

Station News

The Connecticut Agricultural Experiment Station
Volume 8 Issue 12 December 2018



This Issue

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



CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

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ADMINISTRATION

DR. THEODORE ANDREADIS attended the annual meeting of the Connecticut Working Lands Alliance held in Hartford (November 14) and attended the annual meeting of the Connecticut Farm Bureau held in Wallingford (November 15).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE attended the 2018 Sustainable Nanotechnology Organization (SNO) annual meeting held in Arlington, VA and gave a talk entitled “Engineered nanomaterials for the suppression of fungal and viral crop disease” (35 attendees) (November 5-9); met with Dr. Scott Angle, who is the new Director of the USDA National Institute of Food and Agriculture (NIFA), and Dr. Hongda Chen, who is a USDA National Program Leader, and discussed CAES programs and research (November 6); met with Dr. Lloyd Whitman, who is Principal Assistant Director of Physical Sciences and Engineering of the White House Office of Science and Technology (OSTP), Dr. Charles R. Santerre, who is Senior Policy Advisor at the OSTP, and Dr. Lisa Friedersdorf, who is Director of the National Nanotechnology Coordination Office (NNCO) in the Eisenhower Executive Office Building, and provided an update on CAES nanotechnology programs (November 7); met with Sarah Shapiro of Senator Chris Murphy’s Washington, DC office and provided a briefing on CAES programs and research (November 8); participated in a teleconference call with the CT Departments of Consumer Protection (DCP), Agriculture (DoAg), and Public Health (DPH) on establishment of a CT Rapid Response Team (RRT) which are designed to provide an integrated rapid response for all-hazards human and animal food emergencies (November 13); attended the annual Nanyang Technological University- Harvard School of Public Health- Sustainable Nanotechnology (NTU-HSPH SusNano) Workshop at Harvard University and received funding (\$155,000) for a project entitled “Nano-encapsulation of Agrichemicals for Sustainable Agriculture” (November 14-15); participated in a faculty ZOOM call for the Center for Sustainable Nanotechnology (November 21); participated in a teleconference call to discuss preparation of publications or a book related to the October 2018 Quantifying Environmental Exposure to Nanomaterials from Manufactured Consumer Products Workshop (QUEEN II) (November 27); participated in a teleconference call with Prof. Greg Lowry of Carnegie Mellon University regarding a joint USDA grant proposal (November 27, 30); met with Ms. Mona Elamin and Ms. Vicky Carrier of Gateway Community College and discussed potential internship opportunities for Mona (November 28); participated in the FDA AFRPS Face-to-Face Planning Committee teleconference call (November 29); and met with Jane Philbrick of Till Works to discuss a potential phytoremediation project in Georgetown (November 30).

DR. BRIAN EITZER presented a talk entitled “Analytical Challenges in Studies of Pesticides and Pollinators” and presided over a session at the Eastern Analytical Symposium in Princeton, NJ (25 attendees) (November 12-13); and was a participant in the conference call of the organizing committee of the North American Chemical Residue Workshop (November 14).

DR. CHRISTINA ROBB attended the Eastern Analytical Symposium (EAS) in Princeton, NJ (November 12-13) of which she was the Program Chair as well as an associated EAS board meeting (November 11).

NUBIA ZUVERZA-MENA presented a guest lecture entitled “Nanomaterials and the Food Supply: Applications and Implications” for the course “Biomedical Issues in Pathobiology - Diseases in the World: A One Health Approach” at the University of Connecticut (25 attendees) (November 5).

ENTOMOLOGY

DR. KIRBY C. STAFFORD III presented a talk entitled “Tick Winter Survival and Establishment of *Amblyomma americanum* in New England” while attending the Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual Meeting held in Vancouver, BC, Canada (70 attendees) (November 11-14); and participated in a meeting of the CT Cooperative Agricultural Pest Survey (CAPS) committee held in Jones Auditorium (10 participants) (November 20).

MR. MARK H. CREIGHTON participated in a workshop on black bear management strategies at the UCONN Extension Office in Torrington (November 7); presenting a beekeeper’s perspective on the problem. We also discussed various management strategies, educational programs, and the value of a limited bear hunting season; spoke about the various methods used to feed bees and winter preparation at the Sound School’s monthly beekeepers meeting in New Haven (November 29). A new honey extractor and supporting equipment were donated to the club under the School Beekeeping Grant, supported by a Specialty Crop Grant funded by the U.S. Department of Agriculture and administered by the Connecticut Department of Agriculture.

