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 presented an overview of the history and current operation of the Experiment Station and led a tour of the grounds to a group from the New Haven Preservation Trust (20 attendees) (July 16); hosted Max Goldman, Outreach Assistant for U.S. Senator Chris Murphy and presented an overview of current research, surveillance, statutory and outreach activities of the Station along with a tour of selected laboratories (July 22); was interviewed about Plant Science Day 2015 by Ray Andrewsen WQUN AM 1220 in Hamden (July 23); and participated in a Council Meeting of the Connecticut Academy of Science and Engineering held in Wethersfield (July 29).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE attended a Consumer Product Safety Commission workshop entitled "Quantifying exposure to engineered nanomaterials from manufactured products: Address environmental health and safety implications" and gave two lectures entitled "Accumulation and trophic transfer of engineered nanomaterials by plants" and "Using dietary intake modeling to project human intake of nanomaterials present in agricultural foods and commercial products" (30 attendees)(July 6-8); met with Dr. Bernardo Cordovez of Optofluidics, Inc. to discuss nanomaterial detection platforms (July 7); along with **DR. BRIAN EITZER, DR. CHRISTINA ROBB, DR. WALTER KROL, DR. SANGHAMITRA MAJUMDAR, MS. KITTY PRAPAYOTIN-RIVEROS, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, MR. CRAIG MUSANTE, AND MS. TERRI ARSENAULT** participated in the FDA FERN cCAP monthly teleconference call (July 9); along with **DR. THEODORE ANDREADIS** met with representatives of the New Haven Preservation Trust (July 16); along with **DR. THEODORE ANDREADIS** met with Mr. Max Goldman of Senator Chris Murphy's Office (July 16); and attended a USDA NIFA Food Safety Grant Program Review in Portland Oregon and presented a poster entitled "Nanomaterial contamination of agricultural crops" (100 attendees) (July 24).

DR. BRIAN EITZER presented a poster on the use of Liquid Chromatography High Resolution Mass Spectrometry at 52nd Annual North American Chemical Residue Workshop in St. Petersburg Beach, FL (350 attendees at meeting) (July19 –July 23). He has also been selected as the co-chair of the program for next year's meeting.

ENTOMOLOGY

DR. KIRBY C. STAFFORD III was interviewed about tick testing by Phyllis Swebilius, New Haven Register (July 2); was interviewed about tick removal by Laura Johannes, Wall Street Journal (July 6); was interviewed about biological control programs in the state by Greg Hladky, Hartford Courant (July 7); participated in a Tick IPM Working Group conference call (July 8); and was interviewed about gypsy moth, southern pine beetle, other invasive insects and ticks by Jan Ellen Spiegel, CT Mirror (July 23).

DR. CHRIS T. MAIER was interviewed about the biological control of the brown marmorated stink bug and the lily leaf beetle by Gregory Hladky of the Hartford Courant (July 9).

DR. GALE E. RIDGE was interviewed about the recent gypsy moth outbreak by WATR Radio (July 13); and was visited by Friends of East Rock Park and discussed the Insect Information Office and gave them a tour of the facility (July 27).

DR. CLAIRE E. RUTLEDGE met with reporter Gregory B. Hladky of the Hartford Courant to discuss biological control of invasive wood-boring beetles (July 8). The article was titled "Biological predators being used to attack invasive species across Connecticut" and ran on July 12, 2015 http://www.courant.com/news/connecticut/hc-invasive-biowars-ct-20150712-story.html; spoke with John Burgeson of the Connecticut Post (July 10) resulting in the article "Southern pine beetle found in Westport" published on July 30, 2015 http://www.ctpost.com/news/article/Southern-pine-beetle-found-in-Westport-6414922.php#photo-8384215; attended the Annual Summer Meeting of the Connecticut Tree Protective Association in Farmington (July 16); and met with reporter Jan Ellen Spiegel of the CT Mirror to discuss invasive wood-boring beetles (July 23). The resulting article was titled "Invasive species keep coming, will climate change bring more?" and ran on August 8, 2015. http://ctmirror.org/2015/08/11/invasive-species-keep-coming-will-climate-change-bring-more/

DR. VICTORIA L. SMITH was interviewed about the recent gypsy moth outbreak by Nicole Wetsman on WNPR Public Radio (July 8); attended the summer meeting of the CT Nursery & Landscape Association held at the Bartlett Arboretum in Stamford (200 participants) (July 15); participated in a meeting of the Yale Biosafety Committee in New Haven (20 participants) (July 16); and in cooperation with the Pennsylvania Dept. of Agriculture and USDA-APHIS-Plant Protection and Quarantine, made a site visit to Rolling Rock Stone Company, near Boyleston, PA, to observe an infestation of the invasive insect the spotted lantern fly (25 participants) (July 22).

