. BRIAN EITZER, DR. CHRISTINA ROBB, DR. WALTER KROL, MS. KITTY PRAPAYOTIN-RIVEROS, DR. ROBERTO DE LA TORR-ROCHE, DR. ALIA SERVIN, DR. ARNAB MUKHERJEE, DR. SANGHAMITRA MAJUMDAR, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, MR. CRAIG MUSANTE, MR. JOHN RANCIATO AND MS. TERRI ARSENAULT** attended a pre-assessment accreditation audit by A2LA (February 11); along with **DR. BRIAN EITZER** participated in the FERN cCAP monthly conference call (February 12); along with **DR. CHRISTINA ROBB AND DR. BRIAN EITZER** participated in the FDA FERN Northeast Region Conference Call (February 18); participated in a webinar hosted by the University of California Center for the Environmental Implications of Nanotechnology (UC CEIN) on exposure assessment of nanomaterials (10 attendees) (February 20); participated in a teleconference call hosted by the Sustainable Nanotechnology Organization and discussed potential NSF funding opportunities (10 attendees) (February 23); spoke by phone with Professor Stephen Ebbs of Southern Illinois University about collaborative projects (February 24); along with **DR. WALTER KROL** participated in a Lobster Pesticide Steering Committee Conference Call to discuss progress on the current research project (12 attendees) (February 26); viewed a USDA NIFA webinar on establishing Centers of Excellence (February 26); along with **DR. BRIAN EITZER** participated in an FDA FERN 50-State Conference Call (February 26); and along with **MS. KITTY PRAPAYOTIN-RIVEROS** and **MR. JOHN RANCIATO** met with Ms. Virginia Veneziano of the CT Department of Consumer Protection to discuss the current Manufactured Food Regulatory Program Standard (MFRPS) Sampling Agreement.

DR. BRIAN EITZER was a participant in the NACRW organizing committee conference call (February 12); and gave a presentation entitled "Determination of Pesticide Residues in Tobacco Plants" to the Tobacco Growers Association meeting in East Windsor, CT (110 people) (February 24).

DR CHRISTINA ROBB participated in a webinar based board meeting for the Eastern Analytical Symposium (February 13).

ENTOMOLOGY

DR. KIRBY STAFFORD III spoke on tick integrated pest management at the NOFA Organic Land Care Course at the Three Rivers Community College in Norwich (44 attendees) (February 11) and participated in the Public Hearing Environment Committee on Raised Bill No. 867, An Act Concerning the Enforcement of Firewood Transport Restrictions by the Department of Energy and Environmental Protection (February 13).

MR. MARK CREIGHTON presented a talk on "Bee disease and pests" and handed out Honey Bee Registration forms to students at the CT Beekeepers Annual Bee School held in Woodbury (240 attendees) (February 7); spoke about honey bees and presented information on the value of honey bee registration to students at the Eastern Beekeepers Association Bee School in Haddam (55 attendees) (February 10); presented information on the value of honey bee registration and manned the CAES booth at a honey bee workshop held at Benedicts Home and Garden Center in Monroe (250 attendees) (February 14); staffed a honey bee information booth and spoke about CAES, bees, and pollination at the Connecticut Flower and Garden Show in Hartford (78 attendees visited the booth) (February 19); spoke to beekeepers on bee health topics and collected Honey Bee Registration forms at the CT Beekeepers Association meeting in Woodbury (February 21); staffed a honey bee information booth and spoke about CAES, bees, and pollination at the Connecticut Flower and Garden Show in Hartford (320 attendees visited the booth) (February 22); presented a talk on "Bee disease and pests" and handed out Honey Bee Registration forms at the CT Beekeepers 2nd Bee School held in Falls Village (200 attendees) (February 28); and was interviewed about the state of beekeeping in CT by the Republican-American (February 28).