MS. KATHERINE DUGAS participated in a training on the EZ-Fed Grants system in Wallingford (November 7); staffed a Forest Pest booth at the annual CT Association of Conservation and Inland Wetlands Commissions (CACIWC) meeting held in Cromwell (November 17); along with **DR. KIRBY STAFFORD** and **DR. VICTORIA SMITH**, ran the fall CT Agricultural Pest Survey Committee meeting held in Jones Auditorium (10 attendees) (November 20); and attended the Annual Meeting of the CT Pomological Society held in Middletown (November 27).

DR. MEGAN LINSKE participated in a conference call with Laura Harrington and Sarah Michaels from Cornell, also affiliated with the Northeast Regional Center of Excellence in Vector-Borne Diseases, in addition to two master’s students, about CAES internship opportunities for Summer of 2019 (November 5); participated in a collaborative meeting with Thomas Meyer (UCONN) and members of US Biologic on research and funding opportunities for large-scale tick and tick-borne-disease predictive and adaptive modeling frameworks in Memphis, TN (November 6-7); conducted a Northeast Section Wildlife Society Workshop Committee conference call on workshop selections for the Northeast Fish and Wildlife Agencies (NEAFWA) Conference in April of 2019 (November 13); participated in a NEAFWA planning conference call with mem-

bers of CT DEEP and Delaney Meeting and Event Management group (November 16); led a field trip with 11th and 12th grade students from the Cooperative Arts and Humanities High School's Environmental Studies class at Lockwood Farm to discuss research and career opportunities with **DR. SCOTT WILLIAMS**, **MR. MICHAEL SHORT**, and **MR. JOSEPH BARSKY** (November 28); and conducted the CT Forestry CDE with 12 participating high schools at Lockwood Farm with **DR. SCOTT WILLIAMS**, **MR. MICHAEL SHORT**, and **MR. JOSEPH BARSKY** (60 attendees) (November 29).

DR. ELIZA A. H. LITTLE presented a talk entitled "Spatiotemporal dynamics of *Ixodes scapularis*, *Borrelia burgdorferi* infection, and Lyme Incidence in Connecticut: What can we learn from longitudinal passive surveillance data?" while attending the Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual Meeting held in Vancouver, BC, Canada (70 attendees) (November 11-14).

DR. CHRIS T. MAIER presented a poster entitled "Two Alien Beetles, *Callidiellum rufipenne* (Cerambycidae) and *Pyrrhalta viburni* (Chrysomelidae), Expand Their Distributional Range in Connecticut" while attending the Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual meeting held in Vancouver, BC, Canada (70 attendees) (November 11-14); discussed the exotic velvet longhorn beetle at an Advisory Committee Meeting of the Cooperative Agricultural Pest Survey held in Jones Auditorium (10 attendees) (November 20); and discussed new exotic insects that may threaten Connecticut fruit orchards at the Annual Meeting of the Connecticut Pomological Society held in Middletown (ca. 100 attendees) (November 27).

DR. GALE E. RIDGE flew to Seattle on November 8 and from there drove to Vancouver to attend and speak about Delusions of Parasitosis at the Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual Meeting (November 13). While in transit, the Seattle hotel she was booked to stay in became unavailable because of complications with renovations. They sent her to another hotel. By then it was late in the evening and while preparing a hot drink in the lobby some spilled onto the floor. A pair of feet was next to the spill and Gale apologized. The owner of the feet turned out to be none other than Von, the son of Dr. Paul Waggoner (former director of the Station). Von had also just arrive at the hotel, having flown in from the Midwest to visit his father for a few days. This was a total chance encounter and the following morning she joined Paul and Von at Paul's retirement home for breakfast. Paul is 96 and in excellent health and spirits. On this particular day, he was in a wheelchair due to discomfort in one of his legs. He lives in a beautiful residence overlooking Puget Sound on a steep incline with views to the islands beyond. According to Von, he has taken it upon himself to be the gardener in residence and oversees the care and maintenance of many of the patio gardens that this modern facility possesses. Paul sends his best wishes to all the staff at the Experiment Station and firmly declared as he sailed down a hall in his wheelchair, "I'm still alive and kicking."

DR. CLAIRE E. RUTLEDGE presented a talk entitled "Emerald Ash Borer" at the 2018 Annual Conference of the New England Chapter of the International Society of Arboriculture in Mystic (80 adult attendees) (November 6).

DR. VICTORIA L. SMITH participated in a meeting of the US Forest Service Cooperators, held at Portsmouth Public Library in Portsmouth, NH (30 participants) (November 7-8); participated in a meeting of the Yale Biosafety Committee held in New Haven (20 participants) (November 15); and participated in the Fall meeting of the CT Cooperative Agricultural Pest Survey (CAPS) held in Jones Auditorium (10 participants) (November 20).

