Station News

The Connecticut Agricultural Experiment Station
Volume 6 Issue 4 April 2016

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

CAES

The Connecticut Agricultural Experiment Station

Putting Science to Work for Society since 1875

This Issue

ADMINISTRATION

DR. THEODORE ANDREADIS was interviewed about the risk of Zika virus to Connecticut by Sam Gingerella, WTIC Radio (March 2); participated in a meeting of the Connecticut Invasive Plant Council held in Hartford (March 8); was interviewed about the impact of the proposed budget reductions on the State Beekeeper positon by Bob Miller, Connecticut Post (March 9); was interviewed about the risk of Zika virus to Connecticut by Rebecca Stewart, *Health Care Matters* show, WTIC Radio (March 12); participated in the spring meeting of the Northeastern Regional Association of State Agricultural Experiment Station Directors held in Baltimore, MD (March 15-16); participated in the final thesis defense of PhD candidate, John Soghigian held at Clark University, Worcester, MA (March 18); presented welcoming remarks and an overview of the Experiment Station and its various research, regulatory and public service programs to the Landscape Design School held at the Station (March 22); and participated as Administrative Advisor in the annual meeting of Multi-State Project, NE-1443, *Biology, Ecology & Management of Emerging Disease* held in St. Augustine, FL (March 31).

ANALYTICAL CHEMISTRY

DR. JASON C. WHITE attended the monthly CT Preparedness meeting at the Department of Public Health Laboratory in Rocky Hill (March 7); along with **DR. BRIAN EITZER, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, DR. WALTER KROL, MR. CRAIG MUSANTE, DR. CHRISTINA ROBB, MS. KITTIPATH P.-RIVEROS AND MS. TERRI ARSENAULT** participated in the monthly FDA FERN cCAP teleconference call (March 10); participated in a USDA NIFA reporting webinar (March 10); participated by web-ex in the annual Editorial Advisory Board meetings of *Environmental Science & Technology* and *Environmental Science & Technology Letters* (March 17); along with **MS. KITTIPATH P.-RIVEROS, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE AND MS. TERRI ARSENAULT**, participated in the quarterly FDA AFRPS grant progress update teleconference call with LCDR Ruiqing Pamboukian, Ph.D. (March 19); along with **DR. BRIAN EITZER, DR. SANGHAMITRA MAJUMDAR, MR. MICHAEL CAVADINI, MR. JOSEPH HAWTHORNE, DR. WALTER KROL, MR. CRAIG MUSANTE, MR. JOHN RANCIATO, DR. CHRISTINA ROBB, MS. KITTIPATH P.-RIVEROS, DR. ROBERTO DE LA TORRE ROCHE, AND MS. TERRI ARSENAULT,** gave a tour and described Department programs to an upper level analytical chemistry class from Quinnipiac University (20 participants)(March 22); along with **DR. SANGHAMITRA MAJUMDAR**, participated in a teleconference call with collaborators at the University of Massachusetts Amherst and the University of Texas El Paso to discuss preparation of a joint grant proposal submission to FDA (March 24); and along with **DR. BRIAN EITZER, DR. CHRISTINA ROBB, MR. JOSEPH HAWTHORNE, DR. SANGHAMITRA MAJUMDAR, AND MS. TERRI ARSENAULT**, participated in the annual FDA FERN cCAP technical meeting in New Orleans LA (March 28-31).

DR. BRIAN EITZER was a participant in the North American Chemical Residue Workshop Organizing Committee phone call (March 10); served as a judge at the Connecticut State Science Fair at Quinnipiac University (March 16-17); and presented method validation results during the FDA FERN cCAP annual technical meeting in New Orleans on (60 participants) (March 28-31).

MR. MICHAEL J. CAVADINI, along with **MR. GREGORY BUGBEE** proctored three invasive species exams for the CT Science Olympiad in Farmington on March 19th (30 middle school participants).

ENTOMOLOGY

DR. KIRBY C. STAFFORD III presented a talk titled "Woodland Risks: It's Not Just Lyme Disease Anymore" at the Forest Health Workshop in Jones Auditorium (45 attendees) (March 1); was interviewed by Lori Mach, WNPR radio, about Lyme disease and other tick-associated diseases (March 9); was interviewed by John Carlton, Fox61 News, television about spring tick activity (March 9); was interviewed by Stefan Aleo, WFSB News, television about spring tick activity (March 10); was interviewed by Kaitlyn McGrath, NBC-TV, about spring tick activity (March 10); was interviewed by Karena Garrity, Valley Courier Newspaper, about ticks and tick-borne diseases (March 16); with Dr. Victoria L. Smith, met with State Plant Health Director Kate Aitkenhead, USDA-APHIS-PPQ, to review our joint plant protection plans and activities (March 29); and presented a talk on ticks and tick-borne disease prevention at the Northeastern Area Association of State Foresters (NAASF) Forest Health Committee meeting in Garden City, NY (25 attendees) (March 31).

MR. MARK H. CREIGHTON spoke at the Connecticut Beekeepers Association Bee School at CAES to new beekeepers about bee diseases and the honey bee registration program (120 attendees) (February 6); officially received a USDA specialty Crop Block Grant paperwork begin the Minority Youth Beekeeping project (February 10); attended the Connecticut Beekeepers spring meeting at CAES and spoke on honey bee registration and oxalic acid (90 attendees) (February 13); manned the CAES booth at the CT Flower show in Hartford, CT and spoke with several hundred visitors on forest health and honey bee related topics (February 19-21); attended a lecture on thermoregulation of the hive at the Backyard Beekeepers Association meeting in Weston, CT and spoke about honey bee registration and the use of oxalic acid for Varroa mite control (80 attendees) (February 23); attended a Pollinator Habitat meeting at CAES (February 26); gave a talk on basic beekeeping at the Benedicts Home and Garden Center in Monroe, CT (100 attendees) (February 27); attended the Eastern Connecticut Beekeepers Bee school in Hamden CT, speaking with the 45 attendees on bee health issues and the honey bee registration program (March 1); attended a lecture on queen bee health at the Worchester Beekeepers Association meeting, and met with the Chief Apiary Inspector of MA and the Worchester County Bee Inspector to discuss bee health issues (March 5); spoke on beginning beekeeper topics at Shagbark Lumber and Supply in East Haddam, CT (89 attendees) (March 12); spoke to 2-3rd grade students from the region on honey bees and the role they play in pollination at Eastcon in Hampton, CT (170 students) (March 15); in Wallingford, CT completed a course on Export Certification by the USDA-APHIS PPQ; and became an Authorized Certification Official (ACO) (March 16-17). This course provided information on legal authorities related to export certification, along with current Plant Protection and Quarantine (PPQ) policies.