MS. KATHERINE DUGAS spoke to the Old Lyme Middle School Science Olympiad Entomology team and brought boxes of insects for the students and discussed insect identification (6 students attended) (February 6); helped with the DEEP's display and contributed Asian longhorned beetle and emerald ash borer displays and information for the weekend at the CT Hunting and Fishing Show in Hartford (100 people stopped by the booth) (February 13); staffed the CAES booth and had displays with information about honey bees, Asian longhorned beetle, and the emerald ash borer at the CT Flower and Garden Show in Hartford (300 people visited the booth) (February 20 and 21); spoke to the 10 UConn Master Gardener Coordinators regarding forest pest outreach and future outreach opportunities such as ash tree tagging, Earth Day, and a Hot Topics talk in April at the Master Gardener Coordinator's Meeting in Hartford (February 25); and gave a talk about the Cooperative Agricultural Pest Survey and invasive forest pests at the Denison Pequotsepos Nature Center in Mystic (8 attendees) (February 26).

DR. CHRIS MAIER displayed new entomological literature at a meeting of the Connecticut Entomological Society at Yale University, New Haven (February 20).

DR. CLAIRE RUTLEDGE gave a talk titled "Little trees get eaten too, insects attacking trees" to the Greater New Haven Bonsai Society in New Haven (15 adults attended) (February 10); taught the class "Insects attacking trees" for Arboriculture 101, put on by The Connecticut Tree Protective Association, in Wallingford (45 adults attended) (February 18); taught the class "Insects attacking trees" for an arborist course at Bartlett Arboretum in Stamford (15 adults attended) (February 19); and presented a table "Biosurveillance, using a native wasp to find invasive beetles" at the African Americans in Science Day at the Discovery Museum in Bridgeport (75 adults and youths attended) (February 21).

DR. VICTORIA SMITH participated in a meeting of the Yale Biosafety Committee in New Haven (20 participants) (February 19).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO visited Prof. Baoshan Xing, University of Massachusetts, Amherst, to discuss collaborative research (February 12) and gave the talk "Laboratory Tests of Biochars as Absorbents for Use in Recovery or Containment of Marine Crude Oil Spills" and co-organized and co-chaired the symposium "Oil-Dispersants-Sediment Interactions and Their Implications on Weathering and Remediation of Spilled Oil in the Gulf of Mexico Ecosystems" at the Gulf of Mexico Research Initiative Conference in Houston, TX (approximately 200 attendees) (February 17).

DR. PHILIP ARMSTRONG gave a lecture on arthropod-borne viral diseases as a part of the Principles of Infectious Diseases Course at the Yale School of Public Health. (February 5; 31 attendees); and gave the talk "EEE Virus in Connecticut: Lessons Learned from 18 Years of Surveillance and Research" at the Annual Virginia Mosquito Control Association Meetings in Suffolk, VA (approximately 50 attendees) (February 6).

DR. GOUDARZ MOLAEI gave an invited talk "Dynamics of vector-host interactions and epizootiology of eastern equine encephalitis virus" at the Virginia Mosquito Control Association Annual Meeting *via* video conferencing (February 6); gave an invited talk "New threats and old enemies: Vector-host interactions and the emergence and expansion of arboviruses in the USA" for the Department of Entomology, Rutgers University (approximately 45 attendees) (February 6); and met with Professor Rebecca Rico-Hesse, Department of Molecular Virology & Microbiology and the Department of Pediatrics, Baylor College of Medicine and discussed research topics of interest (February 19).

MR. GREGORY BUGBEE, gave a talk entitled "Improving Soil in the Home Landscape" to the West Hartford Exchange Club in West Hartford (approximately 30 attendees) (February 4); participated in the Phosphorus Nonpoint Source Pollution Workgroup at CTDEEP headquarters in Hartford (approximately 40 attendees) (February 20); with Jennifer Fanzutti, presented a seminar on "Invasive Aquatic Plants" to an environmental studies class at Three Rivers Community College in Norwich (approximately 30 attendees) (February 25); and, with Jennifer Fanzutti, presented the results of the 2014 aquatic plant surveys of Lakes Candlewood, Lillinonah, and Zoar to FirstLight Power Resources technical committee in New Milford (February 25; 12 attendees).

DR. CHARLES VOSSBRINCK met with Carol Royal, manager of Strawberry Fields Farm in Sherman, at Lockwood farm to discuss fig tree care and propagation (February 11).

FORESTRY AND HORTICULTURE

DR. JEFFREY WARD attended the annual meeting of the Connecticut Chapter, Society of American Foresters in Middlefield (February 24).