DR. KIMBERLY A. STONER presented a talk entitled “Pumpkin (*Cucurbita* spp.) Pollination on Organic, IPM, and Experimental Farms in Connecticut” as a part of a symposium, “Insect Ecology, Evolution, and Economics in the Plant Family Cucurbitaceae: Opportunities, Insights, and Challenges Presented by Insects (and Their Microbiomes)” (45 attendees) (November 13); and presented a poster entitled “Tracking pesticide residues in pollen trapped from honey bees (*Apis mellifera* L.)” as part of a symposium, “Understanding and Mitigating the Risks of Pesticide Exposure for Pollinators and Other Beneficial Insects” at the Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual meeting held in Vancouver, BC, Canada (67 attendees) (November 14).



Left to right. Von Waggoner, Dr. Paul Waggoner, and Dr. Gale Ridge

ENVIRONMENTAL SCIENCES

DR. PHILIP ARMSTRONG was interviewed about 2018 being a record season for West Nile virus infection in Connecticut in both mosquitos and people by the Connecticut Post (November 5).

DR. DOUG BRACKNEY gave a talk entitled “Tissue expansion induced basal lamina micro-perforations facilitate arbovirus spread in *Aedes spp.* mosquitoes” at the 68th annual American Society of Tropical Medicine and Hygiene conference held in New Orleans, LA (approx. 100 attendees) (October 27 - November 1).

DR. ANDREA GLORIA-SORIA gave a talk entitled “Transmission of arboviruses by mosquito vectors to live vertebrate hosts is underestimated by in vitro assays” at the MUVE, Biology and Ecology of Disease Vectors symposia of the Entomological Society of America, Entomological Society of Canada and Entomological Society of British Columbia Joint Annual Meeting held in Vancouver, BC, Canada (70 attendees) (November 11).

DR. GOUDARZ MOLAEI gave two talks entitled “Spatiotemporal dynamics of *Ixodes scapularis*, *Borrelia burgdorferi* infection, and Lyme disease incidence in Connecticut: What can we learn from longitudinal passive surveillance data?” and “Population genomics of *Culiseta melanura*, the principal vector of eastern equine encephalitis virus in the United States” at the 2018 Entomological Society of America, Entomological Society of Canada, and Entomological Society of British Columbia Joint Annual Meeting held in Vancouver, BC, Canada (November 11 and 14).

FORESTRY AND HORTICULTURE

DR. JEFFREY S. WARD hosted a visit by John Foppert, PhD candidate Technical University of Munich, to discuss collaborative research on economic impact of managing mature oaks (November 6); participated in a quarterly meeting of the Connecticut Invasive Plant Council in Windsor (November 13); and spoke on “The biodiversity crises - invasive plants” to the Audubon Connecticut Science Committee in Stratford (21 attendees) (November 27).

DR. ABIGAIL A. MAYNARD reported on Station activities at a quarterly meeting of the Council on Soil and Water Conservation held in Vernon (18 adults) (November 8); advised a food composting operation at Wesleyan University in Middletown (3 students, 1 teacher) (November 13); and attended the Annual Meeting of the Connecticut Pomological Society held in Middletown (November 27).

DR. SCOTT C. WILLIAMS participated in a collaborative meeting with Dr. Thomas Meyer (UNCONN) and members of US Biologic, Inc. on research and funding opportunities for large-scale tick and tick-borne disease predictive and adaptive modeling frameworks in Memphis, TN (November 6-7); participated in a Northeast Fish and Wildlife Agencies Conference planning conference call with members of CT DEEP and Delaney Meeting and Event Management group (November 16); and with **MR. JOSEPH P. BARSKY**, **MR. MICHAEL R. SHORT**, and **DR. MEGAN LINSKE** (Entomology), hosted the FFA Forestry Career Development Event at Lockwood Farm (48 students, 12 teachers) (November 30).

PLANT PATHOLOGY AND ECOLOGY

DR. DONALD E. AYLOR was a judge for the final round of the Connecticut Tech Challenge held in at Sacred Heart University in Fairfield. Teams of engineering students from colleges throughout Connecticut competed in the challenge by designing a technological solution to combat automobile accidents caused by distracted driving (36 attendees) (November 15).

DR. WADE ELMER along with **DRS. DA SILVA, QUAN ZENG,** and **NEIL SCHULTES**, met with the Environmental Chemist candidates, Dr. Yanyan Zhang from McGill University (November 16), and Dr. Zhenyu Tian from the University of Washington (November 20).