DR. KIMBERLY A. STONER spoke about bee biodiversity and conservation to the Science Advisory Council of Audubon CT at their new refuge at Stratford Point in Stratford (9 attendees) (July 1); spoke about bee conservation and planting flowers for bees at Natureworks Garden Center in North Branford (26 attendees) (July 16); collected and discussed both pest and beneficial insect in the garden at the Common Ground High School and Environmental Center in New Haven (17 youths and 4 adults attended) (July 18); and was interviewed about bees by Chris Dehnel of the Willimantic Chronicle (July 27).

ENVIRONMENTAL SCIENCES

DR. PHILIP ARMSTRONG gave the talk "Impact of Climate Change on Mosquito-Borne Diseases" to science teachers at Yale University as part of the Yale-Peabody Fellows SEPA NIH educational program on mosquito biology (25 attendees) (July 8); and was interviewed by Rich Cohen of the New York Magazine for an article about Powassan virus (July 14); and was interviewed by Fox CT News about the detection of West Nile virus in mosquitoes (July 31).

MR. GREGORY BUGBEE was interviewed by Steve Good of the Hartford Currant on Water chestnut in Filey Pond. Bloomfield (July 13); spoke on "Invasive Aquatic Plants" at West Haven Eco Camp (approximately 50 attendees) (July 15); spoke on "Invasive Aquatic Plant Control Options for Moodus Reservoir" at a town meeting at the East Haddam Grange Hall (approximately 75 attendees) (July 16); spoke on "The Condition of Bashan Lake and Invasive Aquatic Plant Control Needs," with reference to the drawdown for dam repairs, at the East Haddam Grange Hall (approximately 50 attendees) (July 27); and spoke to the Orchard Valley Garden Club in Southington on "Container Gardening Indoors and Out" (approximately 50 attendees) (July 28).

DR. GOUDARZ MOLAEI was interviewed by Sujata Jain of WFSB Eyewitness News 3 about ticks and tick-associated illnesses in Connecticut (July 17); hosted a group of associates of the "Friends of the East Rock Park Society" at the Tick Testing Laboratory and gave a short talk on tick-associated diseases and preventive measures against tick bites (8 attendees) (July 27).

MR. MICHAEL THOMAS co-led the Farmington Valley Butterfly Count sponsored by the North American Butterfly Association (11 attendees) (July 11).

FORESTRY AND HORTICULTURE

DR. JEFFREY WARD participated in an Audubon Connecticut Science Committee meeting in Stratford (July 1); spoke on tree identification and habitats at the Connecticut Nursery and Landscape Association Summer Family Day in Stamford (34 attendees) (July 15); attended the Connecticut Tree Protective Association summer meeting in Farmington (July 16); was interviewed by Tracy Phelan, WFSB-3, about giant hogweed in Connecticut (July 17); met with Hallie Metzer, Rebekah's Hill Flora and Fauna Preservation Society, and Paul Elconin and Maribeth Chassey , Weantinoge Heritage Land Trust, to discuss forest management in Goshen (July 23); spoke Japanese barberry control and relationship to tick densities at the Lyme disease: Restoring balance in the body workshop in Willington (38 attendees) (July 25); and was interviewed by Will Rowland, Connecticut Gardener, about number of white pines in Connecticut (July 30).

DR. ADRIANA ARANGO VELEZ spoke on "Southern pine beetle, it's here and it's moving into northeastern U.S." at the Connecticut Tree Protective Association summer meeting in Farmington (300 attendees) (July 16).

DR. ABIGAIL MAYNARD talked about the New Crops program during a visit to Gazy Farm in Oxford (July 15); and talked about the New Crops program during a visit to Rose's Berry Farm in South Glastonbury (July 17).

DR. SCOTT WILLIAMS co-lead a botanical hike for the Connecticut Botanical Society in North Guilford (9 attendees) (July 25); and interviewed by Melinda Wenner Moyer of Nature magazine on small mammal trapping and residential blacklegged tick management in Redding, CT (July 22).