DR. ABIGAIL MAYNARD visited and discussed the New Crops Program at Borelli's farm in North Haven and Hindinger's farm in Hamden (February 13); and discussed the New Crops Program with an AP Biology class at Hamden Hall Country Day School (12 students, 1 teacher) (February 19).

PLANT PATHOLOGY AND ECOLOGY

DR. WADE ELMER attended the UConn-CAES Spring Bedding Plant Meeting in Torrington, where he participated in the Connecticut Greenhouse Growers Association Annual Business meeting (February 3); and presented the talk "Fighting Fusarium in flowers: role of mineral nutrition" at the Connecticut Flower and Garden Show in Hartford (9 attendees) (February 20).

DR. FRANCIS FERRANDINO gave a presentation titled "Grape powdery mildew in Connecticut" to the Connecticut Vineyard and Winery Association at the CT Farm Bureau in Windsor (45 adult attendees) (February 23).

DR. YONGHAO LI gave a talk titled "Bedding crop diseases and their management" at the UConn-CAES Spring Bedding Plant Meeting in Torrington (35 attendees) (February 3); gave a talk titled "Bedding crop diseases and their management" at the UConn-CAES Spring Bedding Plant Meeting in Vernon (37 attendees) (February 5); gave a lecture titled "Diseases of the landscape" for the Stamford Arboretum's Arboriculture 101 class in Stamford (8 attendees) (February 17); spoke about "Disease control in the home vegetable garden" at the Connecticut Flower and Garden Show in Hartford (70 attendees) (February 20); and was interviewed about the impact of this year's cold winter temperatures on woody ornamentals by Robert Miller of the News-Times (February 24).

DR. NEIL SCHULTES presented a lecture on "Genetically modified plants" to a Yale University Freshman Science Seminar class Scie031 (12 students attended) (February 6).

DR. LINDSAY TRIPLETT, with **DR. CLAIRE RUTLEDGE**, set up a CAES demonstration table for the African-American History Month celebration at the Bridgeport Discovery Museum, where attendees participated in demonstration activities related to plant disease and insect pests (25 adults and 50 youths attended) (February 21); and gave a guest lecture on career opportunities in agriculture and plant sciences for the class "Career Seminar in Environmental Sciences" at Mitchell College in New London (15 students attended) (February 26).

NEW EQUIPMENT:

Representatives from UVP and Bio-Tek visited CAES on February 25 to provide training and installation for a new gel documentation system and plate reader in Room 114, Jenkins-Waggoner. The gel documentation system is a UVP Chemi-Doc-It 2; it can image fluorescent or chemiluminescent gels, blots, and other small samples, and includes software for user-friendly quantitative image analysis. The plate reader is a BioTek Synergy H1m monochromator-based multimode plate reader; it can measure luminescence, fluorescence, or absorbance at any wavelength in 6- to 384-well plates. The instrument includes an attachment for measuring protein, RNA, or DNA concentration of up to 16 samples at once. The Synergy can be programmed for kinetic studies with shaking and temperature control. If you missed the training and are interested in using these instruments, please e-mail Lindsay Triplett (Lindsay.Triplett@ct.gov).

VALLEY LABORATORY

DR. CAROLE CHEAH was interviewed by Bob Miller of the Danbury News Times about the probable effect of the severe winter of 2015 on Hemlock Wooly Adelgid populations (February 24).

DR. RICHARD COWLES presented "Neonics and bees: What does the science say?" to the Conn. Nursery and Landscape Association winter meeting in New Haven, (120 attendees)(January 7); met with the Hartland Pond Association to discuss hemlock woolly adelgid management (10 attendees) (January 11); spoke about "Spotted wing drosophila" at the Progressive Grower Agricultural Supply educational seminar meeting (60 attendees) (January 16); remotely presented via a video (and phone to answer questions) "Neonicotinoids and bee health" to the Tristate Green Industry winter meeting in Cincinnati, OH, (80 attendees) (February 5); presented "Neonicotinoid impact on pollinators" at the Society of American Floriculture national meeting in Orlando, FL (100 attendees) (February 20); and was interviewed by Jennifer Zurko of Grower Talks magazine (February 25 and 27) regarding the use of neonicotinoids in ornamental horticulture crops.