DR. YONGHAO LI presented “Backyard Composting 101” to the Caudatowa Garden Club in Ridgefield (22 adults) (November 13); and presented “Plant Diseases and Their Management in Organic Gardens and Landscapes” for the CT NOFA Accreditation Course in Organic Land Care in East Hartford (55 adults) (November 14).

DR. ROBERT MARRA presented a 1.5 hour lecture on fungal mating systems to the Mycology (BIO-432) class at Southern Connecticut State University in New Haven (15 adults) (November 1); presented a talk on Oak Wilt at the annual meeting of the New England chapter of the International Society of Arboriculture (NE-ISA) in Mystic (250 adults) (November 5); was interviewed about nondestructive detection of internal decay in trees at Dr. Marra’s Great Mountain Forest research site in Norfolk by Patrick Skahill of WNPR (November 12); and met with Dr. Rebecca Silady and Master’s graduate student Alysha Auslander at Southern Connecticut State University regarding progress on Alysha’s thesis research (November 14).

DR. NEIL SCHULTES gave two lectures entitled “Genetically Modified Plants in Agriculture” to Science Course Sci 031 at Yale University (30 participants) (November 16); and attended The Institutional Biosafety Administrators Association Best Practices Conference in Philadelphia, PA (November 27-29).

DR. QUAN ZENG met the Environmental Chemist candidate Dr. Yanyan Zhang from McGill University (November 16); attended the Annual Meeting of the Connecticut Pomological Society held in Middletown (November 27); and taught a guest lecture entitled “Bacterial plant pathogens and diseases” and lab “Diagnosis of bacterial plant diseases and isolation of bacterial pathogens” at the University of Connecticut (17 students) (November 28).

VALLEY LABORATORY

DR. CAROLE CHEAH gave a workshop presentation on climate impacts on hemlock sustainability at the 41st Connecticut Association of Conservation and Inland Wetlands Commissions Annual Meeting & Environmental Conference held in Cromwell (30 attendees) (November 17).

DR. RICHARD COWLES presented “Erythritol vs. spotted wing drosophila” for the Massachusetts Blueberry Growers’ Association in Westborough, MA (25 attendees) (November 4); discussed “Winter moth and gypsy moth” to the New England Chapter of the International Society for Arboriculture in Mystic (250 attendees) (November 5); presented “Insecticide resistance” at the New England Greenhouse Conference held in Boxboro, MA (150 attendees) (November 8); and presented “The queen of your dreams” for the Connecticut Entomological Society in New Haven (35 attendees) (November 16).

MS. ROSE HISKES staffed a Connecticut Invasive Plants Working Group table at the Connecticut Association of Conservation and Inland Wetlands Commissions Conference held in Rocky Hill (November 17).

DR. JAMES LAMONDIA spoke about identification and management of rose diseases at the Connecticut Rose Society meeting held in Plainville (45 attendees) (November 4); spoke to Mike Emmons and Lindsay Curran of Prides Corner Nurseries about Boxwood blight management training in nurseries and landscapes (November 15); and conducted a short course on plant parasitic nematodes at the Northeast Agribusiness and Crop Consultants Association Conference held in Syracuse, NY (35 participants) (November 28 and 29).

DEPARTMENTAL RESEARCH UPDATES NOVEMBER 2018

Arango-Velez, A., S. Chakraborty, K. Blascyk, M.T. Phan, J. Barsky, and W. El Kayal. 2018. Anatomical and chemical responses of eastern white pine (*Pinus strobus* L.) to blue-stain (*Ophiostoma minus*) inoculation. *Forests* 9(11), 690 <https://doi.org/10.3390/f9110690>

Abstract- The increases in temperature have recently allowed the southern pine beetle (*Dendroctonus frontalis* Zimm.; SPB) and its associated fungi to expand its natural range to northern pine forests. In this study, vigorous eastern white pine mature trees were used to evaluate constitutive and induced response to the southern pine beetle, using *O. minus* as a proxy. We evaluated histological and chemical changes in *P. strobus* in response to the fungus at 28- and 65-days post inoculation (dpi). Inoculation with *O. minus* resulted in an induced defense response as evidenced by the increased production of traumatic resin duct, and lesion development surrounding the site of infection. Starch granules accumulated in the epithelial cells surrounding the resin ducts of inoculated trees. Chemical analyses showed that among phloem phenolics, epi/catechin and three unknown compounds were significantly upregulated at 28 dpi due to fungal inoculation. Several phloem terpenoids (α -pinene, β -myrcene, limonene, terpinolene and β -pinene) were significantly increased in inoculated trees compared to controls at both, 28- and 65-dpi. Continuous production of these terpenoids (up to 65 dpi) can be energetically costly for *P. strobus* as carbohydrate reserves fund monoterpene synthesis, reducing carbon availability necessary for tree development. Induced phenolics along with monoterpenes production and traumatic resin ducts observed in these trees, suggests that vigorous white pine may sustain endemic populations of southern pine beetle and vectored fungi.