MR. JOSEPH P. BARSKY participated Connecticut State Consulting Committee for Agricultural Science and Technology Education in Vernon (July 14); attended the Connecticut Tree Protective Association summer meeting in Farmington (July 16); and participated Connecticut State Consulting Committee for Agricultural Science and Technology Education in Washington (July 22).

PLANT PATHOLOGY AND ECOLOGY

DR. SANDRA L. ANAGNOSTAKIS attended the Board meeting and presented her recent work on the nutrients in chestnuts at the Annual Meeting of the Northern Nut Growers Association in La Crosse, WI (200 attendees) (July 25-29).

DR. SHARON M. DOUGLAS organized and participated in the CAES booth by answering questions about tree health and examining samples from arborists at the CTPA Summer Meeting in Farmington (720 adult attendees) (July 16).

DR. WADE H. ELMER gave a talk titled "Use of mineral nutrition to suppress diseases of ornamentals" at the Connecticut Nursery & Landscape Association summer meeting in Stamford (23 attendees) (July 15).

DR. YONGHAO LI gave a talk titled "Disease management in Christmas tree farms" at the CCTGA twilight meeting in Windsor (30 attendees) (July 14); and staffed the CAES booth and answered questions about tree health and examined samples from arborists at the CTPA Summer Meeting in Farmington (720 adult attendees) (July 16).

DR. ROBERT E. MARRA met with Southern Connecticut State University students from Professor Elizabeth Roberts's mycology class, gave them a tour of the lab, and talked to them about boxwood blight, internal decay, and perennial canker on birch (July 13); had a conference call with Dr. Kathleen Wolf (University of Washington and US Forest Service) to discuss her Lockwood Lecture for next spring (July 16); and attended a webinar on Urban Forestry (July 24).

DR. LINDSAY R. TRIPLETT was interviewed by Nature News and Comment for the article "Rice Researchers Redress Retraction," about a new study in which a group of researchers answered a question left open after they retracted their own previous studies on the same topic. http://www.nature.com/news/rice-researchers-redress-retraction-1.18055

DR. QUAN ZENG attended the Massachusetts Fruit Growers summer meeting in Phillipston, MA and gave a presentation titled "Where did all the fire blight go in 2015?", in which he discussed recent findings in streptomycin resistance survey of the fire blight populations in New England and answered questions regarding disease occurrence, dissemination, and management of fire blight http://massfruitgrowers.org/2015/2015summermeeting.html (120 attendees) (July 21); attended the American Phytopathological Society Annual Meeting in Pasadena, CA and gave a poster presentation titled "Comparative genomics of 15 Acidovorax pathogens provide insights into the emergence of a new turfgrass diseases and the host specificity of Acidovorax" (150 attendees). Dr. Zeng also attended two workshops and committee meetings. During the meeting, he was elected as the Vice Chair of the Bacteriology Committee of the American Phytopathological Society starting August 2015 (July 31).

VALLEY LABORATORY

DR. CAROLE CHEAH with Donna Ellis, UConn, was interviewed for a segment on NBC 30 for a Mile-a-minute weevil release at Glastonbury, presented by Doug Greene, NBC News CT (July 16); with Donna Ellis and Emmett Varricchio, summer research assistant at the Valley Laboratory, was interviewed and photographed by Brad Horrigan of the Hartford Courant and by Jim Shannon of the Waterbury Republican during the weevil release at Glastonbury, (July 16); and was interviewed by Shawn Dagle of the Glastonbury Citizen about the Glastonbury weevil release (July 16).

DR. RICHARD COWLES spoke on the subject "Christmas tree pest management" at a twilight meeting of the CT Christmas Tree Growers' Association at the Valley Laboratory (30 attendees) (July 14); discussed "How to properly handle and apply nematodes for grub control," at the School and Municipal Turf/ Ground Workshop in Hamden sponsored by UConn, (60 attendees) (July 29); and lectured on "Strategizing for bee health" to the Massachusetts Association of Lawn Care Professionals, in Boyleston, MA, July 30 (50 attendees).

DR. JAMES LAMONDIA met with John Cranmer and Steve Zimmerman of Valent at the Valley Laboratory to tour plots and discuss research (July 9); and participated in a research conference call to present research progress as a part of the Potato Cyst Nematode Management Project (July 14).