DR. JAMES LAMONDIA participated in a meeting of the Connecticut Agricultural Information Council at the Valley Lab (January 13); presented a poster on 'Bloat Nematode in Garlic' at the Connecticut Vegetable and Small Fruit Conference held in East Windsor (January 15); and spoke to seniors from MARC about research and services at the Valley Lab (12 people) (January 16); participated in the UConn Internship and Co-op Career Fair (February 4) in Storrs; spoke about research and services at the Station and Valley Lab summer employment opportunities at the Central Connecticut State University Biology Department Career Fair (60 persons) (February 23); welcomed growers to the Annual Tobacco Research Meeting and spoke about research topics and recent developments at the Station, spoke about research on management of tobacco pathogens including poty viruses, black shank, target spot and blue mold fungicide resistance, spoke about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves, and common molds of cured tobacco (110 persons) (February 24); 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 (38 persons) (February 25); and participated in a meeting of the Connecticut Agricultural Information Council at the Valley Laboratory to select the Connecticut Outstanding Young Farmer Award winner and prepare for Ag Day at the Capital (February 27).

DR. DEWEI LI hosted two visiting mycologists, Dr. Bao-Kai Cui and Dr. Li-Wei Zhou, of the Beijing Forestry University and the Applied Ecology Institute, Chinese Academy of Sciences, respectively (December 4); and participated in an advisory board meeting of the project "Recovery from catastrophic weather: Hurricane Sandy mold exposure and health-related training" at UCONN Health Center (December 19).

DEPARTMENTAL RESEARCH UPDATES FEBRUARY 2014

Servin, A.; **Elmer, W.**; **Mukherjee, A.**; **De la Torre-Roche, R.**; Hamdi, H.; **White, J.C.**; Bindraban, P.; Dimkpa, C. 2015. A review of the use of engineered nanomaterials to suppress plant disease and enhance crop yield. *J. Nano. Res*. DOI:10.1007/s11051-015 -2907-7.

ABSTRACT: Nanotechnology has the potential to play a critical role in global food production, food security and food safety. The applications of nanotechnology in agriculture include fertilizers to increase plant growth and yield, pesticides for pest and disease management, and sensors for monitoring soil quality and plant health. Over the past decade, a number of patents and products incorporating nanomaterials into agricultural practices (e.g., nanopesticides, nanofertilizers, and nanosensors) have been developed. The collective goal of all of these approaches is to enhance the efficiency and sustainability of agricultural practices by requiring less input and generating less waste than conventional products and approaches. This review evaluates the current literature on the use of nanoscale nutrients (metals, metal oxides, carbon) to suppress crop disease and subsequently enhance growth and yield. Notably, this enhanced yield may not only be directly linked to the reduced presence of pathogenic organisms, but also to the potential nutritional value of the nanoparticles themselves, especially for the essential micronutrients necessary for host defense. We also posit that these positive effects are likely a result of the greater availability of the nutrients in the "nano" form. Last, we offer comments on the current regulatory perspective for such applications.

Garvin, A.; Doucette, W. J.; **White, J.C.** 2015. Investigating differences in the root to shoot transfer and xylem sap solubility of organic compounds between zucchini, squash and soybean using a pressure chamber method. *Chemosphere* DOI:10.1016/ j.chemosphere. 2014.11.075.