Elmer, W. H. 2018. Impact of Water and Nutrient Management on Disease Problems, Chapter 15 pages 261- 272 In: Water and Nutrient Management for Greenhouse crops, eds, K. Williams, S. Mangiafico, and D. Merhaut, University of California Division of Agriculture and Natural Resources Pub. 3551

Abstract- One of the fundamental strategies for maintaining plant health and suppressing disease in greenhouse crops is to manage the application of water and nutrients. Watering not only affects the health of the plant, but its misuse creates an environment that encourages disease development. Additionally, proper nutrition can often govern the fine line between a crop's susceptibility and resistance to diseases. Plant pathologists commonly refer to the "disease triangle" to illustrate how a disease may occur. Equal importance is given to the three factors of the triangle: a plant's susceptibility to a disease, a conducive environment for disease development, and the presence of virulent pathogens. Altering any of the three components directly affects the severity of the disease or whether disease occurs. For example, many diseases caused by *Botrytis*, *Pythium*, or *Phytophthora* spp. can be suppressed by manipulating the environmental component, that is, moisture in the root medium or atmosphere. Additionally, certain nutrient regimes can suppress *Fusarium*, *Verticillium*, and *Thielaviopsis* spp., as well as powdery mildews, by increasing the resistance of the host. A case study of Sudden Oak Death (SOD) in California demonstrates the principles of the disease triangle. This chapter provides an overview of the governing role of irrigation and nutrition on crop health.

Marko, M.D; White, J.C. 2018. Direct comparison of herbicidal or biological treatment on *Myriophyllum spicatum* control and biochemistry. *Front. Plant Sci.* doi.org/10.3389/fpls.2018.01814.

Abstract- *Myriophyllum spicatum* or Eurasian watermilfoil is among the most problematic invasive aquatic plant species throughout much of North America. *M. spicatum* infestations can result in reduced diversity and abundance of native plant populations. Control of the invader is essential to promoting healthy ecosystems. Several treatment alternatives are available for milfoil control, although cost and efficacy vary significantly, with some treatments resulting in more harm to the native population than no treatment at all. A series of field-based microcosms containing actively growing milfoil were constructed in order to directly compare the impact of two herbicides (2,4-dichlorophenoxyacetic acid and fluridone) and the milfoil weevil (*Euhrychiopsis lecontei*) on weed control and plant biochemistry. Herbicide concentrations in water, plants, and sediments were monitored, as were weevil population dynamics and resulting invertebrate damage to milfoil stems. The impact of the different treatments on levels of polyphenols, carbohydrates, ash, and overall carbon and nitrogen levels in the milfoil were determined. Total biomass of the untreated milfoil increased by more than 2.7-fold during the 53 day experimental period. Conversely, the biomass of milfoil subjected to chemical or biological treatment either remained constant or decreased significantly during the experiment. The herbicide 2,4-D resulted in nearly 100% milfoil mortality by day 20, whereas fluridone toxicity was significantly slower but reached 75% by the end of the trial. Similarly, milfoil growth in the weevil-amended tanks was somewhat erratic but by the end of the trial, the total plant bio-

mass was 71% less than that of un-amended controls. Although the total biomass remaining at the end of the fluridone and weevil treatments was similar, the carbohydrate and starch content of the shoots in the insect treatment were nearly 4.6- and 4.8-fold greater, respectively, than that of the herbicide treated plants. The higher starch content in insect-treated plants could lead to increased autofragmentation and spread of *M. spicatum*. However, herbicide treatments are frequently required for several years. Therefore, integrated pest management, which combines the long-term benefits of biological controls with the short-term benefits of herbicides may provide the best solution to the control of *M. spicatum* and the conservation of native plants.