DEPARTMENTAL RESEARCH UPDATES JULY 2015

Armstrong, P. M., Andreadis, T. G. and **Anderson, J. F.** 2015 Emergence of a new lineage of Cache Valley virus (*Bunyaviridae: Orthobunyavirus*) in the northeastern U.S. *Am. J. Trop. Med. Hyg.* 93:11-17.

Abstract. Cache Valley virus (CVV; Family *Bunyavidae*, Genus *Orthobunyavirus*) is a mosquito-borne zoonosis that frequently infects humans and livestock in North and Central America. In the northeastern U.S., CVV transmission is unpredictable from year-to-year and may derive from the periodic extinction and reintroduction of new virus strains into this region. To evaluate this possibility, we sequenced and analyzed numerous CVV isolates sampled in Connecticut during an 18 year period to determine how the virus population may change over time. Phylogenetic analyses showed the establishment of a new viral lineage during 2010 that became dominant by 2014 and appears to have originated from southern Mexico. CVV strains from Connecticut also grouped into numerous sub-clades within each lineage that included viruses from other U.S. states and Canada. We did not observe the development and stable persistence of local viral clades in Connecticut which may reflect the episodic pattern of CVV transmission. Together, our data support the emergence of a new lineage of CVV in the northeastern US and suggest extensive dispersal of viral strains in North America.

Bugbee, G. J., Gibbons, J. A., and **June-Wells, M.** 2015. Efficacy of single and consecutive early-season diquat treatments on curlyleaf pondweed and associated aquatic macrophytes: A case study. *J. Aquatic Plant Manage.* 53:171-177.

Abstract.: Curlyleaf pondweed (*Potamogeton crispus L.*) is an invasive aquatic macrophyte that impairs lakes throughout much of North America. Management of curlyleaf pondweed with herbicides is common with long-term control and protection **of** desirable native vegetation important goals. The herbicide diquat was applied to Crystal Lake (Middletown, CT USA) in 2007, 2009 and 2010 to control curlyleaf pondweed prior to turion production. No herbicides were applied in 2006, 2008 or 2011. Two other invasive macrophytes, Eurasian watermilfoil (*Myriophyllum spicatum L.*) and minor naiad (*Najas minor All.*), were also present along with 14 species of native macrophytes. Aquatic vegetation surveys were performed to assess the efficacy of the single (1 yr.) and consecutive (2 yrs.) diquat treatments on the invasive and native plant assemblages. The frequency of occurrence and abundance of curlyleaf pondweed were reduced to negligible levels in the treatment years. In the untreated year after a single treatment (2008), curlyleaf pondweed frequency was reduced slightly but the abundance was greater than in the year prior to treatment (2006). In the untreated year following two consecutive early season diquat treatments (2011), the frequency of curlyleaf pondweed decreased by 30% and the abundance declined by 55% compared to the year prior to treatment (2006). After the first of the two consecutive years of diquat treatments (2009), Eurasian watermilfoil was eliminated. Both the frequency and abundance of minor naiad increased in the untreated years of 2008 and 2011. The response of native macrophytes to the diquat treatments was spe-

cies specific but overall native species richness was greater in years following the single and consecutive diquat treatments.

Quah, B.. **Musante, C., White, J. C.** and Ma, X. 2015. Phytotoxicity, uptake, and accumulation of silver with different particle sizes and chemical forms. *J. Nanoparticle Res*. 17:277.

Abstract. The antimicrobial property of silver nanoparticles (AgNPs) makes it one of the most commonly encountered nanomaterial (NM) in commercial products. As a result, its detection in the environment is highly likely and its potential toxicity to bacteria, plants and animals has been heavily investigated. While it is now generally agreed that AgNP itself exerts unique toxicity to plants in addition to that off dissolved silver ion, the accumulation and fate of different forms of silver in plant tissues are unknown. T his study investigates the phytotoxicity, accumulation and transport of Ag with different physical and chemical characteristics (e.g. ionic, nanoparticles, and bulk) in two agricultural crop species: *Glycine max* (soybean) and *Triticum aestivum* (wheat). The results showed that different forms of silver demonstrated differential toxicity to these two species, with the ionic silver at the same nominal concentration displaying the strongest effect on plant growth. Exposure to 5 mg/L of Ag resulted in significant deposition of Ag-containing materials on the root surface but root morphology and distribution patterns varied considerably with Ag type. The Ag transport efficiency from roots to shoots differed with both Ag type and with plant species. Cell fractionization studies confirmed that all types of Ag were internalized in soybean roots, with the plant cell wall as the predominant place for element accumulation. The findings demonstrate that Ag toxicity and in planta fate vary with particle type and that such considerations are likely necessary to adequately assess food safety concerns upon NP exposure.