DR. DOUGLAS W. DINGMAN: presented a lecture on *E. coli* and microbial contamination to the students of Dr. Kristen Martin (St. Joseph University, West Hartford, CT) (March 1) and presented a seminar on honey bee basics and biology to the Cherry Brook Garden Club in Canton, CT (March 8).

MS. KATHERINE DUGAS attended the Forest Health Workshop at CAES (March 1) and staffed a CAES/Forest Pest table at the CT Master Gardener's Symposium held at Connecticut College in New London (300 attendees) (March 19).

ENTOMOLOGY

DR. CHRIS T. MAIER gave a talk on "An Introduction to the Longhorned Beetles or Cerambycidae" at the Forest Health Workshop in Jones Auditorium (March 1) and exhibited fairy shrimp and mosquito larvae from a vernal pool in Guilford at a meeting of the Connecticut Entomological Society at Yale University, New Haven (March 25).

DR. GALE E. RIDGE spoke at Yale University about the history the bed bug, its biology, and how to manage the insect in dormitory settings and taught travelling students and staff on how to protect themselves (15 attendees) (March 9); was interviewed by Kaitlyn McGrath NBC News about the mild winter, early spring, and effects on insects in Connecticut; interviewed by the Danbury Times about the Emerald Ash Borer (March 11); was interviewed by Lori Mack (NPR) about bed bugs (March 15); spoke to the Arc of Meriden-Wallingford about bed bugs and charities (30 attendees) (March 16); was interviewed by Jake Dressler of the New Haven Independent about bed bugs (March 22); spoke at Southern Connecticut State University to health care professionals about bed bugs (35 attendees) (March 23); identified an exotic species of scale submitted to the Station call the Japanese wax scale *Ceroplastes japonicas* on gardenia (March 29); and was interviewed by Harold Harlan from the Journal Courier about spring time insects (March 31).

DR. CLAIRE E. RUTLEDGE presented the talk 'Something old, something new; updates on Emerald Ash Borer and Southern Pine Beetle' at the Forest Health Workshop in Jones Auditorium, New Haven, CT (50 attendees) (March 1); taught "Tree Conditions Laboratory" for Arboriculture 101, Connecticut Tree Protective Association, Wallingford CT (March 2); moderated the full-day workshop "Arborists and the Law" that I organized for The Connecticut Tree Protective Association at Sessions Woods, Burlington, CT (110 attendees) (March 15); talked with Master Gardner students about "Wasp Watching" at the Outreach Opportunity Fair, New Haven, CT (25 attendees) (March 17); and presented a guest lecture 'Emerald Ash Borer' in 'Invasive Species Biology and Management' Bio 226 at Wesleyan University in Middletown, CT at the invitation of Dr. Helen Poulos (35 attendees) (March 24).

DR. VICTORIA L. SMITH organized the annual Forest Health Workshop, held in Jones Auditorium at the Experiment Station. This annual workshop included cooperators from DEEP, UConn, UConn Extension, and USDA, and is a conversation among those of us concerned with the health of the forests (60 attendees) (March 1); with Tia Blevins, participated in Aerial Survey and Aviation Safety and Management, a course conducted by the US Forest Service, held at the Hampton Inn in Dover, NH (20 participants) (March 14-17). Completion of the course qualifies the participants as an Aerial Survey-Fixed Wing Flight Manager. With **MS. VICKIE BOMBA-LEWANDOSKI** and **MR. MICHAEL LAST**, met with personnel from Dept. of Administrative Services-BEST in Hartford to automate and bring on line the licensing functions of the Office of the State Entomologist (March 23); and participated in a meeting of the CT Nursery and Landscape Association Winter Symposium planning committee, held in the WB Young Building on the UConn Campus (6 participants) (March 23).

DR. KIMBERLY A. STONER spoke to the Black Rock Garden Club in Bridgeport on "The State of Bees in Connecticut" (65 attendees) (March 13); and participated in a Professional Development Conference on Cover Crops for Soil Health in Baltimore, MD and worked with a team of farmers from RI and CT and professionals from the Natural Resources Conservation Service and the Eastern CT Conservation District on a series of cover crop demonstration projects that would demonstrate the pollinator benefits as well as benefits to soil health of cover crops (March 29-31).

ENVIRONMENTAL SCIENCES

DR. JOSEPH PIGNATELLO gave a workshop on biochar at the Connecticut Northeast Organic Farmers Association (NOFA) Winter Conference, Darien, March 12 (approx. 25 attendees).

DR. PHILIP ARMSTRONG gave the lecture "Mosquito-Borne Disease Threats in the Northeastern US" as a part of the Forest Health Monitoring Workshop at CAES (50 attendees) (March 1); gave the talk "Phylogeography of Mosquito-Borne Bunyaviruses in the Northeaster US" at the New Jersey Mosquito Control Association Meeting in Atlantic City, NJ (200 attendees) (March 3); was interviewed by the Toronto Star about Cache Valley virus (March 14); met with Yale PhD students in Epidemiology of Microbial Diseases to discuss his career path as a part of the Wine on Whitney Series, New Haven (8 students) (March 29); and presented his research findings at the Annual Northeastern Multistate Project Meeting- Biology, Ecology and Management of Emerging Disease Vectors (40 attendees) (March 31).