Matthews, B.J., Dudchenko, O., Kingan S.B., Koren S., Antoshechkin I., Crawford J.E., Glassford W.J., Herre M., Redmond S.N., Rose N.H, Weedall G.D., Wu Y., Batra S.S., Brito-Sierra C.A., Buckingham S.D., Campbell C.L., Chan S., Cox E., Evans B.R., Fansiri T., Filipovic I., Fontaine A., **Gloria-Soria A.**, Hall R., Joardar V.S., Jones A.K., Kay R.G.G., Kodali V.K., Lee J., Lycett G.J., Mitchell S.N., Muehling J., Murphy M.R., Omer A.D., Patridge F.A., Peluso P., Aiden A.P., Ramasamy V., Rasic G., Roy S., Saavedra-Rodriguez K., Sharan S., Sharma A., Smith M.L., Turner J., Weakley A.M., Zhao Z., Akbari O.S., Black IV W.C., Cao H., Darby A.C., Hill C.A., Johnston J.S., Murphy T.D., Raikhel A.S., Sattelle D.B., Sharakhov I.V., White B.J., Zhao L., Aiden E.L., Mann R.S., Lambrechts L., Powell J.R., Sharakhova M.V., Tu Z., Robertson H.M., McBride C.S., Hastie A.R., Kurlach J., Neafsey D.E., Phillippy A.M. and Vosshall L.B. (2018). Improved reference genome of *Aedes aegypti* informs arbovirus vector control. *Nature* 563: 501-507.

Abstract- Female *Aedes aegypti* mosquitoes infect more than 400 million people each year with dangerous viral pathogens including dengue, yellow fever, Zika and chikungunya. Progress in understanding the biology of mosquitoes and developing the tools to fight them has been slowed by the lack of a high-quality genome assembly. Here we combine diverse technologies to produce the markedly improved, fully re-annotated AaegL5 genome assembly, and demonstrate how it accelerates mosquito science. We anchored physical and cytogenetic maps, doubled the number of known chemosensory ionotropic receptors that guide mosquitoes to human hosts and egg-laying sites, provided further insight into the size and composition of the sex-determining M locus, and revealed copy-number variation among glutathione S-transferase genes that are important for insecticide resistance. Using high-resolution quantitative trait locus and population genomic analyses, we mapped new candidates for dengue vector competence and insecticide resistance. AaegL5 will catalyse new biological insights and intervention strategies to fight this deadly disease vector.

Mullins J, Esponda-Morrison B, **Armstrong P, Shepard J** (2018) West Nile virus- Connecticut, 2018. *Connecticut Epidemiologist* 38(4): 13-14.

Abstract- This report describes West Nile virus (WNV) activity in Connecticut during 2018. Human cases of WNV associated illnesses and WNV positive mosquitoes indicated heightened transmission throughout the state. A total of 23 human cases were reported this year of whom 17 (74%) were hospitalized and 1 (4%) patient died. The number and geographic spread of WNV isolates from mosquitoes was unprecedented with a total of 393 positive mosquito pools from 65 sites in 53 towns. Precipitation and temperatures were well above normal throughout much of the state resulting in a record number of mosquitoes that were tested for virus.

Xu, L.; Dai, Y.; Wang, Z.; Zhao, J.; Li, F.; White, J.C.; Xing, B. 2018. Graphene quantum dots in macrophage nuclei: Uptake, response and DNA cleavage. *Part. Fibre Toxicol.* 15:45 doi.org/10.1186/s12989-018-0279-8.

Abstract- Given the tremendous potential for graphene quantum dots (QDs) in biomedical applications, a thorough understanding of the interaction of these materials with macrophages is essential. In this work, we systematically investigated the nuclear uptake and related cellular response associated with aminated graphene QDs (AG-QDs) exposure. AG-QDs showed modest 24-h inhibition to rat alveolar macrophages (NR8383), with a minimum inhibitory concentration (MIC) of 200 $\mu\text{g}/\text{mL}$. Early apoptosis was significantly increased by AG-QDs (100 and 200 $\mu\text{g}/\text{mL}$) exposure and played a major role in cell death. The internalization of AG-QDs was mainly via energy-dependent endocytosis, phagocytosis and caveolae-mediated endocytosis. After a 48-h clearance period, more than half of the internalized AG-QDs remained in the cellular cytoplasm and nucleus. Moreover, AG-QDs were effectively accumulated in nucleus and was regulated by two nuclear pore complexes genes (Kap β 2 and Nup98). AG-QDs were shown to alter the morphology, area, viability and nuclear components of exposed cells. Significant cleavage and cross-linking of DNA chains after AG-QDs exposure were confirmed by atomic force microscopy in both in-vivo and in-vitro investigations. Molecular docking simulations showed that H-bonding and π - π stacking were the dominant forces mediating the interactions between AG-QDs and DNA, and were the important mechanisms resulting in DNA chain cleavage. In addition, the generation of reactive oxygen species (ROS) (e.g., $\cdot\text{OH}$), and the up-regulation of caspases also contributed to DNA cleavage. The current study provides direct evidence for the adverse effects of AG-QDs exposure on macrophage nuclei and DNA, and provides useful information for guiding the safe use of AG-QDs in biomedical applications.