ABSTRACT: A pressure chamber method was used to examine differences in the root to shoot transfer and xylem sap solubility of caffeine (log Kow = −0.07), triclocarban (log Kow = 3.5–4.2) and endosulfan (log Kow = 3.8–4.8) for zucchini (cucurbita pepo ssp pepo), squash (cucurbita pepo ssp ovifera), and soybean (glycine max L.). Transpiration stream concentration factors (TSCF) for caffeine (TSCF = 0.8) were statistically equivalent for all plant species. However, for the more hydrophobic endosulfan and triclocarban, the TSCF values for zucchini (TSCF = 0.6 and 0.4, respectively) were 3 and 10 times greater than the soybean and squash (TSCF = 0.2 and 0.05, respectively). The difference in TSCF values was examined by comparing the measured solubilities of caffeine, endosulfan and triclocarban in deionized water to those in soybean and zucchini xylem saps using a modified shake flask method. The measured solubility of organic contaminants in xylem sap has not previously been reported. Caffeine solubilities in the xylem saps of soybean and zucchini were statistically equal to deionized water (21 500 mg L−1) while endosulfan and triclocarban solubilities in the zucchini xylem sap were significantly greater (0.43 and 0.21 mg L−1, respectively) than that of the soybean xylem sap (0.31 and 0.11 mg L−1, respectively) and deionized water (0.34 and 0.11 mg L−1, respectively). This suggests that the enhanced root to shoot transfer of hydrophobic organics reported for zucchini is partly due to increased solubility in the xylem sap. Further xylem sap characterization is needed to determine the mechanism of solubility enhancement.

Zhang, W.; Ebbs, S.D.; **Musante, C.**; **White, J.C.**; Gao, C.; Ma, X. 2015. Uptake and Accumulation of bulk and nano-sized cerium oxide particles and ionic cerium by radish (*Raphanus sativus L.). J. Agric. Food Chem.* 63(2):382-90

ABSTRACT: The potential toxicity and accumulation of engineered nanomaterials (ENMs) in agricultural crops has become an area of great concern and intense investigation. Interestingly, although below-ground vegetables are most likely to accumulate the highest concentrations of ENMs, little work has been done investigating the potential uptake and accumulation of ENMs for this plant group. The overall objective of this study was to evaluate how different forms of cerium (bulk cerium oxide, cerium oxide nanoparticles, and the cerium ion) affected the growth of radish (Raphanus sativus L.) and accumulation of cerium in radish tissues. Ionic cerium (Ce(3+)) had a negative effect on radish growth at 10 mg CeCl3/L, whereas bulk cerium oxide (CeO2) enhanced plant biomass at the same concentration. Treatment with 10 mg/L cerium oxide nanoparticles (CeO2 NPs) had no significant effect on radish growth. Exposure to all forms of cerium resulted in the accumulation of this element in radish tissues, including the edible storage root. However, the accumulation patterns and their effect on plant growth and physiological processes varied with the characteristics of cerium. This study provides a critical frame of reference on the effects of CeO2 NPs versus their bulk and ionic counterparts on radish growth.

Collin, B.; Auffan, M.; Johnson, A.; Kaur, I.; Keller, A.A.; Lazareva, A.; Lead, J.; Ma, X.; Merrifield, R.; Svendsen, C.; **White, J.C.**; Unrine, J.M. 2014. Environmental release, fate and ecotoxicological effects of manufactured ceria nanomaterials. *Environ. Sci.: Nano.* 1, 533-548.

ABSTRACT: Recent interest in the environmental fate and effects of manufactured CeO2 nanomaterials (nanoceria) has stemmed from the expanded use for a variety of applications including fuel additives, catalytic converters, chemical and mechanical planarization media and others. This has led to a wave of publications on the toxicological effects of nano in ecological receptor species, but only limited information is available on possible environmental releases, concentrations in environmental medial, or environmental transformations. In this paper, we make initial estimates of likely environmental releases and exposure concentrations in soils and water and compare them to published toxicity values. Insufficient information was available to estimate aquatic exposures, but we estimated inputs to a wastewater treatment plant that could result effluent concentrations that would result in acute toxicity to the most sensitive aquatic organisms tested so far, cyanobacteria. The purpose of this exercise is to identify which areas are lacking in data to perform either regional or site specific ecological risk assessments. While estimates can be made for releases from use as a diesel fuel additive, and the predicted acute toxicity is low, estimates for releases from other uses are difficult at this stage. We recommend that future studies focus on environmentally realistic exposures that take into account potential environmental transformations of the surface as well as chronic toxicity studies in benthic aquatic organisms, soil invertebrates and microorgansims.

Zhang Y, **Pignatello JJ**,* Tao S, and Xing, B, Bioacessibility of PAHs in Fuel Soot Assessed by an in vitro Digestive Model: Effect of Including an Absorptive Sink," *Environ. Sci. Technol.*, online February 18, 2015; DOI: 10.1021/ es505898v.