DR. DOUGLAS BRACKNEY was discussion leader for the Yale of School Public Health EMD563 Laboratory and Field Studies in Infectious Diseases course on the topic of molecular mechanisms of mosquito host-seeking behaviors (3 student participants) (March 17); presented the invited talk "Innate Immune Modulation of West Nile Virus Populations" at the New Jersey Mosquito Control Association Annual Meeting (approx. 100 participants) (March 4); and presented the invited talk "Catch me if you can: A tale of flavivirus evolution and innate immunity" in the Yale School of Public Health Epidemiology of Microbial Diseases Seminar Series (approx. 60 attendees) (March 11).

MR. GREGORY BUGBEE was interviewed by Corey Sipe of the Willimantic Chronicle on the hydrilla problem in Coventry Lake (February 17); gave the seminar "Soil and Fertilizers" as part of the arborists training program at the Bartlett Arboretum in Stamford (approx. 12 attendees) (February 18); was interviewed by Linda Comeau on the hydrilla problem in Coventry Lake for the town of Coventry Newsletter (February 25); with Jennifer Fanzutti presented an invasive aquatic plant workshop at The Connecticut Conference on Natural Resources at UCONN (approx. 25 attendees) (March 14); with Jennifer Fanzutti presented an invasive aquatic plant seminar at Three Rivers Community College in Norwich (approx. 35 attendees) (March 16); with Michael Cavadini proctored the Invasive Species event at The 2016 Science Olympiad at the Robbin's Middle School in Farmington (approx. 35 attendees) (March 19); with Jennifer Fanzutti presented an the results of the CAES IAPP 2015 invasive aquatic surveys of Lakes Candlewood, Lillinonah, and Zoar and Squantz Pond to the FirstLight Power Resources Technical Committee (approx. 14 attendees) (March 22); and gave the talk "Improving Soil in Urban Vegetable Gardens" to inner city gardeners sponsored by the United Way at the Ansonia Community Center (approx. 25 attendees) (March 30). **[note: Greg's includes some February items because he was absent due to SFAM and missed the deadline]**

DR. GOUDARZ MOLAEI presented an invited talk "Vector-Host Interactions and Emergence and Expansion of Arboviruses" and discussed research collaborations with individuals in the Department of Biology and Health Sciences, Wilkes University, PA (approx. 50 attendees) (March 23).

MR. JOHN SHEPARD was interviewed about range maps for issued by the CDC for *Aedes aegypti* and *Aedes albopictus* mosquitoes in Connecticut by Evan White from WFSB Channel 3, Josh Sheinblum from WTNH Channel 8, and John Silva from 1080 WTIC (March 31).

FORESTRY AND HORTICULTURE

DR. JEFFREY WARD spoke on precommercial crop tree management at the Forest Health Monitoring Workshop in New Haven (40 attendees) (March 1); met with Connecticut DOT staff to discuss roadside forest management (6 attendees) (March 8); along with Thomas Worthley (UConn), spoke on "Managing roadside forests" at the 96th Winter Meeting of the New England Society of American Foresters in Sturbridge, MA (45 attendees) (March 10); attended the 96th Winter Meeting of the New England Society of American Foresters in Sturbridge, MA (March 10); along with **MS. AMANDA MASSA**, visited with Bruce Lindsay, Westport Tree Warden, to advise on urban park management (March 11); spoke on "STORMWISE: Integrating Arboriculture and Silviculture to Create Storm Resilient Roadside Forests" at the 20th Central Hardwood Forest Conference in Columbia, MO (35 attendees) (March 30); and spoke on "Twenty-Five Year Response of Non-Crop Trees to Partial Release During Precommercial Crop Tree Management " at the 20th Central Hardwood Forest Conference in Columbia, MO (80 attendees) (March 31).

DR. ADRIANA ARANGO VELEZ spoke on about "Environmental challenges and trees… who wins the battle?", at the Forest Health Monitoring Workshop in New Haven (40 attendees) (March 9); and gave a workshop about "Introduction to tree care: best practices" at the Experiment Station Associates (ESA) (18 attendees) (March 17).

DR. ABIGAIL MAYNARD assisted in preparing experimental garden at Hamden Hall Country Day School (3 teachers, 18 children) (March 14 and 21).

DR. SCOTT WILLIAMS presented "I'm Stumped-Impacts of Rabbit and Deer Browse on Oak Stump Sprout Regeneration" at the Forest Health Monitoring Workshop in New Haven (40 attendees) (March 1); and participated in a graduate committee meeting with University of Connecticut student Kelsey Schwenk in Storrs (March 4).

MR. JOSEPH P. BARSKY participated in the New England Society of American Foresters Executive Committee Meeting in Sturbridge, MA (March 9); and organized and moderated a technical workshop at the 96th Winter Meeting of the New England Society of American Foresters, Sturbridge, MA (March 11).

MS. JOAN L. BRAVO met with John Lavorgna, GioProduction in Hamden to discuss pruning methods and pruning to balance production (March 30); and met with Jerry Savino and staff of Savino Vineyards Woodbridge, to train on Hudson River Umbrella, vine renovation, and proper pruning practices (5 attendees) (March 31).

MR. MICHAEL SHORT attended the Forest Health Monitoring Workshop in New Haven (March 1).

MS. AMANDA M. MASSA spoke on "Assessing urban forest health for avian habitats" at the 96th Winter Meeting of the New England Society of American Foresters in Sturbridge, MA (70 attendees) (March 10).