Xu Y, da Silva WL, Qian Y, Gray SM. An aromatic amino acid and associated helix in the C-terminus of the potato leafroll virus minor capsid protein regulate systemic infection and symptom expression. *PLoS Pathog* 14(11): e1007451. <https://doi.org/10.1371/journal.ppat.1007451>

Abstract- The C-terminal region of the minor structural protein of potato leafroll virus (PLRV), known as the readthrough protein (RTP), is involved in efficient virus movement, tissue tropism and symptom development. Analysis of numerous C-terminal deletions identified a five-amino acid motif that is required for RTP function. A PLRV mutant expressing RTP with these five amino acids deleted (Δ 5aa-RTP) was compromised in systemic infection and symptom expression. Although the Δ 5aa-RTP mutant was able to move long distance, limited infection foci were observed in systemically infected leaves suggesting that these five amino acids regulate virus phloem loading in the inoculated leaves and/or unloading into the systemically infected tissues. The 5aa deletion did not alter the efficiency of RTP translation, nor impair RTP self-interaction or its interaction with P17, the virus movement protein. However, the deletion did alter the subcellular localization of RTP. When co-expressed with a PLRV infectious clone, a GFP tagged wild-type RTP was localized to discontinuous punctate spots along the cell periphery and was associated with plasmodesmata, although localization was dependent upon the developmental stage of the plant tissue. In contrast, the Δ 5aa-RTP-GFP aggregated in the cytoplasm. Structural modeling indicated that the 5aa deletion would be expected to perturb an α -helix motif. Two of 30 plants infected with Δ 5aa-RTP developed a wild-type virus infection phenotype ten weeks post-inoculation. Analysis of the virus population in these plants by deep sequencing identified a duplication of sequences adjacent to the deletion that were predicted to restore the α -helix motif. The subcellular distribution of the RTP is regulated by the 5-aa motif which is under strong selection pressure and in turn contributes to the efficient long distance movement of the virus and the induction of systemic symptoms.

JOURNAL ARTICLES APPROVED NOVEMBER 2018

Bugbee, Gregory J., M. E. Barton, J. A. Gibbons, and Summer E. Stebbins. Connecticut's Invasive Aquatic Plant, Clam and Mussel Identification Guide, 3rd Edition. *CAES Bulletin*

da Silva, Washington L. First Report of Grapevine Leaf Roll-associated Virus-3 in Merlot Grapevines in Rhode Island. *Plant Disease*

Min, L. J., J. R. Ye, X. Q. Wu, **De-Wei Li**, L. Guo, and K. Chen. *Burkholderia pyrrocinia* Strain JK-SH007 Promotes Tomato Growth under Zinc Stress. *Plant and Soil*

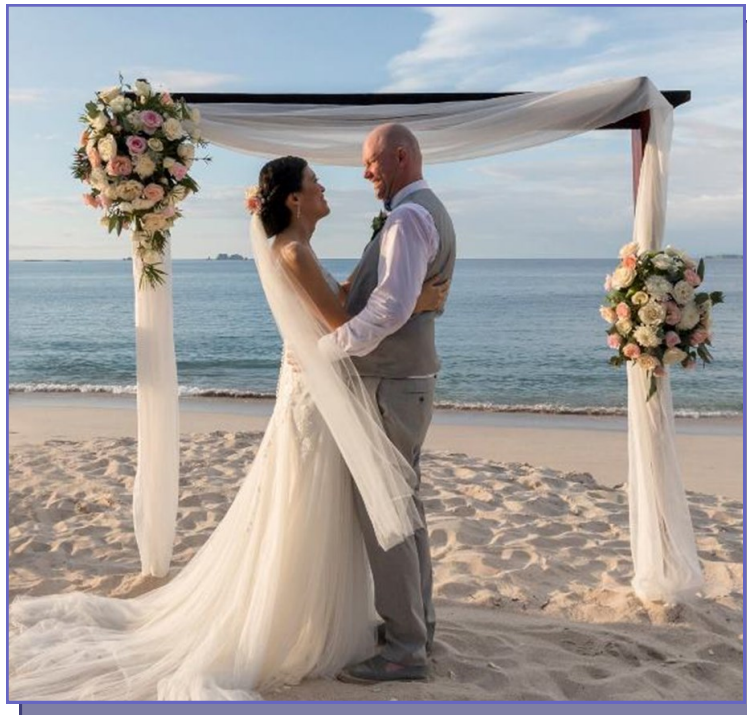
Rutledge, Claire E. Preliminary Studies on Using Emerald Ash Borer (Coleoptera: Buprestidae) Monitoring Tools for Bronze Birch Borer (Coleoptera: Buprestidae) Detection and Management. *Forestry*