ABSTRACT: Polycyclic aromatic hydrocarbons (PAHs) associated with soot or black carbon can enter the human digestive tract by unintentional ingestion of soil or other particles. This study investigated the bioaccessibility of 11 PAHs in a composite fuel soot sample using an in vitro digestive model that included silicone sheet as an absorptive sink during the small intestinal digestion stage. The sheet was meant to simulate the passive transfer of PAHs in lumen fluid across the small intestinal epithelium which was postulated to promote desorption of labile PAHs from the soot by steepening the soot-fluid concentration gradient. We show that the presence of silicone sheet during a 4-h default digestion time significantly increased the apparent bioaccessible fraction (Bapp, %), defined as the sum in the sheet and digestive fluid relative to the total PAH determined. The ability to increase Bapp for most PAHs leveled off above a sheet-to-soot ratio of 2.0 g per 50 mg, indicating that the sheet is an effective absorptive sink and promotes desorption in the mentioned way. Enhancement of Bapp by the sheet correlated positively with octanol-water partition coefficient (Kow), even though the partition coefficient of PAH between sheet and digestive fluid (which contains bile acid micelles) correlated negatively with Kow. It was hypothesized that PAHs initially in the soot exist in labile and nonlabile states. The fraction of labile PAH still sorbed to the soot residue after digestion and the maximum possible (limiting) bioaccessibility (Blim) could be estimated by varying the sheet-to-soot ratio. We show conclusively that the increase in bioccessibility due to the presence of the sheet is accounted for by a corresponding decrease in fraction of labile PAH still sorbed to the soot. The Blim ranged from 30.8 to 62.4%, independent of molecular size. The nonlabile fraction of individual PAHs (69.2 - 37.6% in this case) is therefore large and needs to be taken into account in risk assessment.

Xu W, **Pignatello JJ**, and Mitch WA,* Reduction of Nitroaromatics Sorbed to Black Carbon by Direct Reaction with Sorbed Sulfides, *Environ. Sci. Technol.*, ASAP, February 11, 2015; DOI: 10.1021/es5045198.

ABSTRACT: Sorption to black carbons is an important sink for organic contaminants in sediments. Previous research has suggested that black carbons (graphite, activated carbon, and biochar) mediate the degradation of nitrated compounds by sulfides by at least two different pathways: reduction involving electron transfer from sulfides through conductive carbon regions to the target contaminant (nitroglycerin) and degradation by sulfur-based intermediates formed by sulfide oxidation (RDX). In this study, we evaluated the applicability of black carbon-mediated reactions to a wider variety of contaminant structures, including nitrated and halogenated aromatic compounds, halogenated heterocyclic aromatic compounds, and halogenated alkanes. Among these compounds, black carbon-mediated transformation by sulfides over a 3-day time scale was limited to nitroaromatic compounds. The reaction for a series of substituted nitroaromatics proceeded by reduction, as indicated by formation of 3-bromoaniline from 3-bromonitrobenzene, and inverse correlation of log kobs with energy of the lowest unoccupied molecular orbital (ELUMO). The log kobs was correlated with sorbed sulfide concentration, but no reduction of 3-bromonitrobenzene was observed in the presence of graphite and sulfite, thiosulfate, or polysulfides. Whereas nitroglycerin reduction occurred in an electrochemical cell containing sheet graphite electrodes in which the reagents were placed in separate compartments, nitroaromatic reduction only occurred when sulfides were present in the same compartment. The results suggest that black carbon-mediated reduction of sorbed nitroaromatics by sulfides involves electron transfer directly from sorbed sulfides rather than transfer of electrons through conductive carbon regions. The existence of three different reaction pathways suggests a complexity to the sulfide-carbon system compared to the iron–carbon system, where contaminants are reduced by electron transfer through conductive carbon regions.

Pakpour, Sepideh, **De-Wei Li**, and John Klironomos. 2015. Relationships of fungal spore concentrations in the air and meteorological factors. *Fungal Ecology* 13: 130-134.