PLANT PATHOLOGY AND ECOLOGY

DR. YONGHAO LI Gave a talk titled "Needle Damages of Eastern White Pine" for the Forest Health Monitoring Workshop in New Haven, CT (50 Attendees) (March 1); staffed the 'hands-on' table with tree diseases for Arboriculture 101 in Wallingford, CT (36 Attendees) (March 2); attended the National Plant Diagnostic Network National Conference in Washington, DC (March 7-11) and presented a talk titled "Updates from the Plant Disease Information Office" to Northeast Regional Meeting in Washington, DC (25 Attendees) and along with **MS. LINDSAY PATRICK**, presented a poster titled 'The role of inquiry data in monitoring economically important diseases – Results from the PDIO Plant Disease Inquiry Database" (200 Attendees); gave a talk about "Disease Management in Organic Vegetable Farms and Gardens" in CT NOFA's 34th Annual Winter Conference in Danbury, CT (60 Attendees) (March 12); was interviewed on a phone by Ms. Brigitte Ruthman at the Republican-American about effects of warm winter on spring gardening (March 14), gave a lecture "Tree diseases and their management" for the Stamford Arboretum Arboriculture 101 Class in Stamford, CT (11 Attendees) (March 15); attended the CT Nurserymen's Foundation (CNF) Scholarship Committee meeting and participated in the review of scholarship applicants (March 21); gave a talk titled 'Indoor plant selection and care' for the Towers Ones and East Garden Club in New Haven (15 Attendees) (March 22); and gave a talk titled 'Selection and Care of Houseplants' for the Aging at Home Garden Club (12 Attendees) (March 31).

DR. NEIL SCHULTES delivered the first of a two lecture series on "Genetically Modified Plants in Agriculture" in a Yale Course Scie 031 "Current Topics in Science"(March 11).

MR. PETER THIEL organized First Aid/CPR/AED training through the American Red Cross at Jones Auditorium (32 attendees) (March 29).

DR. LINDSAY TRIPPLET was interviewed by two students from a local Middle school about the effects of climate change on plants (March 4), attended the National Plant Diagnostic Network National Meeting in Washington D.C. from March 8th-12th where she participated in workshop on the "Identification of Microfungi" the University of Maryland (March 12th)

MS. LINDSEY PATRICK won the Rotten Tuber Award at the National Plant Diagnostic Network National Conference in Washington, DC (March 7-11). The award and photo is posted in the *Articles of Interest* section.

DR QUAN ZENG received funding from BioSafe Inc to conduct field trials combining organic materials with various biocontrol agents to control fire blight. Richard Cecarelli is a collaborator on this project. ($2,000)

VALLEY LABORATORY

DR. JATINDER S AULAKH reviewed a Master's research thesis from the University of Nebraska -Lincoln (March 17); and participated in the Connecticut Invasive Plant Work Group Symposium Planning Committee meeting at Windsor (March 21).

DR. CAROLE CHEAH gave a presentation on predicting hemlock woolly adelgid winter mortality in Connecticut at the annual Forest Health Monitoring Workshop at the Jones Auditorium, New Haven (March 1).

DR. RICHARD COWLES presented "The Dos and Don'ts of Neonicotinoids," to SavATree in Danbury (100 attendees) (March 1); conducted a webinar hosted by University of Massachusetts titled "Neonicotinoids, Bees and Urban Trees: The Controversy Defined," archived at https://vimeo.com/157623443, observed during the presentation by 450 individuals, (March 3); spoke to The New Hampshire Arborists Association on "Neonicotinoids and Bees" in Concord, NH, (100 attendees) (March 15); and shared "Against the wind: challenges in using behavioral manipulation for managing spotted wing drosophila," as a C.A.E.S. lunchtime seminar, New Haven (40 attendees) (March 30).

MS. ROSE HISKES participated in the Connecticut Invasive Plant Working Group Symposium Planning Committee meeting in Windsor (March 21); and gave a talk on "Invasive Plants and Insects" to the Simsbury Garden Club in Simsbury (14 attendees) (March 22).

DR. JAMES LAMONDIA 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 (March 2); was interviewed about hops and hops research by Paul Dockter and Lamott for HomeBrew, an iCRV radio show (March 3); participated in Agriculture Day at the Capital, speaking about the 2015 Century Farm Award and Anderson Farms of Wethersfield (March 16) (100 people); was interviewed about tobacco diseases, fungicide use and resistance management by Julia Ellis of Tobacco Farm Quarterly (March 16); and participated in the American Phytopathological Society Division Forum Representatives meeting held in conjunction with the APS Potomac Division meeting in Richmond VA (March 22 to 24).

DR. DEWEI Li visited the Instituto of Ecologia (INECOL), Xalapa, Mexico and worked with Dr. Gabriela Heredia, mycologists/research scientist at INECOL to conduct a preliminary study in a cloud forest near INECOL and in the buildings at INECOL (March 13 to 19). During his visit, he made a presentation "Aeromycology in the Last 20 years: Research and Challenges" (60 people in the audience and 40 people at three other institutions watched via web link) (March 16).

DR. KATJA MAURER taught a UConn Extension Master Gardener class about growing hops held in Norwich, CT (March 12) (30 attendees).

DEPARTMENTAL RESEARCH UPDATES MARCH 2016

June-Wells M, Gallagher F, Hart B, Malik V, **Bugbee G.** 2016. The relative influences of fine and landscape scale factors on the structure of lentic plant assemblages. *Lake and Reservoir Management* 32:116–131.

ABSTRACT The process of plant community assembly has long been a topic of debate among ecologists. Aquatic plant assemblages and their structure may be the result of a series of abiotic and biotic filters that include transport (i.e., physical movement of species), water chemistry, sediment chemistry, basin structure, and competitive interactions. The influences of transport and water chemistry have been well investigated, but many questions persist about the interrelationships among water and sediment variables, including their combined influences on the structure of the aquatic plant assemblage. To understand how these abiotic conditions interact, we sampled 750 points in 30 lakes. Using these data, a split canonical correspondence design was used to evaluate the relative influences of regional and fine-scale conditions in structuring the plant assemblage. Additionally, multiple logistic regressions were employed to determine the individual species' abiotic preferences. The results suggest that the plant assemblage structure is principally determined by the lake-sediment characteristics. Sediment variables explained 28% of the total species-data variance and water chemistry accounted for 9% (total variance explained = 46%; 9% due to intercorrelation of water/sediment characteristics). There were also strong species–environmental relationships; nonnative species showed distinct correlations with sediment pH and lake water conductivity, which may be useful in lake management initiatives such as risk assessment and nonnative species monitoring. Finally, and as expected, the Shannon diversity index was strongly related to depth and light.