ARTICLES OF INTEREST JULY 2015

Dr. Jatinder Aulakh recently joined the Valley Laboratory as a Weed Scientist/ Plant Ecologist. Jatinder is developing a research program on weed management practices in ornamental nursery crops and the identification of adaptive mechanisms underlying the proliferation of invasive plant species. He will study the ecological and biological factors involved in the invasion process to develop chemical, cultural and biological solutions for managing these weeds. Dr. Aulakh earned his B.S. in Agriculture, and M.S. in Agronomy from Punjab Agricultural University in India and his Ph.D. in Weed Science (2013) from Auburn University in Alabama. Before coming to Connecticut, Jatinder was a Postdoctoral Research Associate in the Department of Agronomy and Horticulture at the University of Nebraska-Lincoln. In that capacity he led a research project to quantify the pollen-mediated gene flow from ALS–resistant grain sorghum to Johnsongrass and contributed to the development of integrated weed management programs focusing on preventing/managing herbicide-resistant weeds in corn, soybean and sorghum.

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JOURNAL ARTICLES APPROVED JULY 2015

Brackney, D. E., E. Schirtzinger, T. Harrison, G. D. Ebel, and K. Hanley. RNA: mediated modulation of RNA virus populations. Journal of Virology

Moon, S. L., B. J. T. Dodd, **D. E. Brackney,** C. J. Wilusz, G. D. Ebel, and J. Wilusz. Flavivirus sFRNA suppresses antiviral RNA interference in cultured cells and mosquitoes and directly interacts with the RNAi machinery. Virology

Grubaugh, N. D., D. R. Smith, **D. E. Brackney,** A. M. Bosco-Louth, J. R. Fauver, C. L. Campbell, T. A. Felix, H. Romo, N. K. Duggal, E. A. Dietrich, T. Eike, J. E. Beane, R. A. Bowen, W. C. Black, A. C. Brault, and G. D. Ebel. Experimental evolution of an RNA virus in wild birds: evidence for host-dependent impacts on population structure and competitive fitness. PLOS Pathogens

Grubaugh, N. D., S. Sharma, B. J. Krajacich, L. S. Fakoli, F. K. Bolay, J. W. Diclaro II, W. E. Johnson, G. D. Ebel, B. D. Foy, and **D. E. Brackney.** Xenosurveillance: a novel approach for examining the human-pathogen landscape. PLOS Neglected Tropical Diseases

Huang, Lin, Qiucheng Li, Ya Zhang, Jingjing Guo, **De-Wei Li,** and Jianren Ye. *Colletotrichum gloeosporioides* s.s. is the pathogen of leaf anthracnose on evergreen spindle tree *(Euonymus japonicus)*. Plant Disease

Maynard, Abigail A. How to grow eggplant in Connecticut. CAES Fact Sheet

Chen, G., C. Ma, **A. Mukherjee, C. Musante,** J. Zhang, **J. C. White,** O. Parkash-Dhanker, and B. Xing. Tannic acid alleviates neodymium oxide nanoparticle toxicity to pumpkin: physiological and molecular mechanisms. Environmental Science & Technology

Xiao, Feng, and **Joseph J. Pignatello.** Enhancement of organic compound adsorption to biochar by post-pyrolysis air oxidation. Environmental Science & Technology

Yi, Peng, **Joseph J. Pignatello,** Minori Uchimiya, and **Jason C. White.** Heteroaggregation of cerium oxide nanoparticles and nanoparticles of pyrolyzed biomass. Environmental Science & Technology

Eevers, N., B. Beckers, **J. C. White,** J. Vangronsveld, and N. Weyens. Comparison between cultivable and total bacterial populations associated with *Cucurbita pepo* using cultivation-dependent techniques and 454 pyrosequencing. Environmental Microbiology Reports

Ma, C., **J. C. White,** B. Xing, and O. Parkash. Phytotoxicity and ecological safety of engineered nanomaterials. International Journal of Plant & Environment

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Main Laboratories, New Haven

Lockwood Farm, Hamden

Griswold Research Center, Griswold

Valley Laboratory, Windsor

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

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