ABSTRACT: High concentrations of airborne fungal spores are associated with human health concerns. Environmental variables, such as temperature and moisture, can influence growth and reproduction in fungi and airborne spore concentrations can fluctuate seasonally. However, we do not understand how long-term changes in climate affect fungal abundance in the air. Here, we sampled annually (at peak season, in September, over a 20-yr period) for airborne fungal spores in two North American cities (New York and Toronto), and related fungal abundance to local variation in climate. We found that at both locations, the total precipitation during the 2- month period prior to sampling (Jul.–Aug.) was negatively related to observed fungal spore concentrations. Considering that climate predictions for these two regions indicate an increase in drought events in summer, we expect airborne fungal concentrations to increase in future years, potentially exacerbating human health concerns.

Zeng, Quan, and C.-H. Yang. 2015. Chapter 12: Post-transcriptional and Post-translational Regulatory Mechanisms of Virulence Factors. In: *Virulence Mechanisms of Plant-Pathogenic Bacteria*, edited by Drs. L. D. Fuente, J. H. Ham, S. A. Hogenhout, J. B. Jones, C. Roper, G. W. Sundin, N. Wang, and F. F. White. *American Phytopathological Society* (APS) Press (in press).

ABSTRACT: This chapter describes common virulence regulatory mechanisms that occur at the post-transcriptional and post-translational levels in bacterial plant pathogens, including non-coding small RNAs, glycosylation, and protein-protein interactions.

Zeng, Quan. 2015. Winter and early season fire blight management. *CAES Fact Sheet* http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/winter_and_early_season_fire_blight_management_02-18-15.pdf

ABSTRACT: Fire blight is a devastating disease of apples and pears caused by the bacterial pathogen *Erwinia amylovora*. In 2014, serious outbreaks of this disease were observed throughout many New England orchards. This fact sheet reviews the winter or early-season management practices that can be used to minimize new outbreaks in orchards for the upcoming season.

LaMondia, J. A. 2015. Management of *Calonectria pseudonaviculata* in boxwood with fungicides and less susceptible host species and varieties. Plant Disease 99:363- 369.

ABSTRACT: Calonectria pseudonaviculata causes leaf and stem lesions resulting in defoliation and dieback of boxwood. Trials were conducted to evaluate fungicide management of boxwood blight under greenhouse and container nursery conditions in Connecticut using fungicides previously determined to have *in vitro* activity against conidial germination or mycelial growth. Plants of different boxwood cultivars were inoculated 48 hours after fungicide application. Disease progression was monitored over six weeks and progressed from leaf and stem lesions to defoliation. The level of disease control achieved by fungicides was generally good, with the most efficacious treatments averaging from 95% to nearly 100% control. Products containing propiconazole, myclobutanil, thiophanate-methyl, fludioxonil, pyraclostrobin, kresoxim-methyl, and chlorothalonil had significant efficacy. The combination of systemic plus protectant fungicides in a single application resulted in superior disease control compared to the use of a systemic fungicide. There were no differences between the fungicide treatments that included thiophanate-methyl and those that included propiconazole as the systemic fungicide. Korean and 'Winter Gem' (*B. sinica* var. *insularis*) were the least susceptible of the cultivars evaluated, Common Boxwood (*B. sempervirens*) and True Dwarf (*B. sempervirens* 'Suffruticosa') were the most susceptible, and 'Green Mountain' (*B. sinica* var *insularis* X *B. sempervirens* Suffruticosa) and 'Green Velvet' (*B. sinica* var *insularis* X *B. sempervirens* Suffruticosa' were intermediate. These results suggest that *B. sinica* var. *insularis* may have some level of resistance to boxwood blight. Management of boxwood blight will rely on integrated best management practices that include inspection of incoming plant material, sanitation, cultural controls including use of cultivars tolerant to infection, and fungicide application.