Gent, M.P.N. 2016. Effect of irradiance and temperature on composition of spinach. HortScience 51:133-140

ABSTRACT: The composition of spinach (*Spinacea oleracea* L.) was studied in response to daily light integral (DLI) and diurnal variation in a greenhouse. Values for plantings with different irradiance were compared using normalized daily light integral (NDLI), which was DLI divided by leaf area index. The dry mass as a ratio of fresh mass increased with NDLI as it increased from 3 to 27 mol·mL2·dL1. Reduced nitrogen (N) changed with time of day under high but not under low NDLI. Nitrate and amino acids were affected by temperature more than NDLI. Starch increased with NDLI to 27 mol·mL2·dL1 in morning or afternoon. However, sugars decreased with temperature more than with NDLI, due to a decrease in petioles up to 20 8C. Oxalic acid increased with NDLI or temperature. Over a diurnal cycle, starch had minimum value at 0800 HR and maximum at 1800 HR in all parts. The sugars, sucrose, glucose, and fructose, had a binary response with high values in the day and low values in the night. Oxalic acid increased at the end of the day. Other metabolites had no response to time of day. The growth of spinach may be slow in fall compared with summer due to the effect of low temperature on metabolism of sugars and nitrate.

Ferrandino, F. 2016. Grape anthracnose. CAES Fact sheet. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/grape_anthracnose.pdf

Ferrandino, F. 2016. Grape Downy Mildew. CAES Fact sheet. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/grape_downy_mildew.pdf

Ferrandino, F. 2016. Grape Powdery Mildew. CAES Fact sheet. http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/powdery_mildew_of_grapes.pdf

Li, D.W., Schultes, N.P., Vossbrinck, C. (2016) *Olpitrichum sphaerosporum*: a new USA record and phylogenetic placement. **Mycotaxon** 131-1

Abstract: *Olpitrichum sphaerosporum*, a dimorphic hyphomycete isolated from the foliage of *Juniperus chinensis*, constitutes the first report of this species in the United States. Phylogenetic analyses using large subunit rRNA (LSU) and internal transcribed spacer (ITS) sequence data support *O. sphaerosporum* within the *Ceratostomataceae*, *Melanosporales*.

Li, Y. 2016. Botryosphaeria canker of woody ornamentals. CAES Fact sheet http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/botryosphaeria_cankers_of_woody_ornamentals.pdf

Li. Y. 2016 Downy mildew of cucurbits. CAES fact sheet http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/downy_mildew_of_cucurbit.pdf

Minton, J. A., Rapp, M., Stoffer, A. J., **Schultes, N. P.**, Mourad, G. S. (2016) Heterologous complementation studies reveal the solute transport profiles of a two-member Nucleobase Cation Symporter 1 (NCS1) family of *Physcomitrella patens*. Plant Physiol. & Biochem. 100: 12-17.

Abstract: As part of an evolution-function analysis, two Nucleobase Cation Symporter 1 (NCS1) from the moss *Physcomitrella patens* (PpNCS1A and PpNCS1B) are examined – the first such analysis of nucleobase transporters from early land plants. The solute specificity profiles for the moss NCS1 were determined through heterologous expression, growth and radiolabeled uptake experiments in *ncs1*-deficient *Saccharomyces cerevisiae*. Both PpNCS1A and 1B, share the same profiles as high affinity transporters of adenine and transport uracil, guanine, 8-azaguanine, 8-azaadenine, cytosine, 5-fluorocytosine, hypoxanthine, xanthine, and allantoin. Despite sharing the same solute specificity profile, PpNCS1A and PpNCS1B move nucleobase compounds with different efficiencies. The broad nucleobase transport profile of PpNCS1A and 1B differs from the recently-characterized Viridiplantae NCS1 in breadth, reveal-

Peterson, R.B., Schultes, N.P. McHale, N.A., Zelitch, I. (2016) Evidence for a role for NAD(P)H dehydrogenase in concentration of CO_2 in the bundle sheath cell of *Zea mays*. **Plant Physiol.** accepted March 21, 2016 doi:10.1104/pp.16.00120

Abstract: Prior studies with *Nicotiana* and *Arabidopsis* described failed assembly of the chloroplastic NAD(P)H dehydrogenase (NDH) supercomplex by serial mutation of several subunit genes. We examined the properties of *Zea mays* leaves containing *Mu* and *Ds* insertions into nuclear gene exons encoding the critical O and N subunits of NDH, respectively. *In vivo* reduction of plastoquinone in the dark was sharply diminished in the maize mutant lines compared to wild type (WT) but not to the extreme degree observed for the corresponding lesions in Arabidopsis. The net carbon assimilation rate (*A*) at high irradiance and saturating CO_2 levels was reduced by one-half due to NDH mutation in maize although no genotypic effect was evident at very low CO_2 levels. Simultaneous assessment of chlorophyll fluorescence and *A* in maize at low (2%) and high (21%) O_2 levels indicated the presence of a small, yet detectable, O_2-dependent component of total linear photosynthetic electron transport in 21% O_2. This O_2-dependent component decreased with increasing CO_2 level indicative of photorespiration. Photorespiration was generally elevated in the maize mutants compared to WT. Quantification of the proportion of total electron transport supporting photorespiration enabled estimation of the bundle sheath cell CO_2 concentration (C_b) using a simple kinetic model of ribulose bisphosphate carboxylase/oxygenase function. The *A* versus C_b relationships overlapped for WT and mutant lines consistent with occurrence of strictly CO_2-limited photosynthesis in the mutant bundle sheath cell. The results are discussed in terms of the CO_2 concentration model of Laisk and Edwards [Photosynth Res (2000) 66, 199-224].