Ward, Jeffrey S. Increased Individual Tree Growth Maintains Stand Volume Growth after B-level Thinning and Crop Tree Management in Mature Oak Stands. *Forest Science*

Xu, Y., **Washington L. da Silva**, Y. Qian, and S. M. Gray. An Aromatic Amino Acid and Associated Helix in the C-terminus of the Potato Leafroll Virus Minor Capsid Protein Regulate Systemic Infection and Symptom Expression. *PLOS Pathogens*

Zhao, L., H. Zhang, X. Chen, H. Li, X. Qu, **Jason C. White**, and R. Ji. Soil Metabolomics: An Approach for Integrated Assessment of Plant and Soil Microbial Community Response to Engineered Nanomaterial Exposure. *Environmental Science & Technology*

ARTICLES OF INTEREST NOVEMBER 2018



Dr. Blaire Steven and **Bowen Dou** were married in Costa Rica on November 5th, 2018.

2018 Connecticut-FFA Forestry Career Development Event

On November 30, 2018, the Department of Forestry and Horticulture hosted the Connecticut-FFA Forestry Career Development Event (CDE) at the Lockwood Farm Pavilion. This year's Forestry CDE evaluated students' knowledge of forest management practices, compass reading, forest mensuration, forestry related equipment, wood product identification, 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 competition at the 2019 Eastern States Exposition and the 2019 National FFA Convention in Indianapolis, IN.

DR. SCOTT WILLIAMS, MR. MICHAEL SHORT, MR. JOSEPH P. BARSKY of the Dept. of Forestry & Horticulture, and **DR. MEGAN LINSKE** of the Dept. of Entomology organized and oversaw the event. We would like to thank Eric Hansen of Ferrucci & Walicki for his assistance.



Student participants in the 2018 Connecticut-FFA Forestry Career Development Event

GRANTS RECEIVED NOVEMBER 2018

Wenqin Xu, Joseph J. Pignatello, Paul Proposal Number: ER19-C3-1239
 U.S. Department of Defense Strategic Environmental Research and Development Program (SERDP), Project Number: ER19-1239
 Title: Optimizing carbon amendments that simultaneously adsorb and transform legacy and insensitive high explosives. Approved for funding November 5, 2018. Experiment Station award, \$422,451. Time period: 5/1/2019 to 1/31/2022.

Abstract- High concentrations of munitions constituents (MC) residues, including legacy and insensitive high explosives (IHE), are commonly found in soil at DoD testing and training ranges, posing a significant safety threat to personnel. Many legacy explosives have been placed on the EPA's Contaminant Candidate List and some are possible human carcinogens. Many IHE are highly water-soluble and can easily migrate from soil to

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water. Consequently, IHEs represent a significant source of contamination to ground and surface waters at DOD ranges. This project will address these issues by developing technologies for simultaneously adsorbing and destroying MC residues. The central objective of this project is to design and optimize pyrogenic carbonaceous matter (PCM) in ways that facilitate the retention and/or hydrolysis of legacy explosives and IHE of concern at DoD sites using a combined experimental and computational approach. Preliminary evidence is presented to show that carbons not only adsorb, but also catalyze the hydrolysis of some MC. Four main tasks are designed to accomplish the goal: **(1)** identify the key structural characteristics of legacy explosives and IHE that make them susceptible to adsorption and/or PCM-facilitated hydrolysis, **(2)** tailor the surface characteristics of PCM to enhance the adsorption and hydrolysis of MC, **(3)** apply computational chemistry to provide a mechanistic understanding of PCM-facilitated hydrolysis and to guide the optimization of PCM for achieving the dual function of adsorption and hydrolysis of MC, and **(4)** assess the effectiveness of optimized PCM as soil amendments toward MC mixtures. The tailored PCM can maximize the sorption/degradation of legacy explosives and IHE, minimize the transport of such explosives, and therefore mitigate environmental impacts. They can also be used for treatment at the source of contamination.



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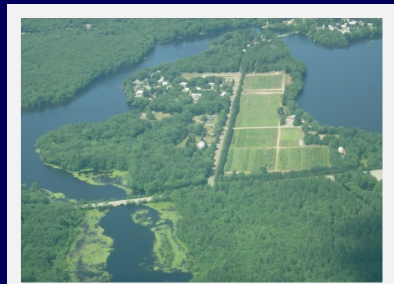
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