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JOURNAL ARTICLES APPROVED FEBRUARY 2015

Hea, Qiang, Shao-Lun Liub, Xiaoyan Zhanga, Youyi Zhanga, Jinshan Xua, Zeyang Zhoua, and **Charles R. Vossbrinck.** Comparative genomics of geographical strains of *Antheraea pernyi* nucleopolyhedrosisviruses. *Acta Entomol. Sinica*

Giordano, P. R., **Quan Zeng,** N. M. Dykema, A. R. Detweiler, and J. M. Vargas. First report of *Xanthomonas translucens* causing wilt disease on perennial ryegrass *(Lolium perenne)* in the United States. *Plant Disease*

Eevers, N., M. Gielen, A. Sanchez-Lopez, S. Jaspers, **Jason C. White,** J. Vangronsveld, and N. Weyens. Optimization of isolation and cultivation of bacterial endophytes through addition of plant extract to growth media. *Environmental Microbiology Reports*

Pignatello, Joseph J., and **Wade H. Elmer.** Biochar. Researchers explore an ancient substance with future promise. *Connecticut Horticultural Society Newsletter*

Ma, C., **Jason C. White,** O. M. Dhanker, and B. Xing. Metal-based nanotoxicity and detoxification pathways in higher plants. *Environmental Science & Technology*

Han, Q., C. Zhou, S. Wu, Y. Liu, **Lindsay Triplett,** J. Miao, J. Tokuhisa, L. Deblais, H. Robinson, J. E. Leach, J. Li, and B. Zhao. Crystal structure of the complex between *Xanthomonas* AvrRxo1-ORF1, a type III effector with a polynucleotide kinase domain, and its interactor AvrRxo1-ORF2. *Nature Communications*

Zeng, Quan. Winter and early-season fire blight management. *CAES Fact Sheet*

Armstrong, Philip M., Theodore G. Andreadis, and **John F. Anderson.** Emergence of a new lineage of Cache Valley Virus. *American Journal of Tropical Medicine and Hygiene*

Hayes, Laura E., Kathryn A. Sackett, N. P. Anderson, M. D. Flowers, and Christopher C. Mundt. Evidence of selection for fungicide resistance in *Zymoseptoria tritici* populations in western Oregon. *Plant Disease*

Li, Yonghao. Downy mildew of impatiens. *CAES Fact Sheet*

Li, Yonghao. Seiridium canker of Leyland cypress. *CAES Fact Sheet*

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STATION NEWS

Connecticut Agricultural Experiment Station

ARTICLES OF INTEREST

Tobacco Research Meeting Held at the Valley Laboratory

One hundred and ten people attended the Connecticut Agricultural Experiment Station's annual Tobacco Research Meeting held at the East Windsor Scout Hall on February 24, 2015. Dr. James LaMondia and Director Dr. Theodore Andreadis welcomed growers and spoke about research topics and recent developments at the Station. The meeting addressed a wide variety of issues of concern to growers. Dr. James LaMondia spoke about the CORESTA pesticide residue program and strategies to reduce pesticide residues in wrapper leaves and research on management of tobacco pathogens including poty viruses, black shank, target spot and blue mold fungicide resistance. Mr. Thomas Rathier spoke about soils, microbial activity and tobacco. Dr. James LaMondia spoke about common molds in cured tobacco. Mr. Bill Leahey spoke about CT tobacco labeling and marketing and incorporation of the Connecticut-Massachusetts Tobacco Growers Association. Ms. Colleen Kisselburgh discussed tobacco insurance program changes and Mr. Ross Eddy of the Farm Services Administration provided updates on FSA services to growers. Ms. Jane Canepa-Morrison, Ms. Michelle Salvas, Mr. Nathaniel Child and Mr. James Preste assisted with much of the behind the scenes work for the meeting. The meeting qualified for pesticide applicator re-certification credit in Connecticut and Massachusetts and 65 persons received credit.

GRANTS RECEIVED

DRS. KIMBERLY A. STONER, BRIAN D. EITZER, and RICHARD S. COWLES were notified by the Connecticut Department of Energy and Environmental Protection that they will receive a grant of $145,000 for a study of possible routes of exposure of honey bees and bumble bees to neonicotinoid insecticides through the nectar and pollen of treated nursery plants.

DR. RICHARD COWLES received funding from CT DEEP in a grant led by **Drs. Kim Stoner and Brian Eitzer**, to evaluate the use of neonicotinoid insecticides in Connecticut nurseries and the exposure to pollinators (grant total $145,000).

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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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Station News was prepared and edited by Dr. Theodore G. Andreadis, and Mrs. Vickie Bomba-Lewandoski.