Li, D.W., Schultes, N.P., Vossbrinck, C. (2016) *Olpitrichum sphaerosporum*: a new USA record and phylogenetic placement. **Mycotaxon** 131-1

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Peterson, R.B., Schultes, N.P. McHale, N.A., Zelitch, I. (2016) Evidence for a role for NAD(P)H dehydrogenase in concentration of CO_2 in the bundle sheath cell of *Zea mays*. **Plant Physiol.** accepted March 21, 2016 doi:10.1104/pp.16.00120

Abstract: Prior studies with *Nicotiana* and *Arabidopsis* described failed assembly of the chloroplastic NAD(P)H dehydrogenase (NDH) supercomplex by serial mutation of several subunit genes. We examined the properties of *Zea mays* leaves containing *Mu* and *Ds* insertions into nuclear gene exons encoding the critical O and N subunits of NDH, respectively. *In vivo* reduction of plastoquinone in the dark was sharply diminished in the maize mutant lines compared to wild type (WT) but not to the extreme degree observed for the corresponding lesions in Arabidopsis. The net carbon assimilation rate (*A*) at high irradiance and saturating CO_2 levels was reduced by one-half due to NDH mutation in maize although no genotypic effect was evident at very low CO_2 levels. Simultaneous assessment of chlorophyll fluorescence and *A* in maize at low (2%) and high (21%) O_2 levels indicated the presence of a small, yet detectable, O_2-dependent component of total linear photosynthetic electron transport in 21% O_2. This O_2-dependent component decreased with increasing CO_2 level indicative of photorespiration. Photorespiration was generally elevated in the maize mutants compared to WT. Quantifica-

bisphosphate carboxylase/oxygenase function. The *A* versus C_b relationships overlapped for WT and mutant lines consistent with occurrence of strictly CO_2-limited photosynthesis in the mutant bundle sheath cell. The results are discussed in terms of the CO_2 concentration model of Laisk and Edwards [Photosynth Res (2000) 66, 199-224].

Li, D.W., Schultes, N.P., Vossbrinck, C. (2016) *Olpitrichum sphaerosporum*: a new USA record and phylogenetic placement. **Mycotaxon** 131-1

Abstract: *Olpitrichum sphaerosporum*, a dimorphic hyphomycete isolated from the foliage of *Juniperus chinensis*, constitutes the first report of this species in the United States. Phylogenetic analyses using large subunit rRNA (LSU) and internal transcribed spacer (ITS) sequence data support *O. sphaerosporum* within the *Ceratostomataceae*, *Melanosporales*.

Li, De-Wei 2016. Biology of Microfungi. Springer, Switzerland. 650 pp. DOI: 10.1007/978-3-319-29137-6. ISBN 978-3-319-29135-2

Abstract: This reference book includes 24 chapters written by a group of experts in the different fields of microfungi and cover a broad range of topics on microfungi. It provides the most updated information on the latest development in systematics and taxonomy of microfungi, new techniques which were developed in the last ten years and their application in microfungal research. After the International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) was adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011, it has had a profound impact on mycology and its research. Fungal nomenclature changes and its significance to fungal taxonomy and naming of microfungi in the future is discussed in detail. Since dual names system for fungi developing both sexual and asexual states, and fungi developing only asexual state is no longer available, the first five chapters will clarify some confusion and provides perspective views on the direction for future research. The next nine chapters cover microfungi and their ecological roles or functions in the different habitats (air, indoor, aquatic, marine, plants, soils, etc). The remaining 13 chapters cover the relationship of microfungi and humans (good and bad) and usage or application microfungi in different industries, such as food, agriculture, forestry, green technology, pharmaceutics, and medicine, as well as in our daily life. The book bridges the gap between basic mycological research and applied mycology and provide readers a unique set of information and knowledge of microfungi generated from multiple angles in different fields of mycology.

Li De-Wei. 2016. Introduction -Advances and Predicament. Pages 1-6, in De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland. DOI: 10.1007/978-3-319-29137-6_1

Abstract: This chapter briefly discusses the recent advances in mycology and identifies major challenges mycologists are facing. It also provides an overview of the book.

Li De-Wei, Castañeda-Ruiz R. F. and LaMondia J. 2016. Evolution of fungi and update on ethnomycology, Pages 237-266, in De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland, DOI 10.1007/978-3-319-29137-6_11

Abstract: In the last twenty years, studies on the early evolution of fungi have made significant developments with the assistance of molecular clock dating methods and new fossil evidence. The origin of fungi probably dates back over 800 million years ago. The evolution of major fungal phyla is also reviewed. New archaeological discoveries and new analytic technologies developed in the last four decades enable us to date the artifacts related to using fungi from pre-literate periods of human beings. At present, utilization of fungi by humans can be traced back to prehistorical periods. The production of alcoholic drinks and fermented foods and usage of medicinal microfungi in human history are discussed and updated.

Castañeda Ruiz RF., Heredia Gabriela, Gusmao L F. P. and **Li De-Wei** 2016. Fungal Diversity of Central and South America, pages 197-217, in De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland. DOI:10.1007/978-3-319-29137-6_9

Abstract: In the last 30 years 3757 taxa and 104 genera of microfungi have been described from the Central and South American Neotropic. The Neotropical zone in Central and South America are a megadiverse ecozone where a large number of undescribed fungal taxa remain to be discovered. This chapter reviewed the studies conducted on diversity of microfungi from different substrates and habitats in the neotropic in the past 30 years and discussed the generic novalties described from the these studies. At the same time, the methodology of sample collection, preparation and incubation used in these studies are provided in detail.

Yang C, Pakpour S, Klironomos J. and **De-Wei Li** 2016. Microfungi in indoor environments: what is known and what is not? Pages 373-412, in De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland. DOI 10.1007/978-3-319-29137-6_15

Abstract: Most indoor fungi belong to the microfungi. The latest advancements in research on indoor microfungi are reviewed in this chapter. It emphasizes the systematic development, fungal fragments, health effects, MVOCs, natural disasters, domestic mites, and new technologies used in research regarding indoor fungi. These areas are not well covered by reviewed literature. In each area we discuss the directions, areas or knowledge gaps which need to be addressed in future research.

Magyar D., Vass M., **De-Wei Li** 2016. Dispersal strategies of microfungi. Pages 315-371, in De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland Doi: 10.1007/978-3-319-29137-6_14

Abstract: Successful and efficient dispersal of fungi is crucial to the survival of the fungi, balance of ecosystems and stability of biodiversities. Dispersal strategies of microfungi and other fungi are reviewed in detail based on the literature published in the last four decades. It covers the latest development of research on the dispersal process: liberation, transportation, deposition, resuspension, and survival of fungal spores and other propagules from microscale to macroscale. The characters of dispersal strategies of fungi from different habitats are elucidated. The fungal habitats include litter, soil, plants, insects, other animals, and aquatic and marine environments etc. For each strategy, the associated mechanisms are discussed for their ecological significance. The significance of new technology used in the recent studies on dispersal strategies is presented. At the same time current and future applications of dispersal strategies of microfungi are discussed in the chapter.

LaMondia, J. A. and P. Timper. 2016. Interactions of Microfungi and Plant Parasitic Nematodes. Chapter 23, Pp. 573-614. De-Wei Li (ed), Biology of Microfungi. Springer, Switzerland, DOI 10.1007/978-3-319-29137-6_23.

Abstract: Plant parasitic nematodes and microfungi inhabit many of the same ecological habitats and interact in almost every conceivable way. Nematodes can feed on fungi, and conversely fungi can use nematodes as a food source. Fungi have been widely studied as biological controls of plant parasitic nematodes. Fungi can attract or repel nematodes and nematodes and fungi can interact to either directly or indirectly increase or even decrease plant disease. Nematodes can also feed on fungi and act as biological controls of plant disease. Plant parasitic nematodes likely obtained the cell-wall degrading enzymes necessary to successfully feed on plants from fungi through horizontal gene transfer. Finally, plant parasitic nematodes can interact with fungal pathogens or even nonpathogenic or weakly pathogenic fungi to increase plant disease.

JOURNAL ARTICLES APPROVED MARCH 2016

Anderson, John F., **Francis J. Ferrandino**, **Michael P. Vasil**, Robert H. Bedoukian, Marie Maher, and Karen McKenzie. Attractants and repellents of bed bugs (Hemiptera: Cimicidae). *Journal of Medical Entomology*

Cheah, Carole A. S-J. Predicting winter mortality of hemlock woolly adelgid in Connecticut. Abstract, Northeast Natural History Conference

Datnoff, L. E. and **W. H. Elmer**. Mineral nutrition and florists' crop diseases. In: *Handbook of Florists' Crops Diseases*. R. J. McGovern and W. H. Elmer (Eds.). Springer Publishing Co.

Elmer, Wade and Kathyrn Kamo. Diseases of *Gladiolus*. In: *Handbook of Florists' Crops Diseases*. R. J. McGovern and W. H. Elmer (Eds.). Springer Publishing Co.

Rutledge, Claire E. and **Adriana Arango-Velez**. Larval survival and growth of emerald ash borer on white ash and white fringetree saplings under well-watered and water-deficit conditions: a direct comparison. *Environmental Entomology*

Servin, A., **R. De La Torre Roche**, H. M. Castillo, L. Pagano, **J. Hawthorne**, **C. Musante**, **J. Pignatello**, M. Uchimiya, and **J. C. White**. Exposure of agricultural crops to nanoparticle CeO_2 in biochar-amended soil. *Plant Physiology and Biochemistry*

Stafford III, Kirby C. and **Goudarz Molaei**. With ticks, it is not just Lyme disease anymore. *Sanctuary* (Newsletter of the White Memorial Conservation Center)

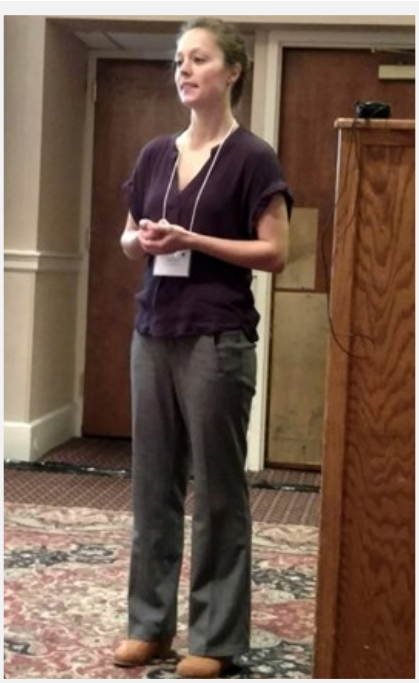
Uchimiya, Minori, **Joseph J. Pignatello**, and **Jason White**. Disintegration of biochar pellets by fullerene C60 supercrystals into amorphous carbon nanoparticles. *Environmental Science and Technology*

Wang, Z., L. Xu, J. Zhao, X. Wang, **J. C. White**, and B. Xing. CuO nanoparticle interaction with *Arabidopsis thaliana*: toxicity, parent-progeny transfer and gene expression. *Environmental Science and Technology*

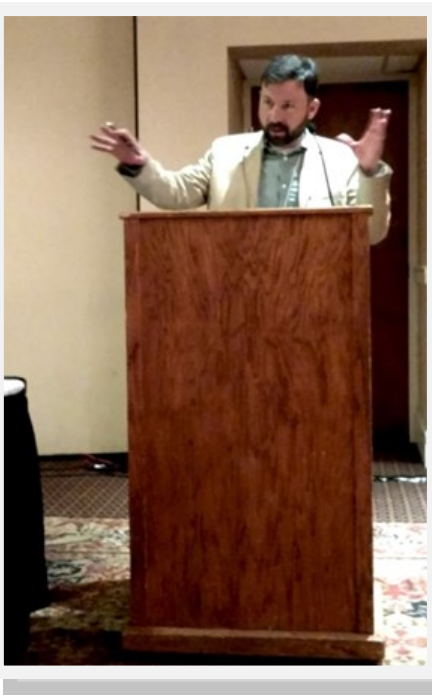
Williams, Scott C., Michael A. Gregonis, and **Michael R. Short**. White-tailed deer fawn fact sheet. *CAES Fact Sheet*

Zhang, Yanyan, **Joseph J. Pignatello**, and Shu Tao. Bioaccessibility of nitro- and oxy-PAHs in fuel soot assessed by an in vitro digestive model with absorptive sink. *Environmental Science and Technology*

ARTICLES OF INTEREST MARCH 2016



MS. AMANDA M. MASSA speaking on habitat assessments at the 96th Winter Meeting of the New England Society of American Foresters in Sturbridge, MA



MR. JOSEPH P. BARSKY moderating a technical workshop at the 96th Winter Meeting of the New England Society of American Foresters, Sturbridge, MA

ROTTEN TUBER AWARD

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION

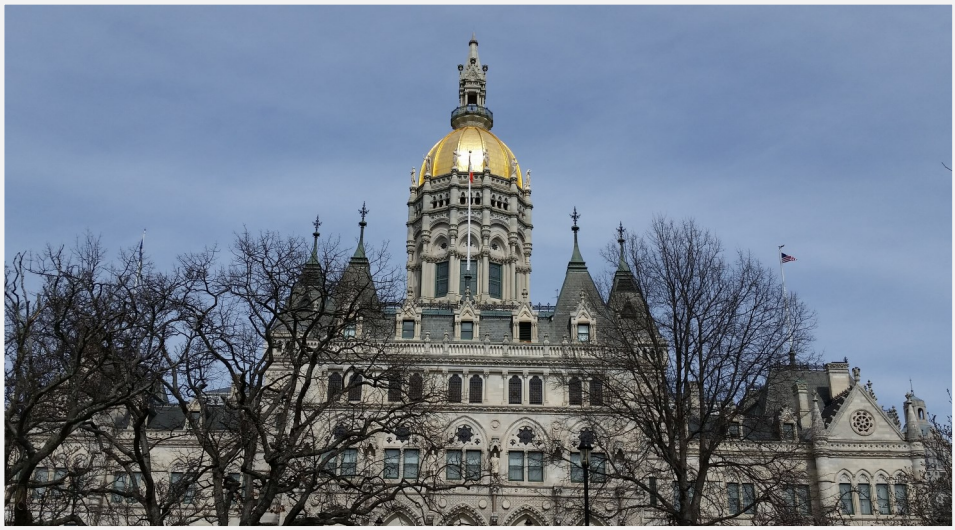
NEW HAVEN, CT

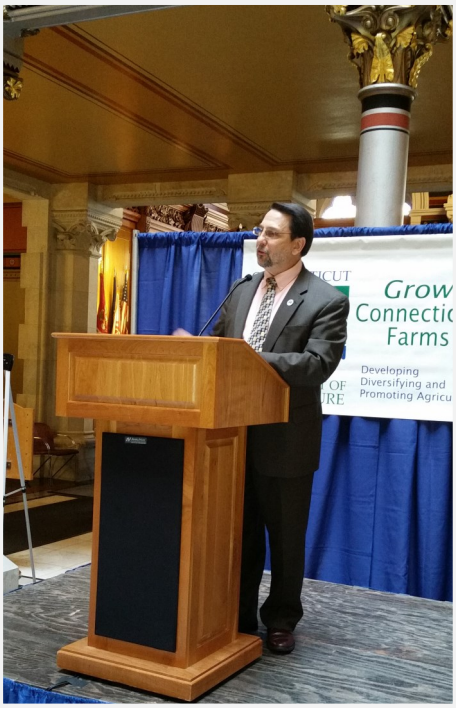
SUBMITTED BY LINDSAY PATRICK

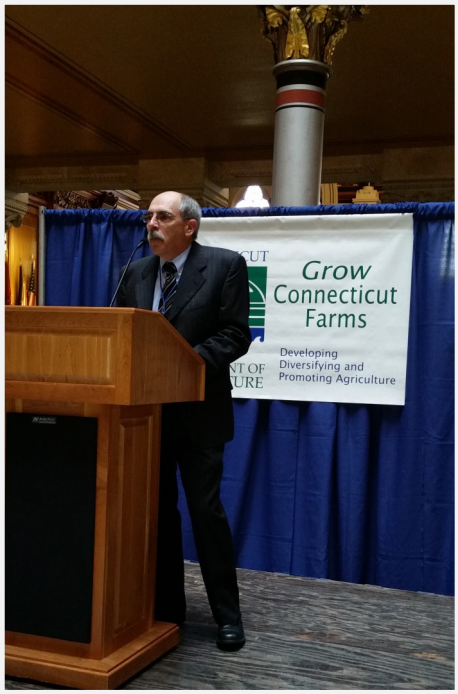
On April 28th, 2015 an arborist brought to our office a large root from an apple tree. The root was covered with orange-colored nodules and the tree was in serious decline. “It’s hollow and decayed on the inside” he said. Without hesitation, I stuck my face right into the opening at the end of the root, assuming I might find clues as to the cause of the problem. I promptly shrieked and nearly fell off my chair! A pair of green eyes was staring back at me! Bewildered, the arborist asked me what was wrong. I rotated the root around to share my findings with him; a very large toad had made himself at home in the hollow root! The arborist left the root with me for further disease analysis, and I brought Mr. Toad outside where he begrudgingly hopped out of his cozy cubby. You never know who or what will hitch a ride to your office on a sample!

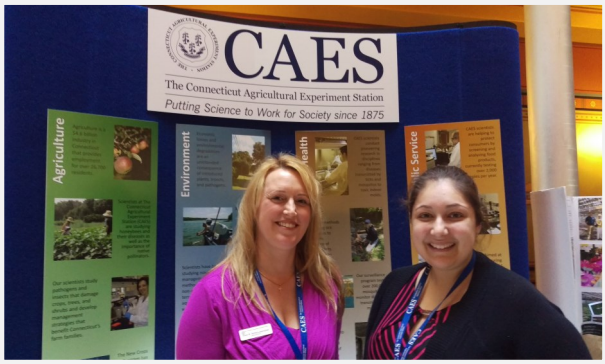
The specimen submitted by Ms. Patrick that won the ROTTEN TUBER AWARD

Select photos from AG Day at the State Capitol, held on March 16, 2016.









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Back and Current issues of Station News are located on our website at http://www.ct.gov/caes/cwp/view.asp?a=2826&q=378188

